report on the international seminar

climate · habitat · culture
Report on the international seminar

CLIMATE HABITAT CULTURE

AN ACTIVITY IN THE FRAMEWORK
OF THE BUILDING RESEARCH
OF THE AM - RESEARCH & DESIGN GROUP

Architecture completion - Milieu integration
Report on the international seminar

CLIMATE HABITAT CULTURE

AN ACTIVITY IN THE FRAMEWORK OF THE BUILDING RESEARCH OF THE AM - RESEARCH & DESIGN GROUP

an edition

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PREAMBLE

P. SCHMID

First of all I would like to ask you kindly to forgive the enormous - in fact unforgiveable - delay of the publication of this report of the international seminar 'Climate Habitat Culture', which was held at our Eindhoven University of Technology.

Because of the many tasks and the few available (hu)man working hours, but also the late receipt of many contributions and several other circumstances, we succeeded just three years after the congress, to finish the manuscript and the whole layout. It is a pity that we did not get the very contributions from Biereaud, van Gemert and Goffin. Even for that my apology.

Several interesting questions on special subjects and the total report of the seminar in general gave us, again and again, the implications of the high actuality of the theme and therefore we still felt the duty to publish, what happened around 'Climate Habitat Culture' in Eindhoven in 1982.

Now the time has come, and we may offer this report, with many thanks to all the helpers who made the publishing of this book possible for the participants as well as for all other interested persons.

Peter Schmid
Eindhoven University of Technology.
March/April 1985
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NOWADAYS THE FUNDAMENTAL DEVELOPING AND APPLIED RESEARCH ACTIVITIES OF OUR AM GROUP ARE MAINLY CONCENTRATED UNDER THE TITLE

IBA - INTEGRAL BIO-LOGICAL ARCHITECTURAL COMPLETION
(formerly AS IN 16 now AS VZ 04)

This programme is divided into two projects:

• Integral Bio-Logical Design of Buildings and Components
  (paradigmas, principles, criteria, design aids...)
• Development of Building Methods, Healthy for the Inhabitants
  (Design aids, systems, prototypes, application...)

Further we are participating in the research of

BUILDING IN DEVELOPING COUNTRIES (IN TE 06)

At the time of the international seminar CLIMATE HABITAT CULTURE
we had several projects in the foreground, namely:

BAMAF
B AS 25

B Basisbeginselen
A Afbouwtechniek
M Milieu Integratie
A Achtergrond
F Filosofie

Principles of Architectural Completion Environmental Integration and Background Philosophy
Energy in the Framework of Architecture and Finishing Touch with Details and Integration

Humane Ecological and Bio-logical Architectural Environment in Relation to Psychosomatic Health

Self Realisation, Teaching Methods and Education Building Aspects

and some other projects beside.

Architect Albert Abut was attracted to the project BAS 27 HEBAP 'The Aspects of Humane Ecological and Bio-logical Architectural Environment in Relation to the Psychosomatic Health'. Because of Abuts professional experience in less industrialized countries (than ours) and his interest in Appropriated Technology, he investigated an important part of this project. During one year (which later was extended to a few months more) he had a contract with our university, which enabled him to concentrate on this very subject and us to develop this research in general.
During this inspiring work, our contacts and exchanging of thoughts the idea came up, to organize a seminar in the framework of this research project and its special study. Hence the organization of the International seminar 'CLIMATE HABITAT CULTURE' - CHC - became a fact.

*  
This report on the seminar starts with a summary of the work which was done by Albert Abut in the BAS 27 research project HEBAP (Humane Ecological and Bio-Logical Architectural Environment in Relation to Psychosomatic Health)

After the opening speeches to the conference you will find the contributions of almost all speakers of the congress, so far as possible illustrated.

Groups of contributions are divided by the discussions which are also given here as far as possible.

A special part of these main chapters brings work of the members of the Department of Architecture, Planning and Building Science at the Eindhoven University of Technology.

The seminar took place within three interesting exhibitions, also organized by the AM group:

1. BUILDING IN YEMEN BY ARCHITECT RIBA DEREK H MATTHEWS
   (original title:)
   BOUWEN IN YEMEN ARCHITECT RIBA DEREK H MATTHEWS

   This exhibition showed paintings, photographs and architecture, all made by Derek H. Matthews.

2. HUMANE ECOLOGICAL AND ENERGY ASPECTS OF BUILDING BY
   ARCHITECT ALBERT ABUT
   (original title:)
   HUMANE ECOLOGISCHE EN ENERGETISCHE ASPECTEN VAN HET
   BOUWEN ARCHITECT ALBERT ABUT
In a way a presentation of the whole research work, which was done by Albert Abut in the framework of the BAS 27 research project HEBAP

3. DESIGN AND THIRD WORLD
BY STAFF MEMBERS AND STUDENTS OF THE EINDHOVEN UNIVERSITY OF TECHNOLOGY
(original title:)
ONTWERPEN EN DE DERDE WERELD, MEDEWERKERS EN STUDENTEN THE

Besides some students from several studies including the final one, most of the members of the Department, engaged in work in the third world, exposed examples of their work concerning 'Climate Habitat Culture'.

This exposition showed in a way a cross section through all scales of building, from tools and furniture via buildings to townplanning and design principles.

The exposers where:

Piet Beekman, arch. HBO
Gerard Brekelmans, arch. HBO
ir. Peter Erkelens
ir. Paul Jansdaal
dr. ir. Jules Janssen
ir. Wolf Schijns
Prof. mag. arch. Peter Schmid
Rene van Veen, arch. HBO

A part of the exposed materials of all three exhibitions are integrated into the contributions in this book.

The report ends with some carefully conclusions
## Seminar Program

### March 31st, April 1st and April 2nd

**Auditorium, Building TH Eindhoven**

### Wednesday, March 31st 1982

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<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.00</td>
<td>Opening speech by Prof. Dr. ir. T. Bas, dean of the department of architecture and building-constructions, TH Eindhoven</td>
</tr>
<tr>
<td>10.30</td>
<td>Introduction by P. E. Lapere M.Sc., Director of the development-cooperation office TH Eindhoven</td>
</tr>
<tr>
<td>11.00</td>
<td>Break</td>
</tr>
<tr>
<td>11.10</td>
<td>The role of exchanges in the emergence of new building cultures by B. A. Jude Architect D.E.S.A.</td>
</tr>
<tr>
<td>12.30</td>
<td>Lunch break</td>
</tr>
<tr>
<td>13.30</td>
<td>Opening of the exhibition &quot;Building in North Yemen&quot; at the main building, cross-gates of the TH Eindhoven</td>
</tr>
<tr>
<td>15.00</td>
<td>Break</td>
</tr>
<tr>
<td>15.00</td>
<td>Accessibility and earth-constructions by E. H. Deutser</td>
</tr>
<tr>
<td>16.30</td>
<td>Summary of the day and discussion</td>
</tr>
<tr>
<td>18.05</td>
<td>Break</td>
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</table>

**Conferences by:**
- P. E. Lapere M.Sc.: Building with climate and use of local materials

### Thursday, April 1st 1982

<table>
<thead>
<tr>
<th>Time</th>
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</tr>
</thead>
<tbody>
<tr>
<td>9.30</td>
<td>To Eindhoven staff experiences and project-realization on the seminar theme by R. van Veen, Arch. MBO</td>
</tr>
<tr>
<td>10.30</td>
<td>Introduction by P. E. Lapere M.Sc., Director of the development-cooperation office TH Eindhoven</td>
</tr>
<tr>
<td>11.00</td>
<td>Breakfast</td>
</tr>
<tr>
<td>11.30</td>
<td>Visit of the exhibitions</td>
</tr>
<tr>
<td>12.30</td>
<td>Lunch break</td>
</tr>
<tr>
<td>13.00</td>
<td>Observations on housing problems in several third world countries by J. K. A. Breu A.C.A.</td>
</tr>
<tr>
<td>15.00</td>
<td>Break</td>
</tr>
<tr>
<td>15.00</td>
<td>The significance of participation in the development of habitat by J. Turner Architect</td>
</tr>
<tr>
<td>16.00</td>
<td>Summary of the day and discussion</td>
</tr>
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<td>18.00</td>
<td>Break</td>
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</tbody>
</table>

**Conferences by:**
- R. van Veen, Arch. MBO: Building with climate and use of local materials
- J. K. A. Breu A.C.A.: Observations on housing problems in several third world countries

### Friday, April 2nd 1982

<table>
<thead>
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<th>Time</th>
<th>Event</th>
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<tr>
<td>9.30</td>
<td>&quot;Low cost housing&quot; with appropriate technology and building materials by Prof. Dr. ir. G. Rinke</td>
</tr>
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</tr>
<tr>
<td>13.30</td>
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</tr>
<tr>
<td>15.30</td>
<td>Break</td>
</tr>
<tr>
<td>15.00</td>
<td>Development projects in western countries by G. Nettinga</td>
</tr>
<tr>
<td>16.00</td>
<td>Final discussion</td>
</tr>
</tbody>
</table>

**Discussions are lead by Prof. Mag. Arch. P. Schmitz**

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**Free Entrance**

**Information:**
- SAS secretary postbox 4
- P.O. box 511
- 5600 MB Eindhoven
- Ph. 040/425478
SUMMARY OF THE FORMER RESEARCH

A. ABUT

Research Report

Perspectives Eighties in Architecture

A summary
by A. Abut, architect d.p.l.g.
seminar 'Climate Habitat Culture'
conceived and organised
by A. Abut, architect d.p.l.g.

The working team for the realisation of the seminar, lead by Prof. mag. arch. Peter Schmid
Albert Abut, arch., ir. Wolf Schijns, arch.

(A BAS - AM realization)
The realisation of this book, of the seminar 'Climate Habitat Culture' and of the exhibitions was made possible thanks to the constant efforts of Peter Schmid, leader of the group A.M.(T.H.E.); Wolf Schijns, Jan Lagerwerf, Han van der Klip, Pieter Versteeg, Ger Kengen, Marèse Wolfs, Renate van Breukelen and Marjorie Schreuder of the same group, Paul Laperre of the 'Bureau Ontwikkelingsaanwerking' and: Sandra Abut-van Zalm Ghislaine Bromberger Maggi Bulten Jan van Daal Ramf El Daham Jan Isabel Har Hollands Sjap Holst Mohammed Whatibi Michelangelo Majorana Derek H. Matthews Mark Stalpers Wienke Wiemers And so many thanks to all the fellow workers of the T.H.E., colleagues and friends.

A.J. Abut
Man, in order to be able to protect himself from rain, snow, sun, heat and cold has always been looking for building himself a shelter. In his initial nomad life, he knew perfectly how and when to follow the cycles of nature. He adapted himself to nature.

As a result of the sedentarisation, man started to adapt his direct environment to his needs according to his living in cities (urban) or in villages (rural). Complex social, economical structures arised. This led to a different kind of private as well as collective organisation of space. Industrialisation & overpopulation pushed man to live in less and less appropriate houses/dwellings: The epoque of "housing" started. (post-war, pre-fab, sleepcities and....shims, as a consequence of the demographic appeal of industrialisation).

Also, nature slowly degradated (industrial trash, deforestations, etc...)

A new beginning:

Today our world is entering in a new era. But the structure in which man has emprisoned himself physically and psychologically is a restriction for him to make this very important step. We talk about the housing crisis, but unappropriate dwellings are still rising like mushrooms from our damaged planet. We all carry the mark of aculturalisation: original rural & urban patterns have been disturbed, misused or replaced. This counts for people that live in New-York or Paris as well as for the inhabitants of Lima or Manila.

The blindly use of modern building techniques and materials is one of the aspects of aculturalisation which damaged very strongly the existing social structures. This contributed to the loss of traditional cultural treasures. This blind use is nowadays considered as a world-wide fiasco by the majority of the "experts" and the inhabitants, the latter whenever given the opportunity to speak up.

Also priorities changed as a result of the rise of energy costs. The impact of this energy crisis -and in response to it- the priorities in the field of engineering and architectural designs changed. Techniques of energy conservation started to be "developed", without doubting that these are as old as the ages.

Housing relates the problems of need, of growth of population, of culture and form. It appeals psychological and physiological comfort: human comfort.

Today there is a new consciousness which considers the use of materials and design processes to be adapted to each climate, topography, social structure and culture, taking in consideration ecological and environmental factors.

....For, knowing our experience is knowing our environment. We shouldn't submit but adapt, as the world doesn't belong to men.

In it's first part this book gives some explanations on parameters to be studied before one starts (or participates to) the design process of a housing (or facility buildings) project anywhere on earth. In its second part, we will have a close look to diverse witnesses of different persons (architects, engineers, town-planners or others), who today are representing the socio-technical potential of the building world.
The power of man, as an ecological dominant is increasing, as well as the influence that plant & animal domestication have on the content of the cultural landscape (with its association of the physical and cultural form, generated by the interplay of man and nature) and the quality of human life. This results in a severe disturbance of the ecological balance.

There is now a whole developing science of ecological planning. Coupled with a technological capability, this should make the reversion of our actual degrading situation possible.

Nature provides us life, food and shelter. Everything in it is in an absolute balance. But man forgets its important presence and pollutes it by using its elements without being aware of their real relative value. He builds dams where he shouldn't and uses massively destructively all the natural elements.

For instance: the construction of a dam causes the drowning of the fertile lands beneath and a negative feedback. The consequences of the construction of the Assouan Dam on the Nile (this dam was of course a technological wonder)

1. It stops the fertile soil; this diminishes ipso facto the mineral nutrients consistency of the river's water.
2. This results in the fact that the primary productivity drops down.
3. This also causes the fall back of the secondary productivity of Oriental Mediterranean Sea.
4. The Egyptian fishermen catch only 1/6th of their former "harvest".

Men should work with nature because in a way he is a part of it. When he builds he is to consider the ground and its resources, its composition and its environment. The habitat and utility building has to be conceived until its details with respect for these relationships because the maintenance of thermal equilibrium between the human body and its environment is one of the primary requirements for health, well-being and comfort.

Also the design of a pleasant and economic building cannot be achieved without an understanding of the adjacent system: the climat or environment and the human response system.

In ancient times and still today, in so-called primitive or traditional, rural settlements men build after taking proper note of the forms of the hills, directions of watercourses, since buildings are themselves "the outcome of the molding influences of winds and waters"; in addition they also consider the heights and forms of buildings, the directions of roads and bridges in order to fit into the landscape and not because of an obscure economical or competitive reason.

The demographic explosion today appeals an indisputable international cooperation. The coming post-industrial societies must be founded on a global ecological planification. This is a necessity for the sensorial development of the child for his enriched contact with a natural and non degraded milieu.

The definite stability of human settlements, including the ones on the industrialised countries, in order to satisfy the material, recreational and cultural needs of man, must be realised in complete harmony with nature, taking in consideration that the environmental crisis is not to be attributed to the technology itself, but its wrong use. We have to re-synchronise ourselves with nature.

"Even the natural spaces don't exist in sufficient quantity in order to satisfy the recreational needs of men. The private appropriation and the real estate speculation should be controlled."

John O. Simonds.

---

THE DYNAMICS OF ECOLOGICAL SUICIDE

This chart is a fair representation of foreseeable trends in the world and human condition. It is alarming, yet there is room for hope! Historically the human being faced with other impending disasters, has demonstrated an immense capacity to adjust and overcome. And earth, within limits, has proved its resilience (after: John O. Simonds)
"There is far more to learn from the wisdom of the past, from structures shaped by imagination and built of materials appearing naturally on earth, than from any further expansion that white man's techno-plastic procures."

Lloyd Kahn

...Then started the complex questioning of design methods and materials use. Today we came as far as the promotion of use of a material like earth-launched at government levels of western developed countries, as in USA (New Mexico), France (Competition of Isle d'Abeau) etc.- to replace concrete or iron which were seen as unreplaceable and unique materials for all regions of the world, for all climates and all cultures!

Role of governments, public and private initiatives.
The actual policy of western developed countries governments is to subsidise:
--private initiatives on thermal insulations of walls and roofs, --ameliorating the heating apparatus and natural air-conditioning system, --the double glazing of windows in old and new buildings.

They also made new energetical plans for the development of new and renewable energies and set new norms and codes of thermal insulation.

They started to launch programmes for the trying out of building materials and they took action to inform the building professionals.

But the first changing needed is the progress in the design process by reconsidering the rules and priorities:
--siting and orientation of the building to the sun,
--more careful design of glass area and use of more efficient glass and shading of the glass.
--heavy insulation.

--buildings closed to the north.
--solar gain and daylighting.
--orienting windows properly and covering them at night to reduce heat loss.
--natural ventilation etc., in order to reduce heat loss in winter and to favour natural ventilation in summer...

...Like the Greeks of Priene (West Anatolia) who designed their dwellings in such a way that the section of the house facing south was built lower than the northern section in order not to cut off the winter sun and considering the path of the sun (winter and summer solstices) did already centuries ago.

"The ideal house should be cool in summer and warm in winter."

Socrates.

(illustration 1)

In ancient China and Japan (where the earthly environment was seen as a model of the cosmos) the proper location of houses is related to taking good note of the forms of hills, directions of water courses, since these are themselves the outcome of the moulding influences of wind and water.

(This deep relationship between topography, climate, culture and house or settlement is nowhere better shown than in these systems).

Still today many local-traditional architectures respect the above mentioned features.

In the Mediterranean Europe and Asia Minor, folk architecture continues to apply some of the principles of solar building as a matter of common sense. Especially in Greece and Turkey the idea of orienting homes to the south is still not forgotten. The facades
face south in villages and farms, as well as in the cities. Where they can not face their houses south, the inner rooms are turned south.

Also the Spanish build their homes with thick walls of limestone and adobe. This masonry helps to keep the buildings warm in winter and cool in summer. (Illustration 3)

Illustration 3: Spain (Castilla): pisé construction (from "Archi de Terre", Patrick Bardon & Varoujan Arzoumanian)
Copyright: Editions Parentheses.

---

FORMATION OF TEMPERATURE INVERSION

Topography can strongly influence air temperature. A difference of 7 to 8 m in height can cause a difference of 5 to 6 °C in air temperature, under still air conditions. (after: Koeningsberger). Illustration 2

1. Foundations:
The lower part of the walls (until 2 m), the angles and the back wall, exposed to prevailing wind and rain are made with stone.

2. Pisé elements are built on these stone walls alternating the joints.

3. A protective rendering covers the pisé. The tiles are set with mortar on corn straw stems.

The traditional house of the north and north-east regions of Nepal assembles all practical techniques for an efficient indoor climate control. (Illustration 4)

Illustration 4: A CENTRAL WALL (Du Angola)
A deciding factor for the utilisation of different spaces in the houses is its vertical location.
From: The Traditional Architecture Of The Kathmandu Valley, by Wolfgang Korn.
Copyright: Bibliotheca Himalayica (Tuldy).
The roofing is done with tiles pressed on mortar or clay layers. These roofs protect the walls of brick and mud mortar from the powerful monsoon rain and the strong sunlight (the overhang is generally about 1 m).

Architects have been studying this model and tried to "modernise" it. (Illustration 5)

The building orientation (illustration 6) and space layout are to be dictated by climate, site characteristics and specific functional requirements. The room layout should mostly be issued and decided by the climatological forces around the unit.

The modern technology should mainly be present to help the future builder to understand local conditions and not to impose him a material to be used in a specific way, dictated by the technology.

The modern technology can help in: making and setting topographical maps, accessibility to site, calculation of air velocity and its effects on certain building surfaces to be used or not to evade the heat loss, increase longevity of materials, cross examination of natural forces, water leakage, moisture adaptation of technics to building regulations of the area, soil characteristics, (strength or bearing capacity), most appreciate foundation to use, calculation of high water table (in spring or heavy rain), glare discomfort, vegetation, possibility of planting of coniferous (or other) trees as wind-breaks, shade and absorption of solar radiation in summer (they loose leaves in winter: low sun to warm the room), sky conditions, rates of temperatures, precipitation data, frost data, snow loads (for roof structures), vapour pressure, humidity etc.

The use of natural materials such as stone and earth (not wood, because of Actual ecological situation, but certain woods only: the type of trees that can be considered as a renewable resource), salvage materials: such as old barns valuable and beautiful posts...

Illustration 5: SECTION SHOWING TYPICAL ROOF DETAILS

**ROOF TILES**

Wooden planks, split bamboo or flat grooved tiles of type (A)-Chola Apas- are placed over the rafter on the top of which is laid a 4 cm to 10 cm layer of clay, on which the Djingatis (B)- tiles are pressed, with an overlap of almost 2/3.

Special tiles are used for ridges of type (C), Konus and Gogochas, and valleys of type (D), Dokuns, as well as for the provision of light and ventilation of type (F), Bhauwas.

The corner at the junction of the eaves is emphasized by a corner tile (E) Kunpa, most often designed in the shape of a bird.

From: The Traditional Architecture Of The Kathmandu Valley, by Wolfgang Korn. Copyright: Bibliotheca Himalayica (Tuldy).
and beams for framing, in order to plan the most appropriate building in a specific environment. Also the interaction between buildings is not to be underestimated like it has been since the 18th century. Already in the beginning of the 19-ies W. Atkinson and Augustin Rey found that the space between buildings in the settlement affects shading and sunning as does the organisation of the spaces within the house. (Illustration 7)

Illustration 7 According to the studies of Augustin Rey, long apartment buildings facing south should be spaced apart 2¼ times their height to avoid shadowing.

Towards a better way:
The adequate use of these knowledge will give birth to a (more) human and self-sufficient rural and environments and therefore a new cultural landscape. Besides the third-world's traditional and technical building processes and their progress should be married with the western traditional and modern technical building processes. Their failure and evolution should be regarded as very important experiences.

Traditional rural building being based on low investment and high maintenance. When comparing imported building materials with those used locally one is likely to find that in terms of heat transfer and thermal comfort, the local materials are superior, and when one compares the material costs, the local materials will be likely prove the most economic.

When a building material is to be imported, there are troubles of transport, insurance, time and specialised skill, that rise also the value of that material and the rise of specialised skill causes plus-value of built environment and we should consider that the effect of the construction of a new type of building with modern materials in a traditional environment are felt on social, cultural and economical levels in that region.
"Which formal characters, touching to their structure distinguish the so-called primitive societies from the ones that we call modern or civilised?"


For long times considered as "places", the urban and the rural have been facing each other, the urban receiving the most "evaluated" qualifications. From now and on, it is a way of thinking, of feeling, of evaluating, that distinguishes them.

Two different ways of life:
Between these two extremes, man has to consider all the flux: transformations, evolutions, stages, levels and foresee a new dynamic: the equally related one as:

"Building and living activities which more than any other are tied to geographical and social situations."

J. Hабрахен.

Today the total surface of the land available on earth to cultivation is diminishing in ratio of the demographic growth. This results not only from natural clauses but also from the urban and industrial expansion. This is mainly because towns are usually settled at the bottom of rich, alluvional valleys. Therefore the growth of these towns is done at the expenses of the most fertile areas.

In addition, the abandon of the country by its inhabitants who look for new sources of income in urban areas, causes the agricultural crisis and this becomes one of the sources of today's socio-economical situation.-

The settlement
Initially the shelter was conceived in function of a language characrerised by rules governing the creation, growth and use of built space, indigenous and venacular building being the expression of adaptation to climate and to constraints of resources. This balance is still found today in rural areas where the diversity of esthetics of each habit is an element of visual comfort: diversity in unity.

Traditional architecture generates people's vitality, community and creativity in designing their life. But in many rural areas, and urban areas of developing countries the building of European type became the ideal model. This type of construction asking a complet technology and therefore a skilled kraftmanship, leads to an economical dependency.

In the western developed countries as well as in developing countries, cities are too dependent on higher level governments to take strong, independent policy initiatives. Citizens and citizen groups have little control over policy making, however strong and frequent their demands.

As a result of the land use policy of governments, the political and contextual aspect of the real estate speculation leads to a generalised conflictual situation. Therefore the role of professionals (lawyers, economists, engineers, architects etc.) should be to provide the right context with the right tools.

"The major changes that are needed to make cities more human must come from the climate of opinion of the society as a whole".

Clovis Heimsath.

Settlement
A city is a dramatic event in the environment and not just a assemblage of blocks. The scientific urban solution is based on the best that can be made of the average. Even at the smallest scale, units are studied in isolation rather than as part of their surroundings.

Housing areas stop arbitrarily such technics actually prevent coherent design of spaces around buildings.
For an efficient urban renewal there is a need of modification of housing policy. The neighbourhood - helping each other - collective life, better than the unit - isolation.

It would be - and it has been until today - a big mistake to look upon the neighbourhood as a collection of individual pieces. We have to consider it as a totality.

Man has to respect the correlation between settlements and the demographic + cultural context. And, realise that there is a distribution of resources in each locality; an ability of the inhabitants to pay for housing. Also existing housing standards should be respected.

It is possible to create cities that have pleasant indoor and outdoor living spaces and are suited to the social conditions of their inhabitants.

Urbanisation in developing countries. (Photo: United Nations)

Puerto Rico slum at San Juan. (Photo: Thomas E. Benner - from Shostal)

Traditional grid in a hot-dry climate.
I am very honoured to welcome you on this seminar as dean of the Faculty of Architecture, Urban Planning and Building, and as a member of the Department of Architecture and Urban Design. The title of the seminar is a highly abstract one.

Looking at the list of participants I'm quite sure the theme will be worked out at a much more concrete level, at which architects feel more comfortable.

The theme is connected with building in the third world, at least in areas of which climate, habitat and culture is quite different from the Western European scene. I hope we will not fall in the trap of romanticism. I believe we will not, because some of our guests have enough experience to bring us back to reality.

It is a good idea to have a seminar of this kind, which is the second one within a period of six months at our faculty, because it balances the scales. The first seminar tried to clarify what they (in the third world) could learn from us. This one will make clear what we can learn from them.

For an Institute of education the attitude last mentioned is a good one, but we are obliged to look at these third world projects not in a detached way, but in a participatory way, being involved in the problems that are solved and have to be solved.

This gives a "feeling" of reality and common sense which is a nice notion. So I suppose that we will try to approach the problem from the inside as architects and planners do, and not from the outside by trying to understand the meaning of peculiar architectural forms, as architectural critics use to do.

Studying the building situations and activities in the third world will give a better understanding of the essence of building in our own situation.

Speaking in the terminology of the seminar's theme I hope that this room will be a habitat: "a place where the organism of this seminar lives, including all living and non-living factors or conditions of the surrounding environment".

I hope that in a metaphorical way the seminar's theme will deliver us a favourable climate for the discussion as a medium for this meeting.

And I hope that the group of participants of this seminar in the context of the so defined habitat and climate will give the setting for the third element of the theme: culture: "behaviour, peculiar to mankind, together with objects that are part of this behaviour".

Or, speaking in terms of human ecology: "Man's collective interaction with this environment: the way which structures adheres to the quality of material resources and to the existence of other human groups".

With this setting of the stage, I open this seminar and hope we will have a good time.
I am Paul Lapperre, Head Development Cooperation Office, Eindhoven University of Technology.

I am no architect, neither am I a hardware oriented technologist, but an agromunist, specialist in tropical soils, with 12 years experience development work in Africa. Don't be fooled by that statement because it might imply considerable experience and insight in the problems of developing countries. Some people however never get any wiser and I am apparently one of them. When I left for Africa some 17 years ago I was convinced to be able to contribute to the development of that continent by transferring knowledge to people eagerly awaiting my arrival and advice. Gradually over the years I arrived at a state of mind where I saw more problems than answers and from that state of mind I am addressing you today.

When I look at the topics of this 3 day seminar I come to the conclusion that it focuses to a large extent on the problems of the third world countries, and, possibly, some ingenious answers. The title of the seminar "Klimaat-Habitat-Kultuur" has puzzled me to a great extent. Consulting the Oxford dictionary I discovered, reading the title from right to left, that taking our particular type of intellectual and social development as a starting point we are going to look at the nature of natural homes taking into consideration prevailing conditions of temperature, rainfall humidity, etc.

I have told you before that I am not an architect and this relieves me of dealing with that nature of natural homes - habitat - and the influence of prevailing conditions of temperature, etc. I am stuck however with the definition of culture as a particular type of intellectual and social development. Or in other words regularities in the behaviour, internal and external, of the members of a society.

Most of us present here today belong to a society, that is to a network of relations between human beings, that is above all characterized by it affluence or material wealth. We have through history more or less the same culture. We call ourselves "civilized" taking our cue from the etymology of the word civilization that means belonging to a culture found in cities. And that certainly to you is worth a mental reflection.

If we now look at the countries of the third world and if we try to define, to find, the most striking and startling difference between our society and theirs it is the difference in material wealth. In the industrialized countries affluence, material wealth, is rule and poverty is exception, limited to individuals and small groups. In the developing countries affluence is exception and limited to individuals and small groups, poverty is rule.

For me, and I guess for most of you, it is extremely difficult to grasp the emotion of poverty because we have never been poor, really poor in the sense not to be able, for extended periods of time, to satisfy our basic needs. To illustrate the magnitude of poverty I therefore have to revert to figures, disregarding for the sake of this speech, their inhuman nature.

In the world there are some 31 nations raging form Afghanistan to Upper Volta, that are referred to in UN-terms as the LDC's. They have vastly different geographical, climatological, cultural and political settings but they share a number of grim statistics:

- income per capita < $400/annum
- industry contribution to GNP < 10%
- literary rate < 20%

Nearly 300,000,000 people live in these countries and that is about 13 percent of all the people living in developing countries. And those are only LDC's.

If I take an average income of some $700 per annum I am talking of 1,300,000,000 people.
No matter how presumptuous this may seem, we believe that we can contribute, no matter on how small scale, to this goal by transfer of technology and know-how or in other words by sharing research and teaching efforts with people in developing countries.

With some of the reflections on culture, poverty, and a decent life for all citizens of this world in mind I have come to the last part of my introductory speech today. A path that might prove to be the most slippery one for me, because it deals with your specialization: shelter.

Modern science can come up and has come with solutions for many problems in the past decades and will undoubtedly continue to do so. Solving a problem as such however, e.g. dividing methods to make good quality cheap bricks or improving bamboo constructions, does not necessarily mean that you can implement your solution in such a way that you can significantly contribute to a decent life for all.

There is for instance the problem of numbers. In 30 years the population in developing countries will double and it is a fair estimate that the population in the third world cities will double in less than 15 years at a city population growth rate of 6% per annum.

As I have said earlier in my speech, the etymology of the word civilization indicates that in the industrialized countries we link civilization with culture found in cities.

In a society however where mass poverty is rule, housing conditions in cities for the majority of the people are far worse than in rural areas.

Housing conditions cities being far worse than in rural areas.

People migrate from rural areas to cities because of:
- escape social and economic insecurity
- opportunity to earn higher income in subsistence economy of the city
- take part in better social provisions.

In my daily language this means that people move to the towns, because the meager life there is still to be preferred over the life without chance in the rural areas. Life that can in many cases not support, by traditional means, the vast growing population (some 3%). Furthermore in many countries there appears to be a political bias towards easing living conditions in cities. Hundreds of thousands of people living in an area of a few square miles represent a very real threat to any government in power when their dissatisfaction grows beyond endurance. They can riot, create mass demonstrations and eventually overthrow a government, and kill its members.

Pressure on the other hand can hardly be expected from scattered farmers and herdsmen living hundreds and sometimes thousands of miles away from the cities. Riding, walking and even cycling, and the latter I know from experience, takes lots of energy and is a very good remedy against aggressive feelings. Hence the political bias in favour of improving conditions in the cities.

When preparing this speech I glanced over some of the more commonly available literature and ended up with the impression that shelter problems can be tackled roughly in the following ways:
- upgrading slums and shanty towns, by means of upgrading infra-structure, social services, etc.
- site + services schemes by means of allocating ready made plots with infra-structure
- low cost housing projects by means of prefab buildings. Who, for that matter, looking at the income, can afford such a house?
- aided self help.

From literature I also got a figure of some 45.000.000 units dwellings to be constructed by the year 2000 if we are cope with the demand.
Also there seems to be some consensus about the general criteria that have to be fulfilled for these solutions:
- take into account the environment
- use locally available materials
- incorporate indigenous techniques and crafts
- apply indigenous building forms
- let people specify their own needs
- apply materials with low energy consumption
- avoid, as far as possible, the use of expensive machines.

What I did not find, to my surprise, is yet another solution:

improvement of the living conditions of the majority of the people living in developing countries.

Improvement therefore, of life of 85% of all people being those that live in rural areas.

Once people can satisfy their needs for:
fresh water, energy, clothing, health, communication, and shelter in rural areas, there will be little need for mass migration to the cities.

I respect your effort in the field of providing shelter but I believe that shelter has to be seen in the light of other needs and priorities, if we are to achieve equal opportunities for all in this world.

A new international economic and social order will have to be achieved, not in 50 years time, but in our lifetime, now, so that our children may live in a world that provides, and not only shelter, but shelter, long last, for all.

Thank you.
Examples of architectural and building practices similar to those encountered in developing countries may also be found in so-called developed countries. Relatively poor regions exist everywhere and the relations they have with the richest parts of the country are much alike a NORTH-SOUTH relationship:

Excerpts from this abound in France's rural South-West where the author is practising architecture.

To a foreign architect - that is, coming from Paris for example - who would ask me what's so special about our region, I should answer that every place in the world has something special on behalf of sound architecture:

Local conditions vary with thousands of parameters and building particularities are much more the rule than this architect might have experienced.

So, what's so special with our local conditions?

Climate for instance

- What does the paradox of being both a contrasted and atlantic climate mean? What does that mean for a builder?

It means that the conflicting forces of rain, wind and sun shape acutely architecture and that none could ignore them without risks. It means that there is almost an unwritten code as to where, when and how to build a house; local authorities have even issued recommendations that almost ban some building practices that national regulations find accurate elsewhere.

There are dozens, may be hundreds, of points in a building where local conditions have created exceptions to standard building practices. To be more precise the problem is not with local conditions but with the notion of STANDARD BUILDING PRACTICE.

For a "foreign" builder the problems with weatherproofing walls, windows, roofs; the problems with soils, septic tanks, chimneys; and so on... are not without solutions. But the use of unproper "Standard" techniques may lead to uneconomical solutions.

There is another part of architectural design where the notion of standard is rather odd: it is when we speak of HUMAN STANDARDS.

- I won't pretend that our culture or sociological characteristics are far from those of nearby regions... but differences exist... and the combinations of differences may lead to significant changes in terms of design for human needs.

Symptoms of these differences abound, especially in rural areas: developers and builders of "model houses" are always asked for so many changes that many of the houses actually built have nothing to do with the "model".

- Sociological differences are not only with the people who inhabit dwellings but also with the people who build them.

Rural building is always done on a small scale, so though you may find some large companies - by local standards - most of the work is being done by craftsmen working with few employees or alone. Some are skilled, many just wet things down, all behave under a pattern they share with their clients: ACCULTURATION.

- more specifically: architectural acculturation in every aspect of a building culture: design, technics, economy, use... and so on.

The important thing is that this situation has not evolved strictly under domestic causes.

With the conflicts between local conditions and the consequences of being a very small partner in a larger stronger culture - Theincoming of cultural standards of a dominant culture, the near impossibility for a community to send back corrections for flaviat inadequacies, or to identify with a stronger culture of his own... All this tend to create acculturation which in that case I'd rather name SCHIZOID CULTURE.

What does that mean in terms of a craftsman practice?

First, he is no longer a repository of building traditions, the heir of a former culture: 19th century masons were designers during their apprenticeship they were taught such
things as composition and proportions. Each craftsman was able to invent his own version of a regional style and even now you can recognise the craft of a particular mason or carpenter of this epoch. This came to a halt during World War 1 and the practice was lost after World War 2. Though they always pretend to be, I know of no mason or carpenter being an able designer nowadays.

The sudden evolution in the nature of buildings was not met by the traditional structures of education and economy.

This loss was accompanied by the loss of technical know-how though it occurred in a different manner. The man who mastered traditional techniques would abandon them with the coming of new building materials and forget and even despise the old ways.

Many new techniques proved in fact to be better than old ones but not all of them: lime putty and sand for wall finish has proven so

... (continues)
A people who would make a whole set of those compatible innovations possible would acquire a new cultural dimension; thus when I speak of new buildings culture I mean a whole set of solutions, whether old or new, fitting together to match every aspect of architecture: from building science to political economy or symbols an art.

I'm not going to state which are the necessary conditions for the emergence of a new building culture; this may prove to be a difficult and ticklish subject; but I want to emphasize the role of intercultural exchanges in the process.

To schematise let me introduce the notion of CIVILISATION UNIT, that is a set of people sharing common values and concerns on a specific point: here architecture and building!

This abstraction cannot be precise: inside the same country you may have several civilisation units which may interlace; this is very important to know when dealing with a country: ex. urban and rural areas may be considered as two different units.

This doesn't mean that state borders are irrelevant ... since there are many limits to the notion of local laws every nation has its own organisation rules: that tend to create a common frame for people with very different cultural legacies; this is specially true in Africa where state and ethnic borders crisscross each other.

Being the heir of one or many cultures this would-be civilisation unit has been under the influences of strong dominant cultures with flagrant inadequacies to local conditions: a defence reflex may be to retire within oneself, to reject "foreign" influences, and to try to develop cultural innovations in a tight incubator. These are drastic measures! It is not because force may be useful against unequal exchanges that every cultural tie must be severed: EVEN IF INNOVATION IS AN INTERNAL PROCESS IT CANNOT GO WITHOUT EXCHANGES.

A: No innovation is made only with entirely new materials; old ways either found home or abroad may fit in the cultural puzzle and may be the one part that makes all the machine work: nobody is going to stop an efficient idea, even if it is coming from an obnoxious background.

B: Exchanges are needed because cultural innovation is a long process which craves after experiences and experiments: wood management is to try not to make the same mistakes twice, others may have had the same problems as yours!

EXCHANGE IS A NECESSARY FERMENT FOR THE EVOLUTION OF A CULTURE

It is an obvious point but some consequences must be underlined:

1st- With the global village at hand, nobody is going to make his own little cultural revolution all by himself. Among other weapons unequal exchanges must be fought with pragmatism and efficient results ... not only with generous ideas.

2nd- Nobody is going to wait for equal exchanges first and then start a new culture: even under unequal exchanges new cultural facts tend to appear: the local innovations which are being developed now will help to create new cultural exchanges with a better balance.

3rd- It's time to acknowledge the utmost importance of SOUTH-SOUTH relationships when speaking of cultural transfert, and this on every aspect of cultures.

What are these civilisation units going to exchange to make a new culture of their own?

- HARDWARE : materials raw or manufactured, tools ...
- SOFTWARE : ideas, know-how, science, education ...
- ORGWARE : this world has been invented to describe the organisation - for the benefit of a community- of existing technologys and means of fundamental research by the use of poltical action. I'll extend this to laws, regulations and economic procedures.

HARDWARE

There is a trend when speaking about appropriate architecture to say "use local materials". This is both true and untrue:

- It is TRUE because local experience has found how to use properly local materials, because many of the local techniques have been wrongly abandoned under the stress of brush socio-economic changes and the appeal of a dominant culture. It is true because new experiments, the use of building sciences or the adjonction of new materials may have elimind many flaws which plagued the traditional techniques.
- It is UNTRUE because many adequate materials - such as wood, iron, glass ... may not be produced locally. It's wishful thinking to say "local is best": imported materials may be much more economically sound and even less damaging to the eclogy - the use of local woods. It is untrue because equals abound in history of typical artefacts of a culture which were made out of imported materials.

The selection of a material or tool must follow these three basic rules:

1st- It must meet the purpose for which it is used. This is a much more complex notion than it seems at first glance because purpose can be balanced between functional use, structural and physical use, and SYMBOLIC USE. Symbolic use is very important, it may be the key to succes or failure ...

2nd- Those who handle or use these materials or tools must master them and not be mastered. They must be able to understand fully all the implications of their use, able to transform them if needed, able to innovate with them. This does not mean that only simple technology tools must be used.

3rd- Economic choices must not be made only in terms of consumer society and mass production economy. Though I am speaking in terms of civilisation units this is similar to explain in terms of state policy: foreign exchange in the building business should not aggravate the unbalance of all the economic exchanges. It should not worsen strategic dependance or stop the emergence of viable local industries.
Ideas, sciences, techniques, education and research

It is a very large subject, so I am only to make a few remarks:

- Technological transfer in building has led to many bitter blunders; these mistakes are still common practice both when a dominant culture practices or makes buildings in developing countries and when this culture teaches people to work in these countries.

- "Developed" theoretical sciences and developed building techniques are noteworthy; they draw a considerable force from a great mass of experiences and a great deal of research in building sciences. But when taught all of this must be handled with care: the limits between science and technics are not clear, and we must remind that technics are a collection of specific answers to specific questions under specific conditions; when conditions change solutions change!

- Full knowledge of both local conditions and how things work is necessary to choose the best adapted techniques:

  science and/or experience will provide the capacity to judge and invent but in the field of pure technique the exchange must go as "under these particular conditions this has been proved to work, or fail ...."

  - Provided that the aim is not to find the "best" technique but the most efficient, all kind of exchanges may be useful: even far-away North-South exchanges may be profitable for both parties in terms of experience. The problem is still that, speaking in economic terms, this does not seem yet to profit to the South.

  - In this prospect it's time to introduce methods of value analysis for the use of experts specialized professionals, consultants and the like when these come from an upper class or from developed nations with high income habits: is there any method to force them to give advices worth their tremendous cost by local standards?

- Another interesting exchange is relation between two units sharing the same conditions. The benefits of this South-South dialogue may be almost immediately, but South-South communications are not yet well organized and more often than necessary follow a South-North-South path.

  Sending students automatically in the universities of developed countries should not be a reflex:

  - the tradition of European trade builds was that to become a master worker one was to make a journey in different regions of the country to learn local craftsmanship; this would certainly be a worthwhile organization between civilisation units sharing the same scale of problems.

Building regulations may be the best and the worst thing for a builder:

developed countries have huge sets of regulations, and though regulation making is not yet mature because it is put in terms of Do And Don't, it is still very valuable as a by-product of a great mass of experiences and experiments. Are regulations a necessity? the obvious answer is still yes - safety regulations, the rejection of faulty goods ... etc... are a necessity- But how can a civilisation unit, which may be quite small, have an economic way of designing such a large set of regulations adapted to local needs and conditions?

Both through exchanges and organisation of an internal process of regulation of regulations.

- Through exchanges: REGIONAL COOPERATION OFFICES could manage import, export, transformation, research of regulations which may concern civilisation units sharing weather the same reason, the same climates or the same socio-economic conditions.

- The remaining problems are still educational and political: how to let regulations not get out of books and go into practice?

  The same process may go for laws though there is a stronger contradiction between the mould of "cast-in" contracts and organisation and the local innovation in new forms of organisation that is what politics is about!

At small local levels dynamic procedures do exist: I've heard that fishermen in Ghana have invented a totally new form of organisation to manage work and profit sharing; it has nothing to do with our form of companies or cooperatives; it is perfectly adapted to their problems and civilisation and it works!

We may have elaborated complex procedures for sharing work and profits but may be this one may give birth to OUR own local adaptation to OUR needs.

And this will be my conclusion:

I don't think that "developed" architecture is so well-off that we should boast and impose our views. We've always known that other countries could give us new challenges, experiments results and innovations: they already have done it! they have had influences in Art and, though it is less known, in technics (when offering stress conditions for our building practices or when we have developed our own version of their techniques).

Those who don't feel the need for equal exchanges because they are not interested in abstract justice, should practice equal exchanges because they are the most profitable for every side.
My qualifications for talking about the Yemen are through working there in a United Nations assignment in 1972 and afterwards. This gave me the opportunity of discovering this fantastic country and its notable architecture. It might be asked, "where is the Yemen?" It is in the southern part of the Arabian peninsula, with a coastline to the Red Sea. Its neighbours are Saudi Arabia to the north, South Yemen to the south, and across the sea, Ethiopia and Somalia. North Yemen is the Yemen Arab Republic, as distinct from South Yemen (the People’s Democratic Republic of Yemen).

Its topography shows a warm humid coastal belt bordering the Red Sea, with an intermediate zone leading up to the high upland region some 2000 metres above sea level, on the eastward side of which the land drops towards the desert on the east. This is the reputed area of the kingdom of the Queen of Sheba, and it contains ancient remains of temples and dams from the Sabaean and Himyaritic times. The famous Ma’rib Dam is notable. This demonstrates the great antiquity of the Yemen, whose civilization goes back beyond the 1st century BC. Important trade routes traversed the country. It is generally agreed that building and architecture are influenced by climate and geology (Fig. 1 & 2). A study of its geology shows the sources of the raw materials for building construction. There are sources of good building stone, and also clays suitable for making burnt brick, sun-dried blocks and rammed earth. The clays are suitable as finishes for flat earth roofs. Gypsum is available. There is a shortage of timber.

The traditional materials and building methods are shown in the film "Traditional Architecture in the Yemen" made by Vladimir Bibic and myself as a contribution to the United Nations Conference on Human Settlements ("Habitat") held in Vancouver in 1976. The subject is also illustrated by colour slides.
It must be said that without people there would be no buildings. Their costume and buildings show the influence of climate as between the cool uplands and the warm coastal zone, which affects both the people and the style of building and the landscape. Climate is a determining factor in these differences, and is illustrated by five case studies (Figs. 3) made for Sana'a and Ma'abar in the Upland Zone, Ta'izz in the Intermediate Savanna and Midlands, Zabid in the Lowland Maritime zone, and Hodeida in the Warm Humid Coastal zone. The climatic data for each place are plotted on bioclimatic charts. From this it is shown that Sana'a and 'A'aba in the uplands have comfortable conditions during half of the year, and with less diurnal variation between day and night than places on higher ground. Zabid is well above the comfort conditions both by day and by night, being in the lowlands, as is Hodeida on the coast.

These climatic patterns are reflected in traditional solutions to building design (Figs. 4, 5 & 6), The Upland zone, including Sana'a, (Fig. 4), is characterized by the use of many high buildings. Where possible, rooms for living and sleeping face south, having large windows to allow the winter sun to warm the rooms. The north side is cool, and used mainly for stores, kitchens, bathrooms and stairs. Because of the large diurnal range of temperature, as between day and night, thick walls are necessary so as to even out the temperature, providing cool conditions by day and warm by night, without the need for heating or air-conditioning.

In contrast, the higher temperatures and relatively humidity in the coastal lowlands demand the cooling effect of breeze, and in this area, including Hodeida, Lahaya and Mocha, windows are not fitted with glass, so timber grilles and shutters (the "masrahibyah") have been adopted (Figs. 6 & 9). Zabid, whilst being in the lowlands, has a different micro-climate, being in the Maritime semi-Desert, uses sorts of courtyard planning and low buildings. The high buildings of the "Red Sea Style" (REFERENCE: "The Red Sea Style", and "Sa'akin Passages") by Derek H. Matthews, KUSH Vol 1,1969 and Vol 11,1966) are in solid brick or stone. In the coastal region there are also more modest houses of thatch and straw (Fig. 11) both of oblong and circular plan. Rain is not a great problem as affecting building design. Provided earth walls are kept dry, they stand for ever.

**FIG. 3. CASE STUDIES**

**BUILDING DESIGN RECOMMENDATIONS**

**SANA'A & MA'ABAR** (Upland Mountain and Plateau) Compact planning with enclosed spaces; no cross ventilation required; Outdoor sleeping areas not required; Small window openings, 10% - 20% of wall area; some solar heat may be admitted on east, south and west; Handy external walls and roofs required with time-lag greater than 8 hours.

**TA'IZZ (Intermediate Midlands)** Compact planning with enclosed spaces; Cross ventilation required; Provision should be made for outdoor sleeping; Small window openings, 10% - 20% of wall; Handy external walls and roofs required with time-lag greater than 8 hours.

**ZABID (Lowland Maritime semi-desert)** Compact courtyard planning to relieve heat gain; enclosed external spaces; No cross ventilation required; Small window openings, 10% - 20% of wall; Handy external walls and roofs required with time-lag greater than 8 hours.

**HODEIDA (Warm humid coastal lowlands)** Elaborate buildings on east-west axes so as to reduce exposure to sun. They may be turned slightly so as to catch the breeze. Other orientations are possible in allover spraid layout as in the old town, where buildings provide shade for each other; open plans for breezepenetration, but some protection against strong winds may be needed; Permanent cross ventilation required; rooms single-stacked; Provision should be made for outdoor sleeping; Medium size windows, 15% - 20% of north and south walls; Handy external walls and roofs required with time-lag greater than 8 hours; Light but well-insulated roofs required with a time-lag of 3 hours.

These recommendations are based on the Mahoney charts and publications of the United Nations.
FIG. 4. TRADITIONAL SOLUTIONS  THE UPLAND ZONE  Sana'a

FIG. 5. TRADITIONAL SOLUTIONS  THE INTERMEDIATE ZONE
Hill village above Ta'izz

FIG. 6. TRADITIONAL SOLUTIONS  THE COASTAL LOWLAND ZONE  Hodeida
Studies on insulation were made in a house in Sana'a, constructed of sun-dried earth block walls 40 cm thick, and with a traditional earth roof. The walls were rendered externally in mud plaster, and internally in gypsum. Measurements were taken of the external temperature, the internal room temperature, and the ceiling temperature during the cold season (January and February) (Fig. 7). The outside temperature at 4:00 a.m. was just over 6°C, and it rose to a maximum of 27°C on January 23, and 21°C on February 4. However, the room temperature remained within about 19°C on either side of 20°C throughout the 24-hour period. As might be expected, the ceiling temperature fluctuated between 21°C and 25°C, reaching a maximum during the hours before midnight, when heat would have been required inside the house. This shows the effect of "time-lag" whereby the sun's heat took about 8 hours to pass through to the inside. The effect of time-lag in the walls would be similar. This is the explanation for the even temperature inside the room, although the outside temperature fluctuated through a range of about 15°C.

The results of this study show the importance of "capacity insulation" which can only be obtained through the use of massive walls and roofs. "Resistive insulation" cannot achieve this effect, as it lacks the "night-storage" factor.

Another influence of climate is in the design of windows. It has been typical in the Yemen to separate the two functions of a window, lighting and ventilation. The older windows were provided with translucent slabs of alabaster for light, with timber shutters below (Fig. 8), for control of ventilation. Today, glass is used instead of alabaster. A further development is in the use of decorative infill panels comprising plain or coloured glass set in a rib-work of gypsum plaster, today an almost indispensable element in window design in the Yemen. As already mentioned, in the "Red Sea Style" of the coast, glass is rarely used, as it would interrupt the flow of the cooling breeze, which is needed in these humid regions for comfort. (Fig. 9).
Combined with the effect of climate on the form of the building, is the other influence, the use of available materials and the building method. A typical Yemeni house in the uplands and Midlands (Fig. 10) has a basic structure consisting of four parallel walls, about 3 metres apart, the length of available building timber for roofs and floors. This is then supported on load-bearing walls. The climate dictates orientation, to ensure that living and sleeping rooms face south, with large windows to take advantage of the warming sun, whilst the summer sun, being overhead, has not the same effect. The wide central space is useful for many purposes, being in effect a covered courtyard. This is a standard solution for a house plan. It can be carried up so as to provide several more floors above on the same plan. Because walls of stone or sun-dried blocks have to be at least 40 cm thick for practical reasons, there is sufficient strength for the wall to carry four or five storeys, or more. At the same time, there is the required "capacity insulation" (Time-lag).

There are several minor variations in different house types (Fig. 10), such as the high-rise single family house of the Old City, and the suburban version in the Bir al-Azab district of Sana'a. The former Jewish quarter, Ga al-Oloufi, has another type, with a courtyard on the first floor. There is a more recent single-storey version found in the new extensions outside the old walls of the city, and other variations with one or two storeys. Houses in the Tihamah are either in the "Red Sea Style" (Fig. 8) or are built of thatch and grass (Figs. 11 & 12). Then there is the "imported" style of apartment block from two to five storeys, sometimes built in stages, with the steel rods exposed for future extensions. This type has thin infill wall panels of cement blocks supported by the reinforced concrete frame. It has no climatic resistance, and is cold at night and hot in the day. This undesirable solution, as well as being costly to maintain, is unfortunately becoming a standard solution in many countries in the Middle East.
On materials some technical facts can be given. (Fig. 13). Sun-dried earth blocks are made from 30 to 37 cm by 19 to 22 cm and from 8 to 9 cm deep, forming walls at least 50 cm thick. They are usually covered with mud plaster outside and sometimes gypsum plaster inside. The other technique in mud building is known as "zabur". It is carried out by a team who form the earth lumps into balls which are thrown up to the master mason standing on the wall; he places them in position, forming a layer all round the building. Another use of earth blocks is in conjunction with burnt brick for an external skin. This is more resistant to rain. Three courses of earth blocks equal five of burnt brick. The burnt brick is square, like old Roman bricks, about 16 cm square and 5 cm thick. There are also half-bricks. Burnt bricks make wall thicknesses of about 42 or 34 cm. They are also used for the characteristic brick decoration. In the Tihama, bricks of a more conventional oblong shape are made.

FIG. 12. HOUSE DEVELOPMENT - HODEIDA

FIG. 13. MATERIALS - EARTH & BRICK

Half brick Whole brick
Type of bricks used in Sana'a and elsewhere. Other types are used in the Tihama

WALLS OF BURNT BRICK
There is also abundant stone (Fig. 14). For hand-cut work the material is split into smaller blocks in the quarry by means of gunpowder, and then reduced further in size by hand. After being transported to the site, individual blocks are shaped so as to produce one squared face, the rest of the block tapering inwards like a truncated pyramid when laid in the wall. The surface joints are as thin as 1 mm if the surface of the block is finished to a smooth cut. Joints on the external face may be set in either gypsum or cement mortar. The rest of the wall is usually in mud mortar. The internal finish will probably be in a coat of mud mortar with gypsum mortar as the top coat. There are a number of different types of random rubble walling in the Yemen, depending on the character of the locally available stone (Fig. 15, jects). Internal finishes are the same as for hand-cut stone. Externally the stone may be exposed, with cement mortar or gypsum pointing, or alternatively with external rendering of cement and sand or of mud mortar.

Traditional earth roofs (Fig. 16) are supported either on tree trunks or on squared timber, carrying tamarisk sticks that support the earth layer which is finished with a fine layer of clay and sand. Providing the rain-water outlets are kept clear, and the necessary fall is maintained, such a roof is quite waterproof, but it needs maintenance.

If a module of say 1.65 m (window 0.70 m plus pier 0.95 m) is adopted, then even with the use of 40 cm internal partition walls, the following range of room sizes is possible: 1.15 m, 2.90 m, 4.45 m, 6.10 m, 7.75 m, 9.40 m, etc. This theory was used in the projects for the National Institute of Public Administration, the Health Manpower Institute and other projects in Sana'a.

These projects and others (shown in Appendices) such as the conversion of Beit 'Ali into Al Hamd Palace Hotel, and the Ministry of Justice in Sana'a, designed through the United Nations Development Programme, as well as the International School, the Ta'izz School of Nursing, the Provincial Health Centre and Hospital at Dhamar, were built using the maximum of local materials and building methods. They demonstrate that the proper study of requirements and possibilities can lead to an extension of tradition and a regard for the identity of the Yemen, being relevant to the cultural and sociological context and an inspiration for the future.

I agree with Professor Sax, when he opened this Seminar, and warned against falling into the "trap of romanticism". However, that which might appear as "romantic" could perhaps have a functional basis that we should be careful not to ignore. It is one of the three prongs of this Seminar on Climate, Habitat and Culture.
From an etching of Sana'a Old City

by Derek Matthews

These appendices include the text of the film, and also examples of some of the projects that have been designed and built in the Yemen, and put into use within the years from 1972 to 1981. These projects all follow that philosophy outlined in this presentation and in the film. They are in accordance with the policy of the government of that time, as well as that of the United Nations Development Programme. Therefore they demonstrate that with a proper use of locally available resources, the cultural heritage of the people, and also their economic possibilities, can be respected.
From an etching of Sana'a Old City by Derek Matthews

The Main Entrance

Windows and Stonework detail

SANA'A
Health Manpower Institute

General view from the South

Appendix 2

Courtyard. Teaching Block on right, Link on left, Administration Block behind

Side Entry from street, adjacent to the Administration Block, Dormitories beyond
From an etching of Sana'a Old City by Derek Matthews

Ministry of Justice  SANA'A

The first sketch design

The South Front

The Offices

Space under the Dome

A Meeting Hall

Appendix 3
The International School  SANA'A

1 Classroom (4 & 5 year)
2 Staff Room
3 Kitchenette
4 Store (textbooks)
5 Main Office
6 Store
7 Office (Admin. Asst.)
8 Visitors' Waiting
9 Director's Office
10 Office (Deputy Dir.)
11 Office (Resources)
12 Science Laboratory
13 Store
14 Classrooms
15 Store (Audio-Visual)
16 Librarian's Office
17 Learning Centre
18 Study Cells

Bird's-eye view
Earth has been used for the construction of buildings since all times, in all parts of the world, by all people. Today more than 30% of the world population (1,500,000,000) and most probably up to 50%, is living in earthen buildings. This situation makes earth the most widespread and most "popular" building material of the world. Yet it is one of the least known by construction professionals and is completely ignored by official technical authorities. Earth is still used in industrialised countries.

In France, e.g. estimations have been made that 15% of the existing dwellings are built with earth. In California U.S.A., the growth rate of solar-adobe houses seems to be 30% per year.

For the total of the developing countries 80% of the rural people and 20% of the urban inhabitants are using earth as principal building material.

When starting a housing project, at one time, during the analysis stage, one will be faced by some problems concerning the economics of housing. The usual way is to make a rough estimation concerning the most reasonable cost and to design a house that hopefully would be accessible to the people concerned, keeping in mind that later on some design changes could be made.

As the study continues, it is then found out that things are getting more and more complex, and that in fact several designs should be considered, with variations concerning plans, sizes, costs, materials, finishes, etc. The original design becomes useless and all has to be started all over again.
A more systematic approach to this complex problem has been proposed by the U.N.
The cost of an imaginary model house is calculated in function of the surface of the house.
By a social inquiry, the minimum and maximum surface needs of the families are determined.

Socio-economical studies are to give useful information of the economical capacity of the families concerned.
If the solutions derived from the diagrams are not acceptable to the decision makers, several proposals can be adopted.
1. Higher the economical capacity of the families by subventions;
2. Lower the surface standards;
3. Lower the quality of certain building materials, or the quality of the house;
4. Increase the economical capacity of the families by creating jobs;
5. Decrease the cost of the materials of the house (but how?);
In fact, this study should not be made for a selection of wall materials, but for a combination of all materials of the building. In low cost housing wall and roofing materials are most important. In practice, the different materials are often combined following certain patterns.

Thus, in the "cost-surface" diagram, the "materials" should be replaced by "Housing type" graphs. The possible combinations between materials are infinite, but a reasonable selection can be made. Often, this leads to the classification of housing types within certain cost brackets.

<table>
<thead>
<tr>
<th>Non durable houses from .. to .. US $</th>
<th>Semi durable houses from .. to .. US $</th>
<th>Durable houses from .. to .. US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td>40,000</td>
<td>60,000</td>
</tr>
<tr>
<td>30,000</td>
<td>50,000</td>
<td>70,000</td>
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<tr>
<td>40,000</td>
<td>60,000</td>
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<td>60,000</td>
<td>80,000</td>
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</table>

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>SELF-Help</th>
<th>ARTISAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAND. PIPE</td>
<td>23,600</td>
<td>40,800</td>
</tr>
<tr>
<td>WALLS. BRICKS. CEMENT</td>
<td>115,200</td>
<td>139,200</td>
</tr>
<tr>
<td>FLOOR. BRICKS</td>
<td>26,400</td>
<td>38,400</td>
</tr>
<tr>
<td>ROOF. WOOD. C.T. CEIL.</td>
<td>55,200</td>
<td>57,600</td>
</tr>
<tr>
<td>OPEN. MENTAL</td>
<td>38,400</td>
<td>38,400</td>
</tr>
<tr>
<td>PAINT. LATER. LEAD</td>
<td>20,160</td>
<td>26,880</td>
</tr>
<tr>
<td>TOTAL FOR 48 M²</td>
<td>288,960</td>
<td>381,280</td>
</tr>
</tbody>
</table>

REF. URBANIZATION-WORLD BANK-HOUSES, H.
An analysis in the field usually shows that there is a relationship between the housing type and the organisation that builds it. Certain types of houses are built by self help means, and other types of houses are built by contractors.

By studying the cost components of houses, it becomes obvious that part of the cost is due to the kind of materials used, and part is due to the type of organisation that builds the house. Houses built by big contractors are much more expensive than the same houses built by self help means.
But usually small houses are built by self help, and more sophisticated houses are built by contractors. The type of house, the materials used, and the costs involved, are completely different for self help and contractor systems.

The combination of materials used (or housing type) and the organisation that builds, results in housing costs varying from 100% to less than 10%.

If technical assistance is taken in account for self help and artisans, cost can be kept down easily to 50% of the usual contractor cost. It is clear in fact that cost reductions should be obtained rather by changing the organisation than by changing the materials, but both go often together.
Applied in practice, this method shows often (if not always) that the great majority of the people of urban projects have no other choice but to use the most common local materials: stone, wood, fired bricks, bambou ... or earth.

For Magnambougou (Bamako - Mali) 80% of the population has to use earth as the basic building material.

For Bujumbura (Burundi) it is up to 65% of the population that has no other choice but to use earth. Unfortunately, in most cases these dwellings will be MUD SHACKS instead of EARTH HOUSES.
Building houses for US $ 4,000 is a hard problem, but it can technically be solved by any kind of organisation.

Building houses for less than US $ 4,000 and preferably for US $ 1,000 is a problem that only can be solved through self help or artisans. This problem concerns 50% of the African urban population and 18,000,000 houses to be built within the 20 years to come.

How can those MUD SHACKS, built by self help and artisans be transformed to EARTH HOUSES. In fact, these mud shacks need only small technical improvements, at no (or very low) financial cost.

The MUD SHACK's situation is very similar to the LEPROSY situation. Leprosy is still existing and killing thousands of people, even though the means to eliminate it are known and it costs nothing (US $ 2.00 per person): the hands to do the treatment are missing in the field. Those hands prefer to stay in the white laboratories and clean hospitals.

Similarly, the means to improve earth construction practices are perfectly known, and do not cost much. But again the know-how stays in the neat research laboratories, appropriate technology centers, universities, etc.... This know-how should be transferred to the users by extension-workers.

Some conclusions

- Further research on earth construction techniques can be very interesting, technically speaking, and can have high potentials for certain applications, but in terms of the lowest 15% of the low income households it is useless.
- The problem today is to get this know-how to the users, to these 80% in Magnambougou, to these 88% in Kigali, to these 65% in Bujumbura etc., and to these 80% of the RURAL AREAS.
- One of the possible solutions for this problem is certainly: TRAINING. Training of extension workers that will transfer the know-how to the users. Training of architects, engineers, and decision makers, that in this way could be made to accept more easily this "unknown material".
- There is very little chance that big contractors ever will solve low cost housing problems by using earth.
I should like to ask Matthews: could you tell us how it was that one of the occupations you have shown us was in overcoming the "moderne" influences which you illustrated very well in the last couple of slides. It is very difficult to change things once they have been introduced. Can you say how, or whether, this can be overcome? The other part of the question: how were your suggestions on the use of local materials and building methods developed or passed on, how was it possible to carry out these ideas in practice? 

Matthews

I was initially with the United Nations project which had been started by the French Architect Planner Alain Bertaud, whose assignment was to set up guide lines for the newly created Yemen Arab Republic in solving some of the enormous problems concerning planning and physical construction resulting from development and expansion. He realised that it was necessary to study, not only physical planning, but also materials and the aspects of building construction, for new town and city development was to take place. The background was a country, the Yemen, which has been more or less isolated from new technological developments. After the civil war, and during the early years of the 1960's, foreign engineering influences caused design ideas to be imported that did not take into account local possibilities, needs and traditions, so far as building was concerned, and many unsuitable buildings were erected. When the United Nations Development Programme began to give positive assistance to the Yemen from 1968, the Town Planning Project was faced with the questions on how to build, and where, and with what sort of materials. Until the change of the regime, the Yemenis had been able to satisfy their building needs by means of traditional techniques, but with the influx of new demands for development, and new technology, new needs were arising, for which new solutions had to be found. It was hoped that this could be done so as to take into account the fine traditions of building and architecture that had been created by the people during previous centuries.

But the new ideas imported into the Yemen at that time by engineers from Egypt and elsewhere were the usual standard solutions common in so many other countries in the Middle East and in other parts of the world. These buildings had reinforced concrete frames and slabs, with infill panel walls of cement blocks only 20 cm thick. They proved to be unsatisfactory, being hot in the day and during the summer, and cold at night and during the winter, as there was not sufficient "capacity insulation" or "time-lag" in the walls and roofs, being only half or less that that in traditional construction. They needed imported cement and steel. The nature of the materials meant that expensive maintenance was required. From then on, I was involved in the design and construction of a series of monumental public buildings that were constructed on traditional lines and using new technical innovations. These included the National Institute of Public Administration, the Health Manpower Institute, the Ministry of Justice, all within the U.N. Development Programme and with the Ministry of Public Works. I also designed other projects such as the International School, the Health Centre and Hospital in Dhamar, and the La'izz School of Nursing. Some of these were part of the Netherlands Technical Assistance Programme to the Yemen. They were all constructed using local materials and building methods. The Swedish consultants SCAAN who were commissioned by the World Bank to design and carry out a series of schools in the Yemen, were also working with the same philosophy, and they utilized hammer-dressed stone and other local materials. At the same time, commercial interests, and some foreign companies and consultants were going in the other direction, so the impression cannot be given that everything in the building world in the Yemen at that time was fine; there was much insensitive and misguided work being carried out.

These imported ideas were being proposed in a country, the Yemen, which already had a great tradition in building and architecture, going back for hundreds of years and
proving to be satisfactory in practice. The Yemeni people were and are proud of their architectural traditions, and wanted to go on building for example in hand-cut stone, or at least in random rubble, as well as in burnt brick and sundried blocks and rammed earth. They were aware that what was now being offered to them in the name of the "new civilization" was not all that appropriate to their local conditions. So there was a substantial backing behind the U.N. team both from the general public and also from the government.

Before I arrived in the Yemen, a new building had been proposed for the Ministry of Foreign Affairs in Sana'a, which was to have been constructed with a reinforced concrete frame, and thin walls, in the "imported style". The U.N. expert in town planning, Alain Bertaud, persuaded the government to reject this approach and to adopt local stone with load-bearing walls. This was agreed, the new movement was now under way, and the government were convinced it was a good policy, to the extent of carrying out the next project, a government Guest House, in the fully traditional manner, employing the best stone masons and craftsmen that were available. It thus became official policy to build in this way.

**Turner**

Did the government really approve of this philosophy of the use of local building methods and materials, or were they more interested in the "moderne" type of construction?

**Matthews**

I think, from what I have said now, it is true they understood the logic of using local materials and methods as much as possible, also from the standpoint of economics, so as to save foreign exchange by avoiding the importation of items like steel and cement, as well as in giving employment to local skilled workers. It was indeed the official policy of the Ministry of Public Works to use local stone and Yemeni-type windows for all public buildings. There were, however, some differences of opinion when a few Yemeni engineers returned home after being trained abroad in schools mostly in the Eastern Bloc countries. The emphasis had been on standardised industrial types of building construction, and they had little interest in, or desire to develop their own traditions and the rich cultural heritage of the Yemen, which was available for all to see.

**Turner**

I think this is very important, as it could be said that the government is the leader in changing the situation, and so we need to know more about it.

**Matthews**

On the other question asked by Turner: "How is the knowledge being passed on?" I think it has been a two-way process. I probably learned as much as the Yemenis learned. They had their skills, and I was privileged to be in a position to study these and help them to go on. It is most important for a consultant actually to live in the country concerned so as to understand the problems and possibilities, thereby avoiding the danger of suggesting "rubber-stamp" solutions. Because I was totally involved in the design and construction process there, I was able to produce exemplars which are there to be seen, studied and evaluated, and which indicate the philosophy of our U.N. project towards the development of cultural awareness, and which is influenced by climate, in other words: "habitat". It was also shown in the film "Traditional Architecture in the Yemen" made by Vladimir Bibic and myself for the U.N. Conference on Human Settlements (Vancouver 1976).

**Turner**

Were you actually working with the Yemenis?

**Matthews**

Yes, I was getting on with the work. The U.N.D.P. project was based in the Ministry of Public Works in Sana'a, and I was assigned to that. In that Ministry we had a number of Yemeni assistants. They were not trained as architects, for none had the necessary level of secondary school education to enable them to go for formal training, although we looked at ways that might have made that possible. They were draughtsmen who understood the traditional ways of composing plans and elevations, suitable for the state of the local building industry. When some Yemeni engineers returned from training abroad, as I have mentioned, they had been taught techniques applicable to the more highly industrialized conditions, and were not equipped to develop their own heritage of Yemen architecture. Indeed they were not sympathetic to the production of buildings using traditional methods, and relied on boring solutions with the ubiquitous reinforced concrete frame and thin panel walls.

A technical college had been set up in Sana'a by the Chinese, who were putting forward useful ideas in the construction field.

Returning to Turner's question, I was certainly working with the Yemenis, both in the office and on site, with masons, plaster workers, contractors and sub-contractors. The system was almost medieval in character, and it was a challenge to take in the advantages of that system and to try to weld in some advances in technology.

Regarding the dissemination of knowledge, certainly any new knowledge will be passed on by exemplar, particularly in rural areas where building needs must still go on being satisfied using local methods, for it is impossible, from reasons of economics, to import buildings into such areas. Some innovations are being made, and if inappropriate they will indicate those directions along which it is undesirable to proceed. Other factors may introduce alien materials, such as the corrugated iron roofing sheets recently proliferating along the new highway that links Hodeida with the border of Saudi Arabia.
I hope that answers Turner's questions.

TURNER
Yes; but how do we demolish those images of bogus modernity? How do we help to change for the better the understanding of people on value? On the other side of it, what are the relative advantages? What can we do, what can be done? What are the interests behind it? What are the functional needs? Regarding the mud blocks you were showing, we need to know more.

MATTHEWS
I think, in a way, it is not such a bad thing if some mistakes are made, if only to serve as awful exemplars! Also, I believe that, due to the large volume of building being done, some traditional values must inevitably come through into the new architecture, because the climate remains the same, and available materials still exist.

KATAN
When you first started building in the Yemen, you had the more traditional staff. These were joined later by professionals who had returned from training abroad. Would it not have been possible for the U.N.D.P. to start recycling these professionals who had been educated outside, so as to make them more effective in their own country? If they could be guided into acknowledging their own architecture, perhaps by this means things could be prevented from going wrong, and the work you had been doing would then become some kind of a guide-line for them.

MATTHEWS
Well, you all know how the UN works: (Laughter). I tried to do a lot of things, but did not get that far. These were, however, our aims, and given a second five-year period more could have been achieved. We did achieve some of the objectives, I believe. Certainly there is a lot of solid guidance in the buildings that were actually completed, and which are too numerous to mention again. These exist, and must make people think.

KATAN
It could be a good thing if it came to be realized that we can still build modern buildings with charm, and which are still as functional as traditional buildings. The new office block in Sana'a for Yemen Airways has been illustrated on a slide. Could it be that there are two types of modern buildings?

MATTHEWS
No! I think the lesson about that example is there for anyone to see. In the long run, every future Yemeni architect must agree.

AN AUDITOR
There is a problem in educating large groups of people, especially those of a low literacy level, e.g. self-help builders who may be building mud houses. How is it possible to realize such an educational programme? I know of the problem of world-wide literacy programmes, and how little effect they have. They do not help the people who will be forming the new building technologies.

HOUBEN
It has been said that people should learn new technologies, and improve on what they are doing. But they are not able to afford much, for there is no available money to help them to improve what they are doing already. For the other part of the question, there are in existence specialist educational programmes. These can be used, filling in the knowledge required. Someone should organize it for their benefit, on new techniques in building, on the use of concrete, burnt brick, lime, wood, etc. But this is only half of the problem. The village also needs cultural and social development, and knowledge on financial planning. I think a training period of a year is needed, but we cannot give this amount of training to everyone in the village. At the "grass roots" in rural areas they need to know enough to be able to improve their situation, and then this knowledge should be transferred to the suburban, and even urban areas through some other people who could be made extension workers. They should preferably be from the country itself. Many will be of a low technical level, and so the people from the village should be brought together for training, and then go back to their village. The course must be very practical, and is not going to be done by only one or two people. An orientation course is needed. I think it is not coming from an appropriate technology course in Europe or in a developing country. We are trying in the World Bank, everybody is talking about "appropriate technology". In fact, a lot of people are playing around with it. Hundreds of experts are meeting on plaster, lime, cut stone, and you can find small booklets, giving the opinion of Mr X and of Mr Y, but there is not one reasonably well written manual from A to Z for example on burnt brick manufacture in developing countries with low-cost techniques; you can only find a bit of information here, and a bit there. On concrete and steel you can find anything, but on local techniques, what can you find?

AN AUDITOR
What you are asking is, what is the function of the university?

HOUBEN
I think that education should be worked from two levels; firstly from the university level, consisting of decision making, also on materials like concrete. And then at a lower level, the more local materials, so that once they go back to their country and are faced with local problems, they will not be scared by them. It is a question of education. One never knows what is going to be of use. Why should I be studying about concrete if I am never going to use it? But they were giving it to me.

Who knows what he is going to need? Why not give it all the same, on the same level as any other material. We need not change the programme all that much. There may be only ten or fifteen materials altogether, so it might only take three or four weeks more, I think there is time to do it. The other level should be the level
for the politician, the government decision-making level. Regarding very low-cost housing, we have to try to improve the situation a little, but for the community buildings like schools, small hospitals, etc., is the government which makes the decisions. It is here that the architects and engineers can help the government to make decisions, but let us work with the same techniques.

TURNER
But there is a decision affecting the actual result. You talk about the professions with a capital “P”. They do not have a monopoly, and it is exactly because of people like yourselves, and institutions with their kind of power of decision-making that we have become very subjective indeed. Surely what has to be done is to ensure that the people who are most competent to make decisions at the local level are those people who are living in the area. They should have an appropriate image, the kind of image like, for example, that which the World Bank has, where there are people drawing out on drawing boards very small buildings, and getting them built. This kind of thing typifies the extreme impact of deprivation of local power and is absurd. This is a situation we are up against, where community participation is concerned.

AN AUDITOR
It has been said that due to the kind of education and information systems which have neglected the traditional patterns there are problems. Now if we learn, there is a paradox, for if we come to the country with a knowledge of traditional methods, we are not going to help the people with their problems, we are going to make the situation worse.

AN AUDITOR
Why limit the argument to concrete construction? We can sell COCA-COLA all over the world. It depends on promotion, on bringing out the knowledge.

TURNER
That is rather inappropriate technology. Why cannot we sell the concept?

KATAN
What he is trying to say, I think, is that for building houses, there is a problem. People build their own houses, they tend to be small. It is no use giving the small people, the small trader, any training, or even to try to explain other techniques, because their own system seems to work well. There is also the problem where people migrate from the rural areas to the city, and within a year they will have lost everything about their cultural environment and know-how, and eventually other people will have to come to upgrade the situation.

TURNER
On the one hand it is essential to practice what we preach, and thereby to help to change the situation, and on the other hand in addition to trying to help, to get out of their way.

GOFFIN
When they come to our universities we can only make them acquainted with what we know here, hoping that they will eventually set up a course at home, at their educational level and in their rural educational system.
R. KATAN

UN CHANTIER ÉCOLE POUR UN DÉPLACEMENT DE POPULATIONS

En première étape du déplacement de 15000 personnes dû à la construction du barrage de Sélingué au Mali, un chantier-école a été créé pour construire une maison et un bureau-antenne PNUD, sur le site du déplacement. Ceci pour valoriser l’habitat traditionnel et rechercher des améliorations dans l’aménagement des espaces et dans les techniques de construction des nouveaux villages.

En la primera fase del traslado de 15000 personas por la construcción de la represa de Sélingué en Mali, un taller piloto fue establecido para la construcción de una casa y oficina del PNUD en la región del traslado. Esto para valorizar los asentamientos tradicionales y para buscar mejoramientos en el ordenamiento de los espacios y en las técnicas de construcción de los nuevos pueblos.

In the first phase of the 15000 people resettlement due to the Sélingué dam construction in Mali, a training pilot project has been created to build a house and a UNDP field office. This was to enhance and give value to traditional settlements and to research and improve the planning and design of spaces as well as the construction techniques for the new villages.

INTRODUCTION

Il n’est pas de pays aujourd’hui en Afrique qui n’ait en cours un projet de déplacement de populations.

Ces déplacements sont en général provoqués par des tremblements de terre ou par la construction de barrages hydro-agricoles ou hydro-électriques, et sont entrepris dans la plupart des cas en dernière minute.

Les populations concernées sont alors brutalement arrachées à leurs racines. On les transpose de leur milieu rural, dont les technologies villageoises et la planification sont appropriées au mode de vie, et toujours autoconstruit, à un milieu étranger : petites maisons en dur dans des lotissements parcellisés, symbole d’une autre culture et pour d’aucuns “d’une vie meilleure”.

En général, ces milieux dits modernes, sont rejettés par leurs nouveaux habitants qui vont alors se débrouiller seuls pour s’installer ailleurs. Non sans jouir d’une certaine spéculation autour de la vente de ces “maisons cadeau”, importantes pour en tirer profit mais pas pour y habiter.

Dans le cas du barrage de Sélingué au Mali, les autorités responsables n’ont effectivement pensé au déplacement des populations qu’un an avant la mise en eau du barrage, soit sept ans après le début de sa construction. Elles étaient cependant décidées à ce que les nouveaux villages restent dans la tradition et soient autoconstruits, malgré la préférence de certains pour le béton.

A la demande des Autorités Maliennes, les Nations Unies ont mis en place un programme pour aider ces populations. Le lac de retente du barrage hydro-électrique grand de quarante mille hectares, devait inonder douze villages et huit hameaux et provoquer ainsi le déplacement de près de quinze mille personnes.


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Plutôt que d’habiter à 150 km des populations concernées à Bamako la Capitale, et faire deux ou trois visites par semaine, comme il était prévu initialement, nous décidions avec l’accord des autorités locales, de construire un bureau, antenne PNUD du déplacement des populations, et une maison d’habitation sur le site, pour coordonner ce déplacement.

Ce fut l’occasion de créer un chantier-école et d’établir un échange de connaissances des techniques de construction et du milieu de vie. Les ouvriers furent choisis dans les villages à déplacer. Sur le conseil du chef de village, six des paysans constructeurs les plus adroits et qualifiés, composèrent l’équipe initiale. Le chantier école aura employé en tout une quinzaine de personnes pendant deux mois et permis de former quatre cadres devenus chefs d’équipe pour la construction des nouveaux villages.

Notre but fut autant d’apprendre que d’enseigner.

Il ne s’agit point de proposer un modèle aux paysans mais de chercher à améliorer les techniques locales de la construction et de la conception fonctionnelle de l’espace construit en harmonie avec la nature de la région ses traditions et son climat.

Le plan des villages traditionnels de cette région est le reflet d’une culture : c’est un plan organique, flexible et spontané qui varie avec la vie et la croissance de chaque famille. Chaque concession comporte cinq à six cases construites autour d’une cour qui constitue l’espace social de la famille nucléaire.

A l’opposé, le plan de la cité de Sélingué, construit pour les ingénieurs et techniciens du barrage, perd tout contact avec la réalité vivante des traditions locales. Ce sont les mêmes “villas” qui s’étaient dans les banlieues des grandes villes européennes. Ces maisons préfabriquées importées sont montées par des spécialistes étrangers. Elles sont totalement inadaptées au climat. La vie n’y est possible que sous climatisation permanente. Couteuses à la construction, ces maisons le sont aussi à la maintenance.

OBJECTIFS DU CHANTIER ÉCOLE :

I - Formation de cadres locaux pour aider à l’organisation logistique du déplacement de populations (recrutés parmi cette même population).

II - Valorisation des matériaux locaux à travers la construction d’une maison et d’un bureau antenne PNUD du projet de déplacement de populations.

III - Étude et expérimentation pratiques d’amélioration de l’habitat traditionnel : structures, enduits, étanchéité, salubrité, sanitaires, mobilier, etc...en utilisant aucun ou un minimum de produits importés pour que les paysans aient accès à toutes les techniques pour leurs nouveaux villages.

IV- Démonstration que des étrangers à la culture et à la région, peuvent construire des espaces appropriés à leur mode de vie, tout en respectant les traditions régionales et en utilisant la main d’œuvre locale.

DOMAINE DE L’EXPERIMENTATION :

A - ELEMENTS DE CONFORT

A1/ Le Site
Le choix du site a été déterminé par la proximité des services d’eau et d’électricité de la Cité et par la présence d’un bouquet d’arbres. Certains de ces arbres, penchés presque à l’horizon, donnaient un espace ombragé qui tenait naturellement compte des brises dominantes et des fortes pluies des 3 à 4 mois d’hivernage.

A2/ Le Plan : Organisation fonctionnelle
Telle la concession faite de cases individuelles disposées autour d’une cour, la maison est une série de cases rondes ou carrées pour les chambres à coucher, ou d’autres formes pour s’adapter aux fonctions de la cuisine ou de la salle de bains, toutes reliées entre elles par un passage couvert tout autour de la cour-jardin.

A3/ Le Plan : Son microclimat
Contrairement à la concession traditionnelle dont les cases sont construites autour d’une cour vide de verdure, le jardin de la maison a été formé de verdure créée tout autour par le passage couvert a créé un microclimat. La température y est
de cinq à six degrés de moins que sous n'im-
porte quelle ombre aux alentours.

A4/ Le Bureau - ses caractéristiques
Le bureau et la véranda-séjour sont ouverts
sur la cour d'entrée et le public. À l'inver-
se, les cases de la maison sont orientées
vers la cour-jardin, espace plus privé.
La taille du bureau est assez rare dans cet-
té région pluvieuse du Mali. Pour cela nous
avons pensé qu'il serait plus prudent de ren-
forcer la structure en intégrant des piliers
de bois aux colonnes de banco.

Nous avons obtenu ainsi une hauteur de quatre
mètres sous plafond où l'air chaud est auto-
mátiquement expulsé grâce à un système natu-
rel de ventilation haute, donnant ainsi un
espace relativement frais.

A5/ Les ouvertures et la ventilation naturelle
Toutes les ouvertures sont très petites.
Celles dont la forme est triangulaire, sont
composées par trois briques d'adobe. Elles
sont traditionnelles. D'autres très étroites
(20cm) et dont la hauteur varie de 75cm à 1m30
selon le lieu, ont été créées pour donner de
la lumière ou pour marquer la jointure entre
deux cases, toujours ouvertes en direction de
la brise et dans une zone d'ombre permanente
pour induire une ventilation naturelle.

A6/ Orientation du Bureau
Au Sud et à l'Ouest, le soleil étant le plus
fort, nous avons fermé la façade Sud sauf
pour une porte d'entrée. La façade Est, bien
qu'entièrement ouverte, est constamment à
l'ombre parce que protégée par la véranda et
son rideau d'arbres. L'Est reçoit les rafales de
vent et de pluie pendant les mois d'hiver-
nage. La façade Est, à l'origine complètement
fermée sauf pour quelques triangles de venti-
lration au point le plus haut de l'espace, a
reçu presque un an après la construction, une
extension de deux petits bureaux protégés des
pluies de l'Est par un grand auvent.

Comme nous pouvons le remarquer sur le plan,
les cases composant la maison ont des ouver-
tures orientées de telle sorte qu'elles puis-
sent éviter les intempéries et capter la bri-
se pour induire une ventilation naturelle
constante.

A7/ Organisation fonctionnelle et aménagement
des espaces intérieurs
Les aménagements intérieurs des cases ont été
essentiellement réalisés en banco, telles les
plateformes surélevées des lits à 40cm des
bancs ou sièges à la même hauteur encastrés
dans les murs, des niches à différentes haute-
teurs des murs, etc... Pendant le montage des
murs, tant dans les cases de la maison qu'au
bureau, un système très simple d'étagères en
banco y a été encastré comme le montre le
dessin ci-dessous. Ces étagères servent d'es-
pace de rangement. Dans les cases tradition-
nelles, les objets sont en général suspendus
aux bambous du toit de paille, ou traînent
à terre.

B - ÉLÉMENTS D'HYGIÈNE
B1/ Protection contre les insectes
Pour la protection contre l'entrée d'insectes
ou de rongeurs, des moustiquaires métalliques
ont été posées sur un cadre de bois léger et
rigide et fixé aux dormants en bois encastrés
dans la maçonnerie des ouvertures triangulai-
res ou rectangulaires.

Tous les murs intérieurs ont été enduits de
deux couches de badigeon au lait de chaux
pour protéger des insectes.
Tous les bois utilisés dans la structure et tous les bambous des paillotes ont été enduits d’huile de vidange, seule protection contre les termites, disponible en grande quantité et gratuite dans le chantier du barrage.

**B2/ Les sols**

Très souvent, les paysans construisent les murs de leurs cases à même le sol. Pour éviter les risques d’inondation et l'accumulation d'humidité, les sols de toutes les surfaces couvertes ont été surélevés et construits sur un soubassement de trente à quarante centimètres de hauteur.

![Diagramme de la construction d'un mur type sur un sol latéritique](image)

**DETAIL DE CONSTRUCTION D'UN MUR TYPE SUR UN SOL LATERITIQUE**

Tel que le montre le détail ci-dessus, le soubassement est composé de gros cailloux et de terre damée, la tout recouvert d'une couche de cinq à huit centimètres de sable pour la pose de dalles de schistes, trouvées en grande quantité grâce aux excavations provoquées par la construction du barrage. La jointure des dalles de schistes a été faite par un léger liant de ciment. Ainsi, les sols peuvent être lavés ou arrosés fréquemment pendant les périodes de grosses chaleurs pour aider à baisser la température ambiante.

La démonstration était faite qu'avec très peu de ciment (importé et très cher au Mali), les paysans pouvaient avoir un sol hygiénique. Il fallait décourager les sols battus (terre argileuse et bouse de vache) génératrices du virus de la lèpre selon les dernières recherches médicales.

**B3/ Equipements sanitaires**

Le coût des lavabos ou évier étant exorbitant parce qu'importés, il était utile de trouver une alternative de fabrication locale pour encourager l'installation des sanitaires dans les équipements sociaux des nouveaux villages : dispensaires, écoles rurales, centres sociaux, etc...

Nous avons commandé aux femmes potières de la région, deux vasques de terre cuite de 45cm de diamètre, en spécifiant de prévoir un trou d'évacuation de 4cm, pour pouvoir y adapter un syphon, ainsi que des petits carreaux de terre cuite de 7cm de côté pour pouvoir carreler les paillasses de la salle de bains et de la cuisine.

Ces paillasses ou tables de travail ont été construites sur des murets de briques de ban­co entre lesquels un lit de bambous arrêté a reçu une couche de banco stabilisé à 3 % de ciment, sur lequel le carrelage a été posé. La vasque a été encastrée dans la paillasse et les carreaux ont été disposés autour en les joignant par un enduit stabilisé en ciment. Il était ainsi facile de maintenir et de laver le tout.

L'économie réalisée en n'employant ni évier ni lavabo importés était de l'à 10, pose de robinets et de syphons inclus.

Nous avons construit un puits perdu pour l'évacuation des WC et des eaux usées à l'endroit où s'était extrait la terre argileuse nécessaire à la fabrication des briques de banco.

**C - AMELIORATIONS TECHNIQUES**

**C1/ Briques et Enduits**

Sur le site de la maison, une poche de terre argileuse à 30 % mêlée à de la paille fine cassée et de l'eau, nous a donné le banco de la construction. Plusieurs moules en bois de 10x20x40 ont été préparés. Une fois moulées, les briques ont été retournées pour bien sècher sur tous les côtés avant d'être au 4ème jour prêtes à l'emploi.

Le mortier de montage des briques était semblable à celui utilisé pour les fabriquer, sauf pour un pan de mur exposé à la pluie où le mortier a été stabilisé à la chaux sur 2% de manière à mieux faire prise avec des enduits semblables. Deux autres types d'enduits ont été utilisés sur d'autres murs exposés ou non. L'un était d'une composition similaire à celle pour fabriquer les briques et l'autre plus traditionnelle, a été renfor­cée par des termitières finement concassées à 25 %, et de la bouse de vache à 25 % et utilisé après une période de fermentation de 3 semaines.

Sur les murs les plus exposés, les premiers liants ont bien tenu après deux saisons de fortes pluies, les deux autres liants ont été bien conservés sur les murs non exposés et à l'intérieur.

Comme nous l'avons mentionné plus haut, les piliers de banco du bureau ont été renforcés.
Ils sont de 60cmx60cm avec un vide de 20cm. Les colonnes de bois de brousse traité à l'huile de vidange sont placées au centre et aux angles. Les interstices ont été comblés par un liant de mortier mélangé à de l'huile de vidange pour assurer le bois contre les termites.

C2/ Paille et bambous ont été utilisés pour les toitures des maisons, la couverture de la véranda et pour le passage couvert distribuant les cases.

Comme tous les bois de structure, les bambous ont été traités à l'huile de vidange. Le bois de paille de la tente moyenne locale, nous en avons utilisé entre 17 et 20 pour assurer une meilleure étanchéité et une vie plus longue (8 à 10 ans au lieu de 3 ans).

La paille est attachée par petits tas de 3 à 4 cm de diamètre sur des longueurs de près de 8 mètres. Le rouleau traditionnel varie de 4 à 6 mètres seulement. Au lieu d’utiliser une dizaine de rouleaux de paille pour couvrir une paillotte moyenne locale, nous en avons utilisé entre 17 et 20 pour assurer une meilleure étanchéité et une vie plus longue (8 à 10 ans au lieu de 3 ans).

C3/ Étanchéité

Pour assurer l'étanchéité du toit terrasse du bureau (36m²), nous avons réalisé différents essais d'adhésion d'une feuille de polyéthylène trouvée localement en sandwich entre deux couches de toile de jute (8 à 10cm). Trois essais avec des terres de teneur différentes en argile ont été réalisés:

a) avec addition de terre végétale 30%
b) avec addition de sable 20 % et de chaux 10%
c) de sa composition naturelle, telle que trouvée sur le site à 30% d'argile.

L'adhésion la meilleure (c) a été utilisée pour les terrasses du bureau, de la cuisine et de la salle de bains.

La pose de la paille sur structure de bambous traités au dessus de la véranda et du passage couvert, s'est faite sur une pente plus faible que celle des paillotes. Pour éviter des infiltrations d'eau, des feuilles de polyéthylène ont été posées comme des tuiles entre deux couches de paille (voir dessin ci-dessous). Ainsi, l'étanchéité a été assurée pour les toits de brousses et de paille.

D - COUTS DE LA CONSTRUCTION

Les 150 m² de surface couverte de la maison (incluant les espaces protégés mais non fermés) ont coûté un total de $5000 US. dont 85% ont été allés à la main d'œuvre locale et 15% à l'achat de matériaux et à l'expérimentation. Cela veut dire que ce même type de construction vaudrait en autoconstruction $750 US.

IMPACT DU CHANTIER-ECOLE

La construction du chantier a eu un effet psychologique important auprès des populations : elle a valorisé à leurs yeux leur habitat traditionnel. Ils acceptèrent plus facilement leur déplacement et purent ensemble aider à planifier leurs nouveaux villages et améliorer certaines techniques traditionnelles. Ce chantier a provoqué auprès des autorités maliennes, l’Établissement en 1981, du Centre de Technologie Adaptée, fonctionnant aujourd'hui pour tout le pays depuis Bamako.

Nous n'avons pu rester suffisamment de temps pour suivre toutes les constructions individuelles des concessions afin de noter l'impact total des détails d'amélioration dans l'aménagement des espaces et dans la construction des équipements. En 1983, trois ans après le déménagement, un tel inventaire serait de rigueur.

Développement des nouveaux villages

Les nouveaux sites furent choisis sans que le conseil des notables, sous la conduite du chef de village, n'ait changé deux ou trois fois avant de se décider sur le lieu définitif. Ce choix a été fait en concertation permanente avec les habitants de chacun des villages. Après de longues hésitations, ils désirent que le site soit semblable au leur mais agrandi. Grâce a des photos aériennes, il fut aisé de reproduire et de piquer les plans de chaque village existant sur les nouveaux sites, en respectant la relation entre les familles et leurs concessions. En 1981, le désir général, chaque concession fut augmentée de quelque trente pour cent (30%) de la surface initiale.

Sur la grande place du village et aux quatre points cardinaux, il fut apporté des dizaines de mètres cubes de terre argileuse, des citernes d'eau, une quantité suffisante de brousses et de bottes de paille pour que les familles puissent construire au moins un de ces cases qu'ils en avaient laissé dans l'ancien village. Hommes, femmes et enfants avaient chacun leur rôle à jouer. Quelque deux mois avant cette étape, tous le villageois hommes, s'assemblaient pour un effort commun deux ou trois fois par
semaine, week-end inclus, les femmes apportant la nourriture. Ils fabriquaient ensemble sur leur nouveau site, suffisamment de briques de terre sèchée pour en pourvoir chaque famille pour la construction immédiate d'une ou deux cases de dépannage suivant la taille de la famille, et pour construire la maison d'accueil qui plus tard devait devenir le centre communautaire.

Ceci se passait pour chaque village, sous la conduite du chef traditionnel.

Une fois les artères principales du village piquetées et tracées au bulldozer, et le marquage des concessions, chacune des familles prit possession de son terrain.

Les relais nécessaires pour la coordination logistique de l'apport des matériaux et de la construction des nouveaux villages furent assurés par les cadres locaux formés pendant la période du chantier-école. Ils étaient quatre qui, à leur tour, formèrent chacun deux ou trois aides pour pouvoir couvrir par équipe trois ou quatre villages, sous la direction des autorités locales, du coordinateur PNUD et en étroite collaboration avec chacun des chefs traditionnels de village.
The central emblem and symbol within the exhibitions 'Design and Third World' as well as 'Human Ecological and Energy Aspects of Building' around the international seminar 'Climate Habitat Culture' in the Eindhoven University of Technology.
A possible and probably useful - at the same time old as well as new - paradigm is:
Here and now and everywhere there is only one world on all levels, like physically, spiritually, etc. one.

The conditional factors for the remain habitat of our human(e) existence in a proper climate and a human(e) culture during all times of mankind.
There are enormous numbers of relations within the whole. A polygon with diagonals illustrates this a little bit. Therefore we need a holistic approach, which—of course—includes a participatory socially based consensus to survive.
We need the power of distinctive consciousness to achieve the reality, to find a way to (re)create a habitat for human beings in harmony with climatological and cultural possibilities.
In the metamodel of an integral biological architecture we find the principles, components and criteria for a holistic and harmonious approach of building towards a protecting and comfortable habitat and circumstances in our climate and culture.
In this seminar and the concerning part of the research, the building activities in the less industrialized countries in the so called third world (with few exceptions) get a priority.

The in our eyes almost heavy climatic circumstances and original strong cultural aspects of the third world countries attract us again and again. Even the often felt duty or desire to help those parts of our world may be a reason for this kind of activities. As we know, not always based on the pure intention to help.

Therefore I would like to point out, that the whole human population lives on one earth and belongs to one and the same world. I would like to break down the borders, which often lead to a peaceless or warful existence between various parts of the world.

We are more or less bounded to the same nature and the climate for which we are 'programmed' and in which we could come into existence on this world.

The results of all human actions and behaviours are well known under the term culture. Like climate and nature also culture and civilization delivers the needs, opportunities and possibilities to create our habitat.

Before this background - with this paradigmas - we may realize, that we, sitting in this highly developed University of an extremely civilized and industrialized country, can learn a lot, just from the 'primitive' civilizations, as they are often called. And I see the very high value in this kind of 'primitivity', namely the direct relations of individuals and groups to the essential conditions in life.

I had the opportunity to travel a lot because of my research journeys through the countries classified as third world countries, in which the heritage of possibly the highest cultures - like India - is still present to a great extent.

I hardly designed and built in these countries, because I worked as an architect mainly in European countries, but I learned a lot of the ancient and far cultures of the East, to fulfill my tasks in the West. I even realized that the welfare of the industrialized countries in general and for a rich portion is based on what they receive from the less industrialized countries. Finally, as a matter of fact, what one group of people is doing in our world, is a shame, even a crime.

I only want to remind you of these facts, which were already explored by others, like Y. Friedman, I. Illich, S. L. Kwee, M. Türkau, to whom I may refer.

I am convinced, that we have to cooperate, to work together in our department(s) and faculties with permanent and temporary members, with our guests in the happening of 'Climate Habitat Culture' and with people from near and far, for the creation of our habitat (a healthy habitat) - now and in the future - if we want to survive with at least a little harmony.

Our common work has to be focused on the real existential needs of the people in relation to their habitats and the context of the natural circumstances.

Our world became small. So we have to be very careful, at the same time, however, it is easy now to come together, to design a more harmonious environment than ever before.

In various cultures we find the image of different eras - obscure and golden ones with some in between. Nowadays it seems we live, in spite of a bad era, full of political, economic and social wars, pollution on all levels and a lost (human) ecological equilibrium. ! There are many reasons to try by all means, to approach a golden era again, even independently whether the ancient teachings are true or not.

So I hope, to enrich and stimulate you in your own work with this short and general contribution.

Let us prepare ourselves for to a fruitful cooperation in our world and a peaceful creation of habitats in an equilibrium of our environment.
Introduction
Ouagadougou, the capital of Upper Volta, has grown from a little French garrison town at the turn of the century to a community of some 250,000 inhabitants today. Most of this growth took place during the past thirty years. Nearly half of the inhabitants live in "spontaneous settlements" scattered round the edge of the town. These spontaneous settlements were largely built by people who moved from the country to the town to look for work; most of this emigration has occurred since Upper Volta became independent in 1960.

Fig. 1. The growth of Ouagadougou during this century.
The following specific features characterize the areas of spontaneous settlement:

The state is the legal owner of the ground. In other words, the occupants are not the legal owners. A brief sketch of the historical developments will make it clearer how this situation arose. According to traditional land usage, the land was distributed to the users by the leaders of the local community. The people given the land enjoyed the right of usufruct to the land. All others, in particular, only the occupants of the new neighbourhoods laid out in a grid pattern by the French, where the community. The people given the land enjoyed the right of usufruct as long as the land was worked; consequently, the land had no commercial value. It appears that after a long time (thirty to forty years), the owner acquired the right to dispose of the land at will; however, the details of this arrangement are no longer clearly known. In 1964, four years after independence, this customary system of land tenure was officially abolished and the state declared itself to be legal owner of the whole territory.

The inception of the modern legal system of land tenure had far-reaching consequences, especially in the towns. In particular, only the occupants of the new neighbourhoods laid out in a grid pattern by the French, where the title to each lot was recorded in the cadastral register, retained the rights to their land. All others, in particular the inhabitants of the spontaneous settlements (where the land had been allotted in accordance with customary land usage rules), had formally lost all rights to the land they lived on. There areas show a traditional rural settlement pattern, which grew up from an additive process of individual interests. Each newcomer settled on an available piece of land, without there being any over-all planning.

Each dwelling consists of a number of (mainly single-room) buildings situated round a large common yard in which most of the day-to-day family activities take place. This spatial concept has been determined by a long cultural tradition, and is the physical expression of the prevalent form of society. The number of rooms, the materials used and the functions assigned to the various spaces depend on the occupants’ social and economic circumstances. As a result, the house is subject to continual change — though at present, since the people living in the spontaneous settlements are not sure whether they are going to be allowed to stay there, they are restricting further investments in their houses to the absolute minimum.

Elementary urban facilities are conspicuous by their absence: no mains water, no drains, no electricity, no paved roads, no schools, etc. In general, the only collective facility is the small neighbourhood mosque, built by self-help.

Summarizing, we may thus state that nearly half of the inhabitants of Ouagadougou live in spontaneous settlements scattered round the edge of the town, where even the most elementary urban amenities are generally lacking and according to modern legal concepts the occupants are not the owners of the land.

The government of Upper Volta recognizes that the migrants leave the countryside for the towns from bitter necessity, and consequently see little profit in clearing the spontaneous settlements by forcible measures. On the other hand, it is realized that this spontaneous urbanization entails big problems in such fields as employment, education, health care, infrastructure and physical planning. As a result, within the framework of the over-all development policy — which in this primarily agrarian country is mainly aimed at improving the conditions of life in the rural areas — a high priority is given to renovation of the spontaneous settlements rather than to clearing and rebuilding.

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Legend:

1. entrance
2. compound
3. family head
4. wife and children
5. married son
6. daughter-in-law
7. surfaced terrace
8. store
9. reception
10. wash area
11. lavatory
12. waste pit
13. goat enclosure
14. chicken run
15. fruit trees
16. vegetable patch
17. fruit trees
18. compound
19. family head
20. wife and children
Renovation
In 1965 the municipality produced the first plan for reorganization of a partly settled area to the East of the industrial zone, called Coughin-Nord. They apparently wanted to impose a grid layout on the neighbourhood, while respecting the original allotment of land as far as possible. The result is an ill-defined compromise.

In the period from 1975 to 1977, a small experimental renovation project was carried out in Cissin-III, on the southern edge of the town, within the framework of the PNUD (Programme des Nations-Unies pour le Développement). The objective was to divide the available land as efficiently as possible into private and public areas, to improve access and to assign the rights to the land to the occupants after reallocation. Optimum use was to be made of the existing paths in the creation of the new roads (with a minimum width of 8m) through the neighbourhood. Existing social relations were to be respected as far as possible, i.e. the planners tried to avoid moving families a long way from their original home. Finally, existing houses were to be spared as far as possible.

This project yielded few technical problems, but a lot of social ones. The main problem was that the traditional leaders lost face when the land over which they exercised authority under customary land usage rules came under the jurisdiction of the municipality after title deeds to the land had been issued. These developments led to a good deal of tension, which manifested itself as unrest during the practical execution of the project. Problems associated with land speculation were also encountered. As a result of the issue of the title deeds and the improvement of the infrastructure, the value of the ground rose. As a result, lots changed hands at prices amounting to ten times the renovation costs – even though the state still retained the formal ownership of the land! Nevertheless, the project seemed to have been a reasonable success. The number of plots that had to be moved remained limited, while the population density still rose by about 15%. Moreover, it was found a year after the end of the project that the occupants had already improved their dwellings a good deal, confirming the idea that ownership of the land one occupies stimulates investment in one’s own housing. On the basis of this experiment, the World Bank advised the government to apply this restructuring approach on a wider scale.

However, the weak points of this approach became clearly apparent when renovation plans for two other neighbourhoods, Cissin-III and Zogona-Sud, were ready for inspection. The attempt to realize a new road network and a reallocation of the dwelling lots, while retaining as many of the original lots as possible, had led to renovation plans which were clearly not very functional.

In my opinion, it would have been better to start from the requirement that the road network and the new dwelling lots should both satisfy the relevant functional demands; the number of lots which could be retained would then follow naturally.

As a result of this dualistic approach, many of the new dwelling lots in the planned renovation areas were too long and narrow to suit the traditional style of living round a central open space; many of the buildings which were originally spared would have to be knocked down and rebuilt by the occupants after all, as they were situated at an odd angle or back to front on the new dwelling lot; and finally, the new road network was too arbitrary, and hence did not fit in well with the more orderly arrangement in the "grid town."
The objectives of the renovation

Legalization of the present land-tenure situation

As mentioned above, the land in the spontaneous settlements has been distributed among the occupants in accordance with long-established traditional customs. Shortly after Independence, however, this system of customary land tenure was officially abolished and the state became the potential owner of all land in the country. Since then, no one has known what was going to be done with the land.

This permanent uncertainty does not encourage people to invest in their houses, and indeed has a general demoralizing effect on life in the neighbourhood. Under these circumstances, it is hardly to be wondered at that occupants give a very high priority to the issue of title deeds to the land they live on.

Increasing the density

The costs of installing and maintaining the infrastructure needed to keep a town running properly are very high, and can only be paid for if as many people as possible make use of them. At present, for example, only a quarter of the lots in this area are connected to the water mains, the drains are only designed for dealing with rain water, and there is no garbage collection system at all. Moreover, it should be noted that the town is so large that it is an hour’s walk from the outskirts to the centre, where most work, shops and other services are concentrated; and there is no public transport.

For all these reasons, the authorities are trying in various ways to slow down urban expansion. Raising the occupation density is one of the means that could be used. This solution is difficult to apply in the “grid town”, as the people who live there are not prepared to sell part of their lot; once the right to the land has been obtained, they are not at all keen to relinquish it. They would be more prepared to rent some living space; but in view of the cultural value attached to possession of a piece of land, this possibility is not expected to bear much fruit as long as there is vacant land on the outskirts of the town. The occupation density in the new developments can be raised by reducing the individual lot size from the 500-600 m² usual until now. Whether and if so, how - it is possible to include the requirement for higher occupation density in the renovation plans for the spontaneous settlements will be discussed below.

Improving access

The traditional system of land allotment in Ouagadougou does not create suitable conditions for access of motorized traffic. In view of the economic situation, a sharp rise in the number of households owning cars cannot be expected in the immediate future. (It may be estimated that no more than 10% of the households will own a car by 1990). Nevertheless, when making renovation plans, one should bear in mind the need to accommodate an increased traffic density in the future without making excessive changes in the structure of the neighbourhood. The kind of traffic to be expected in particular comprises motor-cycles, taxis, garbage collection lorries, public transport, fire engines and ambulances.

Expanding the infrastructure

As we have already mentioned, the simplest urban amenities are generally lacking in the spontaneous settlements. However, the financial means available for creation of infrastructure are limited, so strict priorities have to be laid down. The occupants are unanimous in naming a drinking-water supply as first priority. Next, the drainage of rain water needs to be improved, as large parts of the neighbourhood become practically inaccessible in the rainy season (July to September), because of the mud. The first steps planned are therefore the installation of public drinking-water taps and the draining of the main roads. The provision of electricity, garbage collection, sewers and a telephone network should also come later.

Planning social amenities

While it seems unlikely that funds will be available for educational and healthcare facilities in the neighbourhood in the near future, space for these facilities should be allowed for in the renovation plans so as to avoid unpleasant compulsory purchase procedures later.

Fig. 8. Necessity of drainage

Fig. 9. Public drinking-water tap
The following 3 renovation plans were worked out for one neighbourhood of 30 ha.

Model 1 (see Fig. 11)
Access to the neighbourhood is improved by provision of a number of new roads 15 m wide, which together with the existing roads form a grid such that each lot is no more than 125 m (one minute's walk) from a road suitable for motorized traffic.

Model 2 (see Fig. 12-13)
Within the grid of model 1, the existing system of pathways is restructured so as to make practically every lot accessible to motor traffic. For this purpose, certain paths are widened to 10 m and extended or moved laterally; in the interests of traffic safety, intersections of these minor roads with the main roads are avoided. However, this proposal leads to very extensive modification of the whole neighbourhood structure: hardly any lot is left unchanged. This proposal would have the effect of increasing the area allotted to roads in the neighbourhood; the occupation density would not be increased at all. Model 2a (see Fig. 13) is a variant of model 2, in which the individual lots are made accessible to motorized traffic either via a street or via a common courtyard. These courtyards, which are given an area of about 500 m², can represent a new element of open space in the neighbourhood alongside the streets (which serve mainly as public traffic spaces).

Model 3 (see Fig. 14)
In this model, a fine-mesh grid is used to create a basically new layout for the neighbourhood, with the following characteristics:
- The roads vary in width, thus providing a simple hierarchy in the available traffic routes (unlike the roads in the French grid town, which are all the same width).
- The individual lots have a basically East-West orientation, which proves to be most effective in connection with the prevailing climatic variations: in the rainy season, the winds (and rain) come mainly from the West, while in the dry season the wind is mainly from the East. It follows from this that a 'banc' house is best protected from the elements if its front facade (which should preferably face on to a street) is oriented towards the North or South.
- In order to raise the occupation density, the lots are made smaller than hitherto customary: lot sizes of 15x15 = 225 m², 15x20 = 300 m² and 15x25 = 375 m², in relative proportions of 85%, 10% and 5% respectively, were chosen. (An increase of 30% in the number of plots with respect to the existing.)
- The grid pattern is modified at the edges (unlike the case in the French grid town), so as to avoid intersections between the residential streets (situated at intervals of 40 m) and the main roads; intersections between the residential streets and the secondary roads are also reduced by the grouping of individual lots round common courtyards.

The following remarks may be made in connection with the proposed reduction in the size of the dwelling lots. Study of aerial photographs of various spontaneous settlements over the course of time show a clear trend from large round dwelling units to smaller square or rectangular lots. This transition is related to the fact that after the move from the country to the town, the traditional agrarian life (in which the dwelling lot must provide room for storage, cattle and cultivation as well as for accommodation) gradually gives way to a more specifically urban way of life based largely on trade, craftsmanship and industry. The traditional closed family structure also changes towards a more open network of social relationships, where married children leave their parents and set up home for themselves.
The three renovation models sketched above were discussed with inhabitants of the neighbourhood and with local leaders in October 1979. About 20% of the people living in the neighbourhood were covered by the survey. The most striking conclusion is that 95% of the people interviewed were in favour of renovation of the neighbourhood rather than leaving things as they were, even if title deeds to the dwelling lots were given to occupants in both cases; the almost unanimous view seems to be that "things can't go on as they are". Further, 74% of the inhabitants chose for model 3 - even though it was made clear to them that this would involve demolition of about three-quarters of the houses in the neighbourhood. This seems to reflect a desire for this neighbourhood to be brought more in line with the rest of the town. 94% preferred living on a street to living on a communal courtyard, the main reasons given being that on a street one has more chance of starting up a shop or other small business, while there is more chance of disagreements with neighbours if one shares a common courtyard. There was less agreement about the desired size of the future lots, the acquisition costs of which rose in proportion to their area; in any case, one-third of those interviewed chose for the smallest lots (area 225 m²). The following suggestions were made as regards the timetable for the renovation activities: first lay out the new lots and the road network, then install the public taps, "because you can't build (i.e. make "banco" blocks) without water (!)", and finally give the people 12 months to "move".

The discussions with the authorities, represented for this purpose by the "Commission Nationale d'Urbanisme" (a kind of advisory body for physical planning), resulted in a majority for the following proposals: the new physical planning for the neighbourhood should be in line with that for the rest of the town; the occupation density should be raised, in order to permit recovery of the infrastructure costs via land taxes and also in order to reduce the distance between dwelling place and work; the third renovation model should be chosen, as this will facilitate installation of the infrastructure both now and in the future and will also yield a definitive allotment of the land; the area of the dwelling lots assigned to the people of the neighbourhood should be between 300 and 450 m² (the upper limit being intended to avoid land speculations). There was disagreement as to whether the occupants should receive compensation for some of the renovation costs: a majority felt that the occupants had acted against the law and thus at their own risk, while a minority considered that the state was at fault for not acting earlier and that the fact that not everyone knew the new laws could be regarded as a mitigating circumstance.

Conclusions
So far, formal physical planning in Ouagadougou has been based on a grid system. In my opinion, the physical planning for both new developments and renovation schemes - whether in the Netherlands or in Ouagadougou - should be integrated with that of the town as a whole. From the viewpoint of the physical integration of the renovated neighbourhood with the grid town, it will be clear that model 3 is to be preferred over both models 1 and 2. The degree of access is hardly improved in model 1, but may be characterized as good in both models 2 and 3.

As regards the occupation density, this remains practically unchanged in models 1 and 2; the difference between these two models is that in model 1 things are left more or less as they are, while in model 2 a great deal of demolition work still has to be done. In model 3, nearly everything has to be demolished but on the other hand the occupation density can be appreciably increased. The renovation costs per lot, to be borne by the occupants, will be less in model 3 than in model 2 because of the higher occupation density achieved in the former. Model 1 involves the lowest renovation costs, but on the other hand further improvements (such as individual links to water mains and the sewers) will be more complicated and hence more expensive.

Summing up, we may conclude that while it had been thought on intuitive grounds that model 1 was the best choice for renovation projects, as it seemed to give less interference with traditional ways of life, the analysis given above indicates that in the present case the more radical approach of model 3 is the best. Somewhat surprisingly, this conclusion was also shared by the occupants of the neighbourhood surveyed.
The concept of an industrial design institute, established by the Pakistan government goes back to the 1960's. A formal scheme was drawn up as early as 1960. A report did stress the importance and need of exports. Improvement of design should meet the demands of foreign buyers. The government realised the fact that unless an indigenous design culture was encouraged, and that too through a Design Institute established in the country, Pakistan could continue to be dominated by the colonial heritage that adversely affects the manufacturing sector which retards the growth of exports and results in a wastage of natural resources without any obvious benefit to the population at large.

The government of Switzerland accepted Pakistan's request to set up an Institute of Industrial Design in Karachi, and an agreement to this effect was signed in November 1970. The project was financed by the Export Market Development Fund from Pakistan while the Swiss government contributed and still contributes until now by providing experts, special equipment and material. Pakistan covers the local expenditure. According to the bilateral agreement the Pakistan Design Institute is a promotional institution in the field of product development and design with emphasis on quality. PDI must have a productive role with the direct impact both on the promotion of the Pakistan exports and on the national industrial production.

The first years of the institute were very difficult, progress was under the optimistic expectations by reasons of political instability.

The change in government power, at that time Ali Bhutto was changed for Zia ul Haq, paralysed trade investments and also PDI-activities.

In the first stage the important role of PDI was the upgrading and innovation of export products to save foreign currency. In a second stage from '78 a new approach was emphasised by developing specific Pakistan products by systematic use of local available materials and skills.

The western experts tried to promote appropriate technology in design. But acceptance by the Pakistani designers and the management of the Institute was rather low. There are many reasons; in this context I only mention two closely related to each other:

- the low prestige of low-technology design in those countries, where people are still devotees of technological progress and
- denying of real-life problems of the low income groups in the higher educational systems.

Teachers and students of high family classes live mentally too far away from the poor and his fundamental needs, and teachers and students of lower and middle classes want to grow away from their family's primitive heritage as soon as possible.

Jansdaal undertook with the Pakistan Design Institute a successfull project for the World Health Organisation (WHO). In connection with an organisation, the so-called Expended Program on Immunization, conducted by the WHO, a workshop has been set up for those working with and transporting vaccines to instruct them in the maintenance of the vaccines and equipments and in the importance of maintenance of the so called "Cold Chain System".

The Cold Chain consists of a series of transportation links during which adequate refrigeration is required to maintain vaccine potency. The vaccine must be carefully packed, transported in specially constructed cold boxes to central and peripheral stores, where they can be transferred to electric refrigerators allowing minimum loss of temperature. Again, for field trips with mobile vaccination teams, specially constructed containers with week long storage capacity and secure locking arrangements are essential.

Close to 97 % of all deaths in childhood occur in developing countries, where 40 % of the population are children, mainly living in rural areas and where the average health expenditure is scarcely $ 1,0 per capita per year. In many of these areas up to 50 % of the children might die before five years of age, largely from preventable deseases. Even though six of main killers (Measles, polio, tuberculosis (BCG), diphtheria, pertusis, tetanus (DPT).) can be prevented by a simple inoculation procedure, 80 million children born annually in developing countries will not be vaccinated. There are two
main technical problems: the sensitivity of vaccines to heat and, allied to this, the difficulty of providing suitable cold storage equipment to keep vaccines at recommended temperature during the "Cold Chain", this is from the manufacturer to the furthest point at which they are to be administered.

A complicating difficulty is that there are differences in temperature sensitivity of vaccines. DPT e.g. when freezing will lose their immunizing capacity. Most vaccines are best maintained at temperatures between +4 to +8°C.

Most developing countries find particular difficulties in the efficient delivery and administration of vaccines to children living in isolated communities scattered in extensive rural areas - often up to 80% of total population. Breakdowns in refrigerating during this, the last stage of the "Cold Chain", have led to high losses of vaccine. This is often due to wrong management and the application of inappropriate equipment.

Only 30% of the children immunized every year in Pakistan are actually safeguarded against disease. Very often the vaccine, when it reaches the field workers and vaccinators, is no longer potent. Adequate care has not been taken to maintain the vaccine to its preservation.

Somewhere along the line, in transit of storage, due to wrong management neglect, lack of knowledge, faulty equipment or breakdowns in refrigeration the vaccine was exposed to higher temperatures that rendered it totally ineffective.

Although several strategies are being tested - using mobile teams from fixed and provisional centres - there are still considerable heavy problems to be solved in order to achieve efficient immunization with restricted resources:

1. Travelling on poor roads and weather conditions;
2. Vaccines sensitivity to heat;
3. Sterile requirements of vaccine administration procedure;
4. Lack of energy supplies for conventional refrigeration;
5. Limited technological and economic resources;
6. Responsibility of the team involved.

In this paper some aspects will be shown of the last stage of the cold chain when no power supply is available. Special boxes have been constructed for the transport of the vaccines. These boxes are insulated and cooled by ice-bags, so-called cold dogs containing water and additive to increase viscosity. The boxes are in use in one week field trips of the vaccination team under extreme climatic conditions.

A prototype of a cold box designed in appropriate technology in Sweden was supplied to the Pakistan Design Institute by the Unicef as an example of a high quality product possible to construct in developing countries.

PDI analysed the box from the point of view of design and manufacturing aspects e.g. availability of material and manufacturing possibilities in Pakistan. The Swedish box is a good example of the way in which designers in the West often think about developing countries. It is a good example of how things don't work.

There are no universal solutions for generalized problems of the developing countries. It is impossible to define the Third World as one phenomenon. Each developing country needs his own problem solution. It is too technocratic to think that there is one optimal design solution for a problem that exists in different cultural and climatological parts of the world.

The design of the Swedish box was not appropriate for Pakistan's conditions.

The required materials and components were not available and different local requirements could not be met.

It was ironically to find after some investigations that PDI in collaboration with a Pakistan firm was able to design and produce a rather sophisticated cold box in medium technology, using fiberglass reinforced polyester as material and pressure moulding as technique. The double shell construction of the box is in situ foamed with polyurethan for insulation and to give structural rigidity to the box.

The necessary ironmongery, clasps and hinges and seals for secure closure proved to be difficult to construct under local conditions at high quality level.

The product proved recently in tests in London to be one of the best. About 40 to 50 models are available in the world.

The cold life time of the PDI-box is about one week under climatic conditions of 43°C. Every day the box is opened 6 times for taking out vaccines.

An interesting innovation has been developed for the WHO by the Pakistan Design Institute by re-analysing the fundamental aims and objectives and generating alternative design solutions.

Cold boxes must be shock-resistant, only than the insulating quality is assured. The insulation material
must be protected against damage, the casing of the lid and box must be very stable and sturdy connected. That's why drop-testing has to be done with all models. Designers and manufacturers tried to make their boxes resistant in the drop tests by constructing the casing in strong and heavy wood, metal or plastic.

The result is a compromise between costs, strengths and weight. It is not true that the heavier and the thicker the material of the casing the stronger the box is. The heavier the box the more vulnerable it will be in the drop test. That's why PDI searched for another system to make the box shock resistant to protect the foam core and the lid closing system against mechanical damage and moisture.

The result of this approach is a hard foam box protected by a surrounding soft foam shock absorbing barrier. The soft foam is protected against mechanical damage by a canvas or leather upholstering and against moisture by a sealed plastic plastic foil between the canvas or leather and the soft foam.

The soft foam is an integral part of the closing system. When closing the heavy zip the soft foam on the contact surface of box and lid will be compressed forming an ideal seal.

This new approach has several advantages: materials and production technology is available in developing countries. If no zips or plastic foam is available, leather straps and other insulation and flexible shock absorbing materials can be used as cotton, wool and lots of other natural fibres.

The total weight of the box is very low, so that even bigger boxes can be carried by persons. Especially for mountainous and other rough terrain where the immunisation team has to carry the boxes over longer distances is this design proposal very useful. The soft box can be carried as a ruck-sack, in towns the vaccinators can carry the light boxes with them travelling by bus or by taxi.

Materials and production costs can be considerably lower than these costs spent in the construction of boxes with a hard casing.

The PDI cold box could not be used as a representative example of an appropriate design for Third World Countries. A product design team and a factory working up different kinds of polymers is a combination not existing in too many developing countries.

That's why Jansdaal was asked by the World Health Organisation to write a paper about constructing and modifying cold boxes for the transport of vaccines using appropriate technology for developing countries in the world in Asia, Africa and South America. This paper has been published now. It is a guide to design modification, testing, production and quality controlling of cold boxes for areas where suitable industrially produced models are physically or economically not available.

The paper deals with appropriate technology, specified as low and medium technology:

- Appropriate technology: objective is to create new products in a defined area with use of the existing know-how of the population and with available techniques and materials in this area. The results must fulfill needs and must be socially, culturally and economically acceptable.

- Constructing cold boxes in appropriate technology implicates the use of low and medium technology.

- Low technology: working up and assembling of traditional materials (steel, wood, copper, brass, natural fibres and adhesives) with traditional hand tools and techniques (Craftsmen technology).

- Medium technology: working up and assembling of traditional materials and non-traditional materials (aluminium, polymers) with more advanced techniques. In this connection are mentioned:
  - punching and bending of metal sheet for hinges and catchers;
  - vacuum forming of thermoplastics;
  - blow moulding of thermoplastics;
  - polyester hand layup technique.

- Mixed low and medium technology:
  - non-traditional materials such as thermoplastic sheet can be traditionally assembled;
  - re-cyclable industrial materials and products can be reused by low and/or medium technology.
The paper is meant for the EPI programme managers, for the designers and producers involved with cold boxes in appropriate technology. The purpose of the given design proposals is not only that they initiate a way of thinking about constructing cold boxes that leads to independence and self-reliance of the participants of the Cold Chain Programme in the Third World.

Ergonomic principles are very important in this respect; a human being is able to carry weights; important factors influencing this ability are weight, shape, distance, and the way in which the weight is carried with or without help of an expedient.

Understanding of principles of heat transfer is very important for designers and they are explained in the paper.

Detailed proposals are given for modification of existing cold-boxes and carriers. Available boxes are researched. Tests showed that the cold lifetime was insufficient, closing of the lid was bad, leakages occur. Reinforcing of the weak outercasting with light metal structures and added various components like catchers, locks and handles are some of the proposals.

The paper is illustrated with drawings showing ideas, possibilities of construction details in low technology and traditional materials, even available in remote areas of the developing countries.

Also the design solutions in medium technology are mentioned, possibly available in towns.

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*Innovative design for the World Health Organisation by the Pakistan Design Institute: the soft-foam vaccin carrier.*

*Ergonomic factors regarding cultural habits of carrying weights.*

*Proposals for modifications of existing cold boxes.*

*Principles of heat transfer are explained in the paper.*

*A tension providing clamp in appropriate technology; local design and production.*
The project for the renewing of a quarter in the old city of Istanbul, is a result of the study trip to Turkey in '78.

If you go to Istanbul you can see a lot of architecture there, you really meet what you learned about architecture, or what you read in architecture books.

But if you are there somewhat longer and you have the sense for the housing problems of the people, you discover the impulse by yourself to help or to do something.

The old quarters of the city are overpopulated, and the circumstances for living there are very bad. This problem is caused by the incomers from the countryside, who cannot find a job in their villages, the agriculture has been mechanised and there is a lack of alternatives for the workers. The circumstances run down, schools are closed and the social services are on a minimum level, many families are looking for a better situation in the towns, or in Western Europe. In this way the migration to the towns had arisen, they live in large groups together, in a few rooms in decayed houses of the old quarters of the city, mostly in the neighbourhood of the small workshops and factories where they have a job of bad and dirty work for little money.

The industrial development of Istanbul needs the amount of cheap labour. If the workers should ask for more or better circumstances they would be discharged.

There is no choice: either to be a poor worker in the town, or unemployed in the countryside. But the background of the slums in the old quarters is complex and covers more problems than I could understand. The larger number of import-workers coming from everywhere, is harmful for the social connection between the inhabitants. Another negative aspect is the density, caused by the haphazard exploitation of the decayed houses, the owners will not turn them into better ones and the government is not able to put more pressure, because there is no money for better houses and reduction of the density, so that the family structure can grow.

My conclusion is that the lack of repair of the houses is the beginning of this negative process, the whole situation of the quarters runs down if you are not able to stop this. You see the tendency that the vacant bad houses are bought by the middle class, not by the real capitalists, but by the "well-to-do" men. The property of houses therefore is spread over a large group of owners. These house exploitants are specially interested in buying 2 or 3 houses in a row in order to break them down for a new and greater building like a hotel or an apartment.

The whole situation causes a damaged environment and the original people leave as soon as possible, but for the existing inhabitants there is no prospect of a better time or place. Their government is the only one who can save their rights.

After Istanbul I was in Egypt, Saudi Arabia and Marocco and there I have also met the problems with overpopulation in the old quarters of the towns. This is not specific for the big cities like Cairo, but each town, small or big, has it more or less. In all places you can see the increase of the unskilled people, outcasts, cheap labourers for the factories, a process always in the same context of a changed agriculture, excess of birthrate (and so on). People living in squatters or slums, together in families, each with their own way of life.

During the execution of the project of Istanbul and especially by the evaluation afterwards, I feel the need to formulate the problem in general terms.

I think that I can say that most of the problems in the third world are problems of density, caused by what is called "urbanisation". The culture of the third world, especially of Islamic countries is not based on a dense society.
All the social solutions, laws, relations between (groups of) people, organisation of towns are based on small concentrations of families, trade cartels, mosque centres, and such. The people have no answer to the new problems arisen, and caused by the Western influence of large scale organisations and production. We (from Western Europe) cannot understand this conflict, we only see the results. But we can help to tackle the gap between the original culture and the problems of the density, because we have experience in living in high-density areas, we have knowledge about social organisation and management.

It is important that the local governments can make clear and describe the situation in such terms, that it can be understood by their own people.

I think that we can give the tools for this process, not tools sharpened by the experience in our situation, but tools adapted to the local situations. Thinking about the right tools asks for the question about the education at our department. Questions like:

What about architecture as a principle of the western status and power?

What about structures grown in our efficient society, with expensive materials and a lot of energy?

What about construction methods all mechanised to save labour?

What about the look at the problems of the third world, without our own profit?

But I have questions, I cannot deny that I was born and have grown up in another world. All the things I'm doing are drained with my education. I find and use the terms and methods which I have learned, like a look in a mirror. The question is: the methods and terms that I will show you now about my analysis of the problem, are they the right ones? Because they are coming from another culture, other feeling and nature. In our culture it is normal to speak in a way of systems, or to make analyses, with special terms for the arrangement of settlements and architecture. I am curious to know the terms and system that can be produced by the people themselves.

Analysis of the housing problem in a quarter of Istanbul.
The oldest part of the city Emnai can be divided into 3 parts: the Islamic part, the Byzantine part and the citadel.

You can see two different kinds of structure there: the Islamic is chaotic with the mosque in the centre, there you find the old wooden houses, the Bazar, University. And secondly, the Byzantine structure, which is rectangular with houses of stone and long row horizontal streets.

Between these two parts there is the Ordu Caddesi, the main road of the old town.

You can see the Ordu as the "public" space, there you'll find the tourists and you can reach the important monuments.

Behind this "public" street, there are the "private" quarters, where people are living; each quarter has its own structure, according to its function: "housing".

I called it the "private" (closed) structure, because it has to be safe. If it is intended for living, safety is the primary factor. Now the problem of the situation of the old housing quarters can be described in terms of being no longer the safe and closed place for living. The people are driven out by the lack of privacy, caused by the growth and strength of mimical functions.

That was also the view of the town planners. They made a model for the
whole city as well as for the parts; to separate public and private. Each part (called a structural and functional unit) has to be a "balanced" unit in itself. If you want to realise such units, you'll have to reduce the amount of transport, between the districts and you'll have to limit production and the amount of people. You can make each part in a way according to its place in the whole of the city, for instance for public service, production or housing. But in the Islamic way of life you shouldn't make one-sided units, because the whole life is "woven" with very many aspects. Each unit therefore must be compared out of several functions related to a standard for the unit as a new complete whole. In this way you get a system, in which each unit has its own principal function.

In a living unit (for instance the housing quarter) not only housing functions have been arranged, but also other functions related to the requirements of good living. In this way you get the "standard" about the character of the other functions in the quarter.

The main functions, depending on the balance in the residential quarter are: living, traffic, production. If you want a balance for good living, you must expel some of the polluting and disturbing functions, like factories, large garages or workplaces, as they disturb the living circumstances.

The recovery of the balance, in order to achieve privacy again, is the first condition for a new start of living. The second condition is to repair the bad dwellings, so that they can be considered for living and become free of haphazard speculation. Once these conditions are set, you can
start the new organisation of living and become free of haphazard speculation. Once these conditions are set, you can start the new organisation of living, traffic and production.

You therefore need an analysis of the structure in relation to the occupied functions, because the structure has the capacity to include functions and this has to be in harmony with its place in the whole.

That means that you can weigh the functions against the capacity of the "structure-services", like sewerage, pipes, electric power, telecommunication etc.
In the project area, the long and row horizontal streets have more technical capacity than the short and vertical ones. Besides, the horizontal streets are more suitable for traffic and heavy functions. On these terms the conclusion can be drawn that the long horizontal streets are the right place for the public functions. The short vertical ones can be intended for living.

For rearrangement of the functions you can collect all the workshops from the cellars of the houses to the corners of the horizontal streets and build a special building there. This can be higher and contain more services, because the infrastructure of the horizontal street allows more than that of the vertical one. The renovation of the living streets in the quarter starts after this moving process.

It is possible to carry out the process in two different phases: first the moving process to build up the public structure, and second the renovation of the houses, either handling each house separately or handling a group of houses in the whole street.

The renovation of the houses is a story of itself, for which I should need another chapter. But the intention of this process is to build up the structure of the houses with an efficient building system and to have them completed by the owners afterwards.
INTRODUCTION
To increase the self-sufficiency of developing countries, indigenous materials must be exploited to the full. Among them bamboo is a familiar material with a long history of usefulness, and in building it has been employed in South-East Asia for housing and for scaffolding; but could it play a bigger part in building, especially in structural applications? To answer this question in 1974 the author began a comprehensive research programme on the mechanical properties of bamboo, particularly for structural uses in joints and trusses. The present paper highlights the research done on these subjects. The problem of durability remains a major one, of course, but falls outside the author's specific field of interest.

Similarly, bamboo as reinforcement in concrete is not described here.

BACKGROUND INFORMATION
Bamboo grows in many countries in South East Asia (India, Pakistan, Bangladesh, Thailand, Malaysia, Indonesia, China, Philippines, Japan, Sri Lanka), in some countries in Africa (Kenya, Tanzania) and in South America (Colombia, Brasil, etc.). In these countries bamboo is a very important material as it is used for housing, other constructions, food, paperpulp, handicrafts, music instruments, water pipes, scaffolding, rural uses, etc.

The annual crop is estimated at 10 million tons (compared with timber in L.D.C.'s, other than firewood: 180 million tons), which equals about 8 million km of bamboo or 200 times the circumference of the earth.

In the context of this report the field of interest is limited to building constructions other than houses. Examples are trusses to support roofs of schools, clinics, market places; bridges; etc.

Table 1 shows the use for these purposes in four countries in South East Asia.
The mean of 20 percent in the last column of Table 1 means:
1.28 million tons,
or 45 million U.S.\$ (1 ton costs 35 U.S.\$),
or 1 million km,
or 25 times the circumference of the earth.
From these 1.28 million tons trusses and purlins for roofs covering 150 km$^2$ could be made, i.e. 0.25 m$^2$ building per caput per year in the four countries mentioned.

For Bangladesh 70 million villagers are said to use bamboo in their daily life, which is about 90 percent of the population of 80 million.

From these figures, how incomplete they might be, it is clear that bamboo is important for construction other than housing for some hundreds of million villagers in South East Asia, which figure could be extended with people in Colombia etc.

The advantage of the use of bamboo as a construction material can be summarised as follows:
- From a bamboo-area, each year ripe culms can be cut.
In case of wood, one has to wait for some twenty years, after which the area is clear-cut (deforestation, erosion);
- Bamboo is a light, strong, stiff and elastic material. In case of an earthquake, its behaviour is very good. For a floorbeam or purlin bamboo needs only 40 percent material compared with wood;
- Only simple tools are needed like machete and hack saw for its cropping and use;
- No sawing or logging like in the case of wood;
- No waste material like bark and sawdust;
- Bamboo is not in competition with wood for charcoal;
- Bamboo can be cultivated by individual villagers;
- The return of capital is faster for bamboo than for wood.

Another advantage of bamboo as a building material is the small quantity of energy needed for production, compared with other building materials, also taking into account the different bearing capacities of each material.

Table 2 shows the ratio of energy for production per unit stress when in use:

<table>
<thead>
<tr>
<th>Material</th>
<th>Energy (MJ/m$^3$ per N/mm$^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>240</td>
</tr>
<tr>
<td>Steel</td>
<td>1500</td>
</tr>
<tr>
<td>Wood</td>
<td>80</td>
</tr>
<tr>
<td>Bamboo</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 1

<table>
<thead>
<tr>
<th>country</th>
<th>bamboo area in km$^2$</th>
<th>annual crop in 10$^6$ ton</th>
<th>% crop used for construction other than housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>6000</td>
<td>1.0</td>
<td>10</td>
</tr>
<tr>
<td>Burma</td>
<td>6000</td>
<td>2.0</td>
<td>12</td>
</tr>
<tr>
<td>India</td>
<td>100000</td>
<td>3.23</td>
<td>16</td>
</tr>
<tr>
<td>Thailand</td>
<td>100000</td>
<td>0.1</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>122000</td>
<td>6.3</td>
<td>20 (mean)</td>
</tr>
</tbody>
</table>
Example: from the figures 30 for bamboo and 240 for concrete it can be concluded that the production of bamboo needs only 1/8 of the energy needed for the production of the same bearing capacity in concrete.

Among the drawbacks of bamboo are the following:
- Bamboo needs preservation, similarly as for timber;
- Due to the hollow form, the fire risk is greater than with wood (which is massive);
- Joints are more difficult than in wood;
- Bamboos are not of equal length and diameter.

RESEARCH IN EINDHOVEN, 1974 - 1982
The reason for the start of our research was a request made by volunteers in developing countries. They asked technical advice on how to build bamboo trusses for schools and warehouses. We did not know how to help them to solve their problems, but we found old information in the files of our former Royal Dutch Indian Army, from the 1890’s. With this information we could give them a proper advice. This old information, however, appeared to be useful to many volunteers, and so we published a reprint. Several hundreds of copies of this Dutch reprint have been distributed among volunteers. In addition to this text, a similar English text has been prepared. Both reprints contain information on the use of bamboo in building. We thus became interested in bamboo, and we developed a research programme on the use of bamboo in building structures, especially in trusses for roofs or bridges. Our idea is that bamboo can play a bigger role in building than it did, because the mechanical properties of bamboo are not used to the full. In bamboo structures a development is required similarly to that in e.g. wooden trusses: a century ago every carpenter built a wooden truss like his father did, with too much wood, and of unknown safety. Now wooden trusses are designed, calculated and built on the basis of much research, with less wood and of known safety. We wish to contribute to such a development.

Our research started in 1974. A bamboo laboratory was installed, bamboo material was ordered from the Philippines and research got under way.

The research was terminated in 1982, yielding the following results:
- an overview of the short term mechanical strength and stiffness of bamboo in case of compression, bending, tension and shear, in relationship with the biological composition of the bamboo;
- a mathematical model of the sclerenchyma-cell, to explain the mechanical properties from the biological composition;
- a study on how to join bamboos to be used in the joints in trusses and bridges. About 50 joints were built full scale, tested and improved. In addition 5 trusses with a free span of 8 m were built.

The results of this program were published on scientific level in a doctor’s thesis and on congresses in London, Singapore and Kyoto.

The results have also been translated to a low technical level, to be used by field practitioners (up till now 1,300 copies). A first and hesitant step towards the transfer of research results to small target groups.
The costs of this programme have been U.S.$ 800000, including
10.35 men-year by staff. These costs were carried by the Eindhoven University of Technology.

Pages 83 - 84 show some pictures. Page 84 shows a cross-section of a building with bamboo trusses, based on this research.

Some closing remarks:

a) The described research programme and findings were presented at the meetings of bamboo researchers in Singapore (1980) and Kyoto (1981). At these meetings, all the leading bamboo experts from South East Asia were present, and their reactions were unanimously positive.

b) Unfortunately, the research is unique in the world and similar research is done nowhere. This leaves us with two problems. First, other research centres should be initiated in countries where bamboo is used and second the already available research results and the results yet to come need translation for the target groups.

c) Housing was not a topic in the programme, because structural problems hardly occur in housing.

d) Recommendations resulting from the programme were:
- research into the long term behaviour of bamboo should be initiated
- design of and research on trusses should continue
- training programmes for young researchers from bamboo countries are needed
- dissemination of the results to people in bamboo countries is a must.

AIMS OF THE PROPOSED RESEARCH PROGRAMME 1984-1988

It is well known how clever people in bamboo regions are in building with bamboo. Why then is research necessary?

- Economic reasons.
  The quantity of bamboo, needed for a building or a bridge, can be diminished to two-third or even one half if tradition is enlarged with the results of research, in a similar way as we have seen with wood in the past forty years in Europe. Bamboo can be used instead of timber, which is becoming increasingly expensive.

- Safety reasons.
  Constructions built with traditional knowledge only, are sometimes much too safe in certain parts of the construction (which also means too expensive), but in others they are not safe enough. Research can improve this to reach a safety equally divided over all parts of the construction, in a similar way as we have seen in the past with brick and timber constructions.

- Ecological reasons.
  If the use of bamboo in building could be promoted, the risk of deforestation could be diminished.
  Special attention should be given to building regulations in countries where bamboo is a common material: in most cases they only deal with steel, concrete and wood, and do not mention bamboo, which prohibits building with bamboo. Building regulations should deal with bamboo as well, if bamboo is to be given the place it is worth. The results of research shall be given to building departments in bamboo-key-countries, to draw their attention to bamboo in future texts of their build-
The aims of the proposed programme of activities concern fundamental, advanced, research, practical and technical research training of your researchers and dissemination of research results.
Dr. Janssen is glad to run a consultancy service on bamboo as a building material. This service is free for those working in favour of developing countries, with no financial interest for their own. This service is based on Dr. Janssen's own experience as well as on his library, containing 280 books and articles, with an index system with 980 entries.

Address:
Dr. J.J.A. Janssen, Eindhoven University of Technology,
P.O. Box 513, 5600 MB Eindhoven.
EXPERIENCES WITH LOW-COST HOUSING IN KENYA

1. Background information

During the years 1977 - 1980 the author worked in Kenya under The Netherlands Technical Assistance Programme. First in the Ministry of Housing and Social Services as a housing planner and later as a materials engineer in the Housing Research and Development Unit (HRDU) at the University of Nairobi. Some of the experiences during this period will be discussed in this article.

2. The Housing problem

Kenya is about 17 times The Netherlands and has about 15 million of inhabitants of which 2 million people live in the three big towns Nairobi, Mombasa and Kisumu.

Like many other developing countries also Kenya is facing a number of problems such as:

- A high unemployment rate
  (of over 20% in urban areas)
- A high birthrate (3.5% per annum)
- A food shortage by times in some parts of the country
- And a tremendous housing shortage in particular in the towns.

Every week 500 illegal dwellings are completed and occupied in the towns of Kenya and three times as much in the rural areas.

The housing shortage is at all levels of income and is one of the reasons for the continuous increasing rents.
The housing shortage can be defined as the difference between the required number of houses and the available number of houses of a certain (defined) minimum standard. It will be clear that the definition of an acceptable minimum standard can lead to numerous discussions. But also the calculation of the required number of houses can be done in different ways.

We will leave this subject and we follow the National Development Plan 1979-1983 (page 171) which gives the following figures:

In 1978 was the current shortfall in urban areas: 140,000 units.
Estimated annual increase in urban households over 5 years: 150,000 units.
Estimated annual increase in rural households over 5 years: 450,000 units.
Annual replacement in rural areas over 5 years:

The same development plan projects a construction output of 74,000 housing units in the modern sector. Experience has shown that there is a considerable difference between the projected- and the real output:

For the plan period 1970 - 1974 was projected: 50,000 but realized 250,000 units and for the plan period 1974 - 1978 was projected 40,000 but realized 9,000 units.

This may justify the conclusion that in this plan period will be realized only: around 30,000-40,000 units. Thus increasing the shortfall by: 1,300,000 units (1) within 5 years.

3. Housing for the lower income brackets

The whole problem of low cost housing is a very complicated subject and cannot be solved in a simple way.

In Kenya the provision of low cost housing is realized by various ministries, the National Housing Corporation (NHC) and foreign aid organizations like the World Bank and USAID (United States Aid) both in collaboration with the Government and also by some private organizations.
Medium and High cost housing is provided for by the NHC and private developers. Limited government funds are used for rental accommodation. Most of housing is built for selling or for tenant-purchase.

A low cost house can be provided in various ways:

1) As a completed house. A standard low cost house consists of 2 rooms of respectively 9 and 12 m², a kitchen, a shower, a toilet and a splash area. The realization of these houses is usually in hands of a special project organization.

2) As a partly completed house. A core unit consists of a shower, a toilet and basic infrastructure (water, sewerage). The owner can complete the house within a limited period with a materials loan.

And:

3) Because of the ever increasing building costs a plot with basic services only (access road, water-tap on the plot and a sewer connection on the plot boundary).
Plot. initially provided with a contractor-built shower and toilet plus main walls and a roof covering the habitable area.

occupied by an owner household and two minor subtenant households.

Low cost housing Kibera

Due to the immense short fall, this provision of Site and Service housing fulfills only a part of the housing market but the people with a low or no income have to seek other housing. They usually rent a room or start to 'squatt'.

Any type of housing is too expensive for low/no-income people, which are an important category. Therefore ways and means have to be found to cater for these people.

We can think of:
- Reduction of the interest rates
- Simplification of standards
- Stimulation of squatter improvements
- Stimulation of self help projects
- Research into more simple designs
- Research into lower cost building materials and constructions.

Activities are undertaken at a number of these points. The last two items are a part of the tasks of the Housing Research and Development Unit, where the author worked.

4. The Housing Research and Development Unit (HRDU)

The HRDU was established as a result of recommendations of a UN report on housing in Kenya in 1965 and is based at the University, Faculty of Architecture Design and Development. It is supported by funding by the Ministry of Housing and Social Services which is also the Units' primary client.

The HRDU publishes a wide range of reports papers and recommendations concerning all aspects of low cost housing. The HRDU also provides a teaching service in the University on low cost housing and urbanization problems.

The staff (15) of the HRDU consists of:
a director, architects (2), sociologist, architect planner, economist, engineer services, engineer materials, some technical and clerical staff.

The materials engineer in the Unit is responsible for the development of low cost building materials and constructions.
5. HRDU Research into low cost building materials and low cost constructions

One of the tasks of the HRDU is research into low cost materials and constructions. Because of the limited number of staff the Unit works closely together with other local institutes like the University Department of Civil Engineering and foreign organizations like the British Building Research Establishment.

The following examples of research are results of either HRDU research only or of joint efforts.

5.1 The HRDU has made a design of a low cost house in 1975 to be built in an experimental self-help scheme in Kibera/ Nairobi. A prototype was constructed on the campus of the University. It is a pity that the actual realization of the project never took place. But it is a very good example of a low cost housing construction. (Fig. 1)

By changing position of the walls the use of the house can be altered. House type A shows a solution with subtenants.

The construction shows some typical low cost solutions.
- A simple column construction
- Wall infill is possible maximum flexibility

5.2 Roofing: Sheets

Sheets of approximately 1 x 1 m can be made on a very simple way on site. This method was developed by the Department of Civil Engineering and the Kenyatta University College. 3 layers of cement mortar are plastered on a flat polythene sheet with also 2 layers of sisal fibres. Afterwards corrugation is given by pressing the sheet into a mould. (Fig. 2)

5.3 Papyrus polythene roof

A low cost roof consisting of polythene sandwiched between papyrus was tested for a period of three years under Nairobi weather conditions. For this purpose an experimental structure was erected at the main campus. This roof type is very simple and appropriate. It can be plastered to reduce combustibility. The estimated life time is at least 5 years. (Fig. 3)

5.4 Thatched roof

Thatch as a roofing material is still in use in rural areas. Thatching materials are: papyrus, grass and palmleaves. As it is at some locations an appropriate building material, the HRDU undertook a research in the Kisi district.

Thatch can be home grown. One acre of e.g. cotton grass can provide for a roof of 100 m². The life time of a thatched roof, if well maintained (and repaired) is in the order of 10 - 20 years. It has very good thermal characteristics but it is a combustible material. So far no treatment could be developed to reduce this.

5.5 Adobe walls with sisoal

The Undugu Society of Kenya has constructed some staffhouses with appropriate materials in Katangi (a small village). This was an application of
research results from the Department of Civil Engineering (UON) and others. The walls were made of unstabilized dried mud blocks (rammed earth) within the joints only sisal fibres. (Fig. 4) These fibres were taken up in a plaster layer on both sides of the wall. This construction has good earthquake resistant properties.

5.6 Research in collaboration with the Building Research Establishment (U.K.)

The Building Research Establishment (England) has developed a new block making machine (Brepak) which can manufacture stabilized blocks of a higher compressive strength than those made with the HRDU, on-site field trials were conducted. Results are promising: the surface of the blocks is smoother, blocks are more condensed. Also unstabilized blocks can be made and it is expected that these blocks will have a longer lifespan than blocks made with the cinvaram. A small clinic was built with the 'Brepak' blocks.

5.7 Low cost timber roof truss

Though Kenya has much timber (podo, cypress and cedar) timber as a building material did never become very popular, because of a number of reasons.

There is a limited knowledge about structural and other aspects of timber. There is also a lack of proper designs for timber constructions. Reason why the HRDU has developed and tested a low cost timber roof truss for a span of a roof of 6.4 m.

5.8 Other research

There is far more research which can be mentioned and which was carried out like:

- The behaviour of trench fill foundations
- Lime sludge mortar

5.8 Other research

There is far more research which can be mentioned and which was carried out like:

- The behaviour of trench fill foundations
- Lime sludge mortar

View of completed wall from the inner side before plastering.

- Case studies of three building projects: a research into the employment generation by building projects.

6. Conclusions

Finally I want to draw some conclusions:

To solve the housing problem is in my view a matter of at least a period of one generation, but also this University can contribute in solving this problem. Let me explain.

The Eindhoven University has given me special leave for more than three years. This has not only happened to me, but also to other members of this University. I have always found it a pity and waste of effort/money that experience obtained in developing countries could hardly be applied back in this University.

I believe that there is a reservoir of knowledge which can be channelled in an effective way e.g. by the set-up of a consultancy unit.
W. SCHIJNS

LOCAL ARCHITECTURE IN MALI, WEST-AFRICA

MOTIVATION OF THE PROJECT

THE RESEARCH PROJECT IS A RESULT OF THE COMMON CONCERN ABOUT THE DERIORATION OF THE TRADITIONAL ARCHITECTURE AND BUILDING TECHNOLOGY IN MALI. AS OBSERVED BY AFRICAN AND DUTCH SCIENTISTS, BUILDERS AND ALSO GOVERNMENTAL OFFICIALS. THIS COULD BE AN IMPORTANT CATALYST IN THE REEVALUATION AND REDEVELOPMENT OF THE INDIGENOUS BUILDING-TRADITION.

SEVERAL FORMS OF ENVIRONMENTAL RESEARCH HAVE ALREADY BEEN DONE BY DUTCH IN MALI. FOR EXAMPLE IN THE FIELD OF ARCHEOLOGY, SOCIOLOGY, GEOGRAPHY, AGRICULTURE, ANTHROPOLOGY AND BUILDING TECHNOLOGY. IN ADDITION THERE IS NEED FOR MORE RESEARCH ABOUT THE AUTHENTIC ARCHITECTURE AND VERNACULAR BUILDING.

DEFINING THE PROBLEM

WE CAN ESTABLISH THAT RECENT BUILDING IN AFRICA IS MOSTLY A PROJECTION OF WESTERN MODELS, WITH THE RESULT THAT THE AUTHENTIC BUILDING CULTURE IS CONSIDERED INFERIOR. THE REJECTION OF TRADITIONAL VALUES DESTROYS THE BALANCE AND PATTERNS OF BUILDING ORGANISATION AND CREATES DEPENDANCES, FOR EXAMPLE AS A RESULT OF THE NEED FOR FOREIGN BUILDING MATERIALS, SUCH AS CEMENT, STEEL, ROOF METALS OR OTHER IMPORTANT WESTERN BUILDING MATERIALS. ESPECIALLY IN RURAL AREAS THESE ARE MORE EXPENSIVE THAN TRADITIONAL MATERIALS BECAUSE THEY HAVE TO BE TRANSPORTED OVER LONG DISTANCES.

AIM TO THE RESEARCH

THE MAIN AIM OF THE RESEARCH IS TO PROVE THE FACT THAT THE LOCAL ARCHITECTURE AND BUILDING TECHNOLOGY OF MALI IS UNIQUE AND OF A HIGH QUALITY LEVEL. IT COULD BE THE RIGHT BASE FOR THE DEVELOPMENT OF AN APPROPRIATE ARCHITECTURE, WHICH STARTS FROM AFRICA'S OWN TRADITION. FROM THIS POINT OF DEPARTURE ONE CAN TRY TO FIND THE SOLUTION FOR MAINTENANCE AND BUILDING PERMANENCE.

RESEARCH SITUATIONS

TWO RESEARCH AREAS IN MALI HAVE BEEN CHOSEN: DOGONLAND, ALONG THE CANYON OF BANDIAGARA AND THE INNER-DELTA OF THE NIGER. IN BOTH SITUATIONS DUTCH SCIENTIFIC WORKERS HAVE BEEN OPERATING FOR MANY YEARS. THEY CAN TRANSMIT THEIR KNOWLEDGE AND EXPERIENCES. AS TO THE DOCONS, ESPECIALLY THE COHERENCE OF BUILT FORM, HOUSE FORM AND ARCHITECTURAL MEANING HAS AWAKENED OUR INTEREST AND HAS RESULTED IN TYPOLOGICAL STUDIES TO THEIR ARCHITECTURE. IN THE NIGER-DELTA WE FOCUS ON THE MONUMENTAL EARTHER ARCHITECTURE OF THE MEDIAEVAL TOWN DJENNÉ. ESPECIALLY ITS OLD MASON-GUILDS WHICH ARE STILL ACTIVE NOWADAYS, ARE OF HIGH INTEREST, BECAUSE THEY HAVE THE KNOWLEDGE AND GREAT SKILL IN MUD BUILDING. SO WE STARTED AN INTEGRAL STUDY OF DJENNÉ'S ARCHITECTURE WITH ANTHROPOLOGIST IMPLICATIONS, BECAUSE WE BELIEVE THAT THESE EXAMPLES ARE IMPORTANT HISTORICAL AND ARCHITECTURAL REPRESENTANTS OF THE BUILDING - CULTURE IN MALI AND WEST-AFRICA AS A WHOLE.

THE RELEVANCE TO THE DEVELOPMENT PROBLEM

IN MALI THE EXISTING BUILDING CULTURE IS NOW CHANGING QUICKLY OR RATHER DISAPPEARING. THIS RESEARCH CAN CONTRIBUTE TO THE COMPOSITION OF AN OVERALL CULTURAL DOCUMENT OF AFRICA WITH COULD SUPPORT THE DEVELOPMENT OF A NEW AFRICAN SELFCONSCIOUSNESS WITH MORE RESPECT FOR THE INDIGENOUS CULTURE. THIS WINTER WE MET SEVERAL YOUNG AFRICAN ARCHITECTS IN TOGO. THEY SHOWED AN INCREASED INTEREST FOR THEIR RURAL ARCHITECTURE AND HAD EVEN MADE PROMISING SURVEY-STUDIES IN THE VILLAGES. APPARENTLY SOMETHING IS CHANGING.
PARTICIPANTS


RESULTS

SO FAR THE PROJECT HAS RESULTED IN THE OBSERVATIONS WHICH WE SHOWED IN SEVERAL EXHIBITIONS, AND A PUBLICATION. ALSO A SMALL EXPERIMENT DURING OUR STAY IN DJENNÉ HAS TO BE MENTIONED. AFTER A REQUEST OF THE LOCAL DOCTOR, PLANS FOR A COUPLE OF SMALL ADOBE HOUSES FOR EPIDEMIC PATIENTS WERE DEVELOPED, TOGETHER WITH TWO YOUNG LOCAL MASONS. BECAUSE TIMBER WAS TOO EXPENSIVE WE PROPOSED VAULTS OF MUDBRICKS FOR THE ROOFS. AN OLD MEMBER OF THE MASON-GUILD WHO HAD EXPERIENCE WITH THESE CONSTRUCTIONS A LONG TIME AGO, TOLD US HOW TO DO IT. PREPARING THE PROJECT THIS WAY A WONDERFUL COMMUNICATION HAS GROWN AND THERE IS NO DOUBT THEY WILL BE UNDER CONSTRUCTION SOON.

THE FUTURE

MORE OFTEN THEN NOT THE ROLE OF THE ARCHITECT IS A DISTURBING FACTOR. HE PROMOTES THE WESTERN BUILDING MODEL AND REJECTS LOCAL TRADITION. WE SHOULD START EDUCATIONAL BUILDING PROJECTS IN RURAL AREAS IN WHICH EUROPEAN AS WELL AS AFRICAN STUDENTS COOPERATE WITH INDIGENOUS BUILDERS, OUT OF THIS COLLABORATION A NEW RESPECT FOR AND KNOWLEDGE ABOUT THE AUTHENTIC BUILDING SKILLS COULD GROW.

WOLF SCHIJNS
MAART 1982
CHIEF-HOUSE IN SANGHA - PAYS DOGON ("GINNA NA")

TOP VIEW OF THE CHIEF-HOUSE-COMPOUND IN SANGHA - PAYS DOGON
J. TURNER

NEW DIRECTIONS IN HOUSING

1.0 SUMMARY

1.1 This is a working paper to provide the common background to a series of current discussions and activities in the sphere of housing and local development. Three elements are discussed which are assumed to correspond with the non-spatial and non-temporal dimensions of all activities in society:

1) the use of basic resources, that is: land and space; work and time; techniques and energy. 2) demands for resources and the goods and services for which they are used, and 3) policy or the response of government to demands for housing goods and services and for the resources used.

1.2 It is argued that useful or operational statements of problems or barriers to the satisfaction of basic needs, such as sheltered habitat, must be in terms of resource use if government policies are to be effective. And, if stated in these terms so that housing is understood as a process and activity rather than a separate sector and commodity, it is evident that effective action by government depends on the support it can give to local initiative, rather than the quantity of dwellings it can supply.

1.3 The proper use of resources, it is observed, depends on institutional structures; above all, on decision-making and control systems. It is concluded that the greater the distances between decision-makers and resource users, the greater the risk of waste and misuse so that decisions must be made at the lowest feasible level.

1.4 It is pointed out that the devolution of responsibilities for resource use and locally specific social, economic and physical structures, or the forms of homes and neighbourhoods, depends on normative decisions and controls which guarantee access to resources and the freedom to use them in locally appropriate ways. Also that the necessary changes in policy demand more government action on the invisible structures of authority, law and the exchange system or finance, and less direct action through sponsorship or construction of housing projects.

1.5 The argument is supported by the already evident trend away from housing project programmes, especially in Third World contexts, to programmes providing disaggregated services. It is anticipated that this worldwide current of change will move toward an increasing emphasis on "resource programmes" through which government can most effectively enable and support local initiatives instead of the ineffective or increasingly costly attempts to intervene directly with the supply of centrally administered housing schemes.
2.0 Common Situations: Demands & Responses

2.1 Most people in rapidly growing cities of low-income countries have experienced an often dramatic deterioration of their housing conditions over the past decades. Many and most of the rapidly increasing number of new arrivals from the provinces and other regions have been forced to pay ever higher rents for inner-city accommodation; extreme overcrowding and the growth of shanty towns in and around city centres have been the inevitable result. At the same time, it has become increasingly difficult for most to resettle on unoccupied land to build their own homes, in their villages or towns of origin, or on the periphery of the city where they were born, or where immigrants may prefer or be obliged to remain. The once common and even general symbiosis of inner-city, low-rental and self-organized and self-managed homes and neighbourhoods or villages of permanent residence has broken down almost everywhere under the combined or separate pressures of rapid urban population growth, land speculation, policies on finance and standards affordable only by the minority of wealthier citizens.

2.2 This situation was and, perhaps, still is misunderstood by the great majority of those in authority and by their vocal and relatively well-off minority constituencies. In the first place, only parts of the whole are seen to be relevant. Low-income housing is seen as a separate phenomenon, even as a physical commodity, separately from the social and economic situations of the households, ignoring its social and economic realities. It is rarely seen in relation to other categories, even in the same city, let alone in towns and villages. Terms such as "eye-sores" betray the superficial perception of those who use them to describe the homes and neighbourhoods of the poor. The elites' own town-houses used to form the cores of almost all cities before that population moved out to the modern suburbs, leaving their subdivided properties for rent to lower-income people, if they were not turned over to commerce. It is not surprising that the wealthy resent the consequent deterioration of the city environment and the predominance of the rapidly increasing low-income majority. The understandable but uninformed reaction is to try to eradicate the physical symptoms.

2.3 As most politicians and planners were ignorant of this process, thinking only of the physical and visible structures and their material standards, their policies were counterproductive: on the one hand, political pressures forced governments to hold controllable rents down to increasingly unrealistic levels, accelerating physical deterioration and the growth of the poorest forms of inner city settlement; while, on the other hand, sporadic efforts were made to rehouse lower-income people in modern multi-family dwellings or in peri-urban single-family unit developments. When lower-income initiatives were taken, responding to effective demands for suburban resettlement in far more realistic ways, these were often violently discouraged by police action, though not always successfully.

2.4 In some Latin American countries, such as Peru and Colombia, these contradictions were particularly evident by the late 1950s. With two-thirds or more of all current urban growth being carried out by unauthorised developers and squatters, the idea of eradication and rehousing — or just eradication — had become absurdly unrealistic. The unavoidable facts were a great incentive to accept the then new idea that the immense collective energy and initiative of the mass of the people should be "mobilised" and "channeled" instead of being suppressed or, if unstoppable, ignored.
2.5 The increasingly numerous, vocal and voting general public, most of which has a great interest in rehousing themselves in the peri-urban settlements or in improving their conditions, once settled, encouraged the authorities to think along more constructive lines. Some of these then new lines of thinking were by well-known observers and even junior professionals working at field level in government departments. Mainly as a result of personal contact with the people supposedly served by the government agencies, a far better understanding of their economic and social situations and priorities were acquired — modifying the views formed on the basis of statistical analyses of physical conditions. In the early, rather simple views that were widely adopted during the 1960s, it was evidently necessary to harness the will and efforts of the mass of the people if any significant housing improvements were to take place in low-income contexts. Many politicians and professionals still long for the unattainable models such as those of Singapore and Hong Kong, but the majority, albeit reluctantly, have come to terms with the facts of contemporary urban life.

2.6 During the 1970s, the still over-simplified interpretations of these facts have led, nevertheless, to considerably more cost-effective government sponsored programmes, many co-funded with international agencies, most notably, the World Bank. The "service programmes" are now more generally acceptable than the "project programmes" of ready-to-occupy housing schemes. Service programmes provide building sites with varying levels of services, often complemented by projects installing services to up-grade existing settlements.

2.7 Although substantially more has been achieved with lower levels of per capita investment of public funds in the sites and services programmes, experience has not been at all even, nor are the prognoses reassuring. In many, perhaps most low-income households' experience of applying for plots in sites and services schemes, the rules and procedures, the costs or all together have led to turning the offer down or to selling the option to others who could afford it. In other, not uncommon cases, properly qualified applicants have been preempted by others even before the intended beneficiaries had the chance to take up or to sell their own rights. And, where the intended beneficiaries have been in the great majority, large sites and services schemes have tended to exacerbate the geographic segregation of social classes.

2.8 Experience of settlement upgrading programmes appears to have been more positive to date. Although great differences of cost and quality have been observed, both of the works carried out and of their maintenance, these programmes appear to have served a much higher proportion of the intended beneficiaries quite satisfactorily.

2.9 However, from some observations and similar experiences in other contexts, the prognosis for upgraded urban areas in mixed economies is disturbing: the often considerable increase of land and property values, following improvement, or even, legal recognition alone, threaten established communities. Low-income renters are squeezed out and low-income owner-occupiers tend to sell out in order to take advantage of the often considerable capital gains. Settlement upgrading under most current conditions could prove to be the prelude to an accelerated breakup of healthy mixed communities and local economies and the replacement by high-income residents or commerce. This may not matter if the former can reconstitute themselves elsewhere, but current urban development forms and policies tend to separate classes and activities into large, distant, homogenous and relatively sterile zones.
The change of perception and understanding needed for the institution of policies that can deal with these threats to real development and the reduction of poverty, is being stimulated by the increasingly evident limitations of these still quite new service programmes. Although sites and services and settlement upgrading programmes have achieved substantially more than the previous project programmes, their present scale and current rate of growth fall far short of need. The central question for the major funding agencies sponsoring service programmes is the same as that which confronted them when their housing budgets were invested in project programmes: "How can production keep up with the growth of demand, let alone catch up with the existing deficit?" A few years ago, senior officials responsible for service programmes thought they knew the answer. Now those who are well-informed with up-to-date experiences are not quite so sure.

3.0 Changing Perceptions and Understanding

3.1 Experience in all spheres has accelerated a deep change of perception and understanding of the elements of housing and any other activities: of demands of resources for their satisfaction, and of authority over demand and supply. In this section, I summarise my own understanding of these changes and, in the next and last section, I outline the policy implications.

3.2 As the foregoing overview suggests, the perception of housing demand is changing from a simplistic assumption that it is a matter of physical quality alone, to the understanding and acceptance of economic, social and institutional needs and priorities, as well as those for the wider, geographic aspects of location. It is coming to be widely, if not generally understood, that people suffer as much or even more from dislocation and insecurity or the non-transferability of tenure than they suffer from the physical discomforts of poor shelter.

3.3 The perception of resources and the means available for the satisfaction of demands has also been changing rapidly, especially since the publication of photographs of the planet Earth from outer space, and the consequent change of the global image from a geo-political chart to an ecological reality. This revolutionary image of our small and delicate space-ship Earth has shifted our focus onto the environmental limits to the waste of scarce resources, and their polluting effects, accelerated by the huge increase in oil prices. This inflation has also accentuated the escalating risks of increasingly unequal access to resources and essential goods. So it is becoming more and more widely understood that the problems of supply have more to do with the economy of resource use than with industrial productivity — that is, more to do with the amount of space, time and energy used in proportion to useful goods and services generated, and less to do with the quantity of products per man-hour or with financial returns on investment.

3.4 The improved understanding of needs, priorities and demands as functions of relationships between people and all aspects of their changing situations, together with the improved or renewed understanding of economy as a matter of basic resource use, are leading to a restatement of housing problems and tasks. The conventional definitions of housing problems in terms of numerical "deficits" statistically determined by officially designated material standards is increasingly suspect. Only where governments have exceptionally high per capita budgets can targets based on such calculations be reached, or even approached — a fact that is more and more widely recognised by populations no longer impressed by the few facades erected as a totally inadequate cover for the
ineffectiveness of government housing action. Even where a majority of those in need have been accommodated in mass-housing schemes, their viability is often if not generally being undermined by technical or social failures and consequent financial losses.

3.5 In order to be stated usefully and to indicate attainable targets, problems must be restated in terms which identify mismatches of supply and demand or, at least, which relate the investment of resources to the output of useful goods and services in space and time. Quantifiable indicators are necessary, of course, but where the conditions are functions of relationships between people and their built environment, these must be ratios or proportions between quantities -- they cannot be fixed quantities or scales, either logically or in practice. For example, anyone will have a real housing problem when accommodation costs more than one can afford to pay -- a lethal situation for those who cannot afford even to eat well enough to keep in good health.

3.6 Real stresses from which people so commonly suffer, but which are often overlooked, are more directly linked to dysfunctions and diseconomies of society and its environment as a whole, than those between physical conditions and appearances. When low-income people are barred from places where they can most easily earn a living and live cheaply, they are much more likely to become burdens on society, rather than contributing, tax-paying citizens. Similarly, when better-off households are barred from the secure tenure of land for improved homes and neighbourhoods, society will lose not only the benefit of their investments, but may also have to carry the unnecessary burden of the highly subsidised inner-city accommodation so many moderate and middle-income households acquire -- often at the expense of those who really need them.

3.7 Increased awareness of the relative nature of needs and the extreme variability of demands, together with an awareness of the necessity of basic resource economy, leads to a deeper understanding of the relationships between demands and the uses and abuses of resources. As one observes what land, skills and technologies are used by whom, how and with what results, it becomes clear that the still widespread assumptions of superior knowledge and authority by professionals working for or through large organisations, whether public or private, are generally exaggerated and often false.

3.8 In the field of housing, economies of scale in the use of basic resources are, by and large, the inverse of what has been so commonly assumed in the past. The larger, more decentralised and more distant the decision-makers from the actual users of resources on sites and in their own homes and neighbourhoods, the greater the expenditures and costs. The larger and more complex the organisation, the higher the proportion of higher to lower-paid employees; the greater the temptations to use capital-intensive technologies, often exacerbating balance-of-payments deficits; large organisations generally increase the centralisation of investment in the metropolis or principal cities, tend to accelerate migration to them through the sudden but short-lived waves of demand for unskilled labour and, by favouring a few large developments instead of many small ones, social stratification is increased still further. Added to these direct consequences of large-scale housing organisations and projects is the diversion, inhibiting or even perversion of resources which only small, local organisations or individuals can use: their own initiative, time, effort and skills; their own savings or other material resources such as small plots of land or improvable properties; and their own savings and will to invest. As one often-noted Argentinian squatter put it: "There is nothing worse than being prevented from doing what one is able and willing to do." The consequences of such frustrations are often converted into excessive demands on those who have usurped personal and local autonomy or, even, into vandalism or other forms of violence.
3.9 A deep change of perception of the roots of security and fulfilment, of real and peaceful development, is taking place. It is the essential complement to the changes of demand and policy which must take place if a sustainable way of life for all is to be established. Led or, at least, anticipated by the discoveries of modern physics, we are now re-discovering ancient wisdom translated into modern terms: that, in the final analysis, matter is energy; that reality lies in relationships and so what matters is not what things are or appear to be, but, rather, what they do for people and to their environment. This understanding leads to or is discovered through the realisation that well-being and growth to fulfilment depend on cooperation and mutual aid on the complementarities of differences of all kinds, professional, social, cultural or sexual -- and not on their rivalry or dominance.

4.0 Implications for Community Demands and Government Responses

4.1 Recent experience and renewed thought indicate major and complementary changes of housing demand and supply or, more narrowly, of government policy: in general and in all contexts, the proper use of resources in order to get more for less and so reverse the growing divides between rich and poor, require a strengthening of personal and local demands for access to resources, on the one hand, and on the other, the helping hand of government must enable and support local initiatives, by increasing access to locally scarce or constrained resources. This constitutes a reversal of the once dominant and rarely questioned belief in the viable necessity of an industrialised or, at least, a centralised mass-housing supply system administered by corporate organisations, whether public, private or both together.

4.2 As the overview of section 2 above reveals, this is not an abstract or utopian notion but based on experience and observation, easily explained. In the perspective adopted, there are no reasons to doubt the evidence that the tighter and more standardised the packaging of housing goods and services — of the elements of both the visible and invisible structures — the higher and more distant the levels of decision and control. Conversely, the higher the levels of decision and control, the greater the need for standardisation. However, the greater degree of standardisation, the greater the inhibition of personal and local resource investment: so the greater the consequent need to replace them with more costly ones; and the greater the need for controls to overcome stresses or resistances generated by the inevitable mismatches between a standardised supply and a variable demand. Therefore, if the intention is to make better use of resources and to get more for less, then decision-making powers over specific, local and personal resource use must be devolved to levels where persons, and the local organisations they control, can make locally appropriate decisions. This, in turn, demands the disaggregation of the separately or independently variable goods and services that make up or support particular dwellings and their surroundings. Hence the already observed sequence of changes from packaged "project programmes" to partially disaggregated "service programmes" and the anticipated move over the present threshold into "resource programmes".

4.3 If the most effective actions are those that can be taken on the independently variable components and elements of whole packages or assemblies, then there must be sufficient agreement on the nature of those handles, or levers, by which whole systems can be modified. This is not the place to present any schemes or models or definitions; all that is needed here are some examples to illustrate the point. The three "fields of action" briefly described below also illustrate essential differences between ways, means and ends — presumably distinctions common to all languages that are bound to be reflected in any whole set of terms identifying what can be done in any sphere or general activity.
4.4 The immediate ends of housing action, as distinct from the further ends of impacts on the context or larger environment that may be intended, are forms or structures, both visible, physical improvements and those that are only indirectly visible, such as forms of tenure, social relations or economic values. Changes of form will have impacts on the whole system, of course, and can have wider impacts on the context and future developments. The design of layouts and buildings (the architecture) can be changed to some extent without changing the other elements and components, such as the nature and organisation of work, or financing. But some forms will limit options for work, finance, both together or other elements, such as building materials and construction standards. Large, multi-unit blocks of flats, for example, will require large building firms with sufficient capital and managerial capabilities for handling the equipment and managing the many specialised sub-contractors required. Small or even medium-sized firms will be eliminated; self-employed and self-help builders will have little or no scope. Financing will be similarly limited to the larger organisations with sufficient capital, limiting, in turn, the range of borrowers or imposing demands for subsidies. Although sometimes exaggerated by deterministic theories, architectural design is a powerful lever for use in modifying any of the other component ways, means or immediate ends of the activity as a whole.

4.5 The forms or immediate ends of an activity are achieved through certain means, used in certain ways. The means actually and directly used are resources, in the strict sense: land and space, work and time and techniques and energy in actual practice. Work, or the exercise of skills in time, like architectural form, which also involves work, can be organised and skills exercised in different ways for the same ends or vice versa. But any particular kind and scale of organisation will have technical, economic or even social limits to its options. Small builders, independent artisans and self-helpers cannot cope with large buildings and it is uneconomic for large building organisations to build small structures individually. And work, like design, is common to all activities in the sphere of housing or habitat; the organisation and nature of planning and design can greatly affect what is designed. The forms of built environments when designed by architects who are directly responsible to the users may be very different from when they are employed by corporate organisations financing or sponsoring housing programmes for their own nominees.

4.6 Finance is in the third general category: although commonly called a "resource" it is not a means in the same sense as work and time, or techniques and energy, or land and space. Money is a means to get the means for building with, one does not actually build with money, or any other kind of exchange. All forms of exchange, monetary or non-monetary, are social inventions and institutions which control the ways in which the human and material means are used to produce or maintain the immediate ends of an activity. Like the other basic institutions of law (or rules in general, including unwritten law or custom) and authority (or government in the broad sense), finance is a more powerful instrument than any one resource and a much more powerful lever than any change of form or design can be. Institutional changes, because they are so powerful, are the most difficult to make. There are bound to be strong resistances from vested interest groups when any significant modification to the exchange system is proposed or attempted — hence the importance of tactical approaches through other, less "political" and provocative channels, such as building organisations or architectural design. For example, if increased autonomy is desired, whether of a national government from dependence on international finance and central banking systems, then the first steps may be to specify small structures that can be built by small firms, artisans or self-builders by stages — and this first step may have to be reinforced or guaranteed by ensuring the participation of the users or others in whose interest it is to invest in such forms.
4.7 This differentiation of ways, means and ends and the identification of the distinct fields of institutional action, of the planning, provision or management of resources, and the construction or improvement and management of built forms, implies a redivision of labour and the redefining of limits to different kinds and levels of authority. In the perspective of this paper, it is clear that the assembly of locally specific forms, the design, construction and management of the built environment, must be in local hands and of the users themselves to the greatest possible extent. It is not a proper sphere for corporate organisation, public or private; supra-local intervention in design and construction must be minimised and, wherever possible, limited to the provision of, or connection with infrastructures and services which cannot be installed or managed by local organisations. The proper role of government is the support of local initiative by ensuring access to resources and freedom to use them within the limits necessary to protect the environment and the freedom and well-being of others. As concluded at a recent seminar attended by a number of well-known professionals and senior representatives of major international agencies:

The focus is clearly shifting to the "informal" or community sector, in an attempt to put to work its inherent resources, to support rather than to dominate a housing process which already produces the majority of housing. It is an approach founded on policies of least intervention, operating simultaneously with those of maximum support; an approach which is interventionist rather than project oriented.

* From the prospectus for the forthcoming Seminar and Workshop on Frameworks for Implementation, an offering of the Professional Practice Program on Design and Housing in Developing Countries, Alternative Roles of Users and Institutions. A follow-up of the Seminar/Workshop on the latter theme organized by the Laboratory of Architecture and Planning, MIT, 77 Massachusetts Avenue, Cambridge MA 02139, USA, August 1982. (The next to be held at the same venue, August 1-5, 1983.)
Question to AMADE
"What kind of technology do you consider possible for transfer between developed and developing countries, speaking of hardware and software?"

AMADE
Many of us during these discussions have been talking of bad technology, but I think there is no such thing. It may be appropriate but it will not be bad necessarily. Concrete can be a good thing, the problem is how to choose with adequate knowledge. Building science can be taught, and it does not require people to be literate in order to learn it. If a developed country wishes to export knowledge, we have to ask "what sort of knowledge?" Every country has to work with its own available materials, and local technologies will even use some high technology products such as plastics and iron, and we are not saying they should not do so, but what are the consequences of such economic exchanges, and what can be done to find a reasonable balance?

I feel that many experts are acting towards developing countries with a certain romanticism. However we cannot reject the realities, nor the use of both local and imported technologies without knowing the consequences.

TURNER to AMADE
I question your statement that there is no such thing as bad technology although you are right in the way you say it. There is no such thing as "appropriate technology", for example, a gun may be appropriate to shoot you. I suggest there are three criteria that apply to any particular situation or event:
Firstly, the impact on positive relationships between persons, this I might call "autonomy". If people are enabled to be responsible for their own decisions, it is satisfactory, but if the opposite, in reducing their capacity to reach decisions for themselves, it is not satisfactory.
Secondly, it is only satisfactory if it minimises the use of energy for the job in hand. This also can apply to waste of space, in the use of land, for example, and also of the use of time.
Thirdly, and this is difficult to describe, as it is a matter of harmony. Is the result shocking for our five senses, is it excessively noisy or ugly.
In other words, are we wasting, misusing and abusing our material resources? These are the criteria in my opinion.

AMADE
Also, if a builder today uses wood for construction, this can cause an ecological catastrophe. It is necessary to change habits.

TURNER
Of course you cannot say a particular thing is good or bad, without seeing it in its context.

SCHEID
Is this really true? Where are the bad things coming from?

TURNER
That is the question of context. If the criteria are settled and the situation understood, it can be satisfactory.

GOFFIN
It depends on the understanding of the culture. If a new material is used in a certain context, it must be studied not only with the brain but also intuitively at different levels, as to what relation this new material will have with people and with the community. It requires a very deep understanding, and it is not sufficient just to start using it.

We have read about the High Dam in Egypt. It was supposed to be wonderful, but we all know what actually happened through some vital points not being studied at the right time.

KAPAN
A similar thing happened with the house I described to you last night. I got into trouble with the international press when a German paper inquired (the Germans were financing the Hydro-electric Scheme in Mali) into this question: "do we have to pay for large projects in developing countries or should we carry out a lot of small projects?" They showed pictures of the dam and also of my house; it gave me a lot of trouble because people were asking "What is intensive labour in development? What scale are we considering? What kind of technology are we using? What is appropriate?" Then we considered culture. What culture are we working in? Are we really trying to help? How can we bring the people of that particular region into a further stage of dev-
velopment? It is not a matter of revolution but of evolution, by trying to bring in something of a better life without disturbing the harmony of their ecology and culture, taking into account the climate and habitat. How do we solve these questions in terms of a rational north-south dialogue, and on what kind of technological basis?

GOFFIN
Are we western people willing to change our level of life? This is a radical process. We think we are clever because we try to think over a whole process. We approach the problem with our minds, but do not want to change our behaviour. This disturbs me. I shall give an example. My father had been a prisoner for five years in Germany, and afterwards he continued to work in a gun factory. I asked him why he did such a job after suffering during the war, and he answered that he did it in order to save his life. We are also doing something similar, we continue to make cars, guns, high technology. I am not advocating that we drop all this technology, but we must understand the meaning of our behaviour, of our civilization. We must have the courage to decide to reduce our material level. We must start with ourselves, otherwise we cannot influence others.

AMADE
I think we cannot change technological matters by saying they are bad; we must propose alternatives so that people can say "this is better".

TURNER
Let me respond. I think it is a question of what we are afraid of, our behaviour is dictated by a pattern of hopes and fears about what we see around us. This influences our attitude. I now see the kind of buildings that I designed not so very many years ago, which I thought indicated the progress of development, as the tomb of our civilization, of our culture. That to my mind is finished, it is collapsing. These are the feelings which frighten me because they are so threatening, and which are the signals that I get from the environment in which we live, giving me opinions differing very much from those of twenty five years ago.

What is it that is so attractive about what people are doing for example in Africa? Intuitively we know it is very beautiful and it could inspire us to do something positive. In talking about values, this is the way we experience them.

How do we react? We love our motor-car, but we wish to get rid of it. The comments made by Paul Goffin touched me very much, and we must be serious and receptive about this, even if it changes our behaviour patterns, however difficult that may be. We can sincerely try to do something about the people out there who are suffering as a consequence of the way in which we are living. So it is a challenge, if not a popular one.

Situations like that of Goffin's father still exist for example in places like Glasgow and Birmingham. People feel threatened by such things as the nuclear threat, but cannot do much about it.

MINKE
I have a question to put to those of you who have built already in developing countries, and I should like to start with a statement, for I do not agree totally with what has been said. For my part I found in several developing countries that the main problem is not that we have to study their culture, to understand the people, and not to bring in new materials and techniques that could destroy their social and cultural structure, but what I found was the opposite: when you arrive, they ask you to build in the western style with western technology. This means they want structures of concrete and steel. I found it impossible to try to convince them that their traditional technology is better for their needs. They laughed at me, thinking I am just one of those artistic western "drop-outs". I could not solve this problem, even on a small scale, and I never met anyone who could. I should like to hear from you, as to how you would handle that problem.

KAZAN
I spoke about population resettlement in Mali, and to try to answer your question, it was part of government policy that the resettlement should be done in local materials and traditional methods and I found it a good policy, yet at the same time the government was finding millions of dollars to build the new electricity plant. They wanted the people to take care of themselves but left it to the U.N. programme to deal with the logistics. After that programme I was afraid about what might happen. After the villages had been built, who was going to design, build and finance the other facilities needed for health, education and community services? The government hoped for some foreign financial aid for this. Usually the schools built in West Africa are of concrete blocks and corrugated iron roofs. So one of the first questions I then asked was "what kind of education do you want to give to these children", that is an important question. What sort of space do they need? It is not enough just to make six rooms in a row under a roof. So far as I know, nothing much has been done, except for a couple of schools built at Bienne in local materials. I hope I have influenced the thinking of people coming afterwards.

A second phase occurred when I went back to set up a centre for appropriate technology. In Mali, as also in most developing countries, the rural world looks to the city for its model, and the city looks to us. That is the problem. The U.N. had a proposal for building ten houses for experts in Bamako, and I suggested they should be built of earth so as to prove to the local people that there may be rich people also who can live in such houses, and who do not think earth is a material only for very poor people. The idea was also for the houses to be integrated into the existing community for social reasons. After talking with the U.N. staff, and also local people including those
working in government departments, I had a list of about twenty-five who wanted to live in this type of house. I was only there for four months to set up a project, which was to be taken over by the nationals. The national director who took over was very sensitive about the problem and his own culture and traditions, so it is hoped he could achieve a fusion between the knowledge he got from our education with the lifestyle existing in his own communities. This could be the beginning of a reversal of an earlier trend towards westernisation. When I travelled in the country, I met governors and also chiefs of the villages and others, many of whom wanted to use earth construction and who were aware of the very rich tradition. I was very impressed that the hierarchy were willing to look at this. Improved methods of building in earth were however needed, to free the people from some of the heavy labour. We must look at the results of laboratory and other research so as to achieve a longer life than five or ten years for an earth building. I saw there some huts that were said to be more than one hundred years old. This is where the study of technology is needed, as well as in aspects of the cultural background, so as to find out how to improve the quality of living.

From that stage, the administrators in the various regions asked why we always built only in the capital city, why not in the regions? So we changed the programme. When I left the government intended to experiment outside the city. This was possible because the political atmosphere was right in that country.

MENKE
Do you mean that it is more important to be a teacher than an architect?

KATAN
Very much so. To me, to be an architect is completely démodé. It is out of place, and this is why I am very sad to be one because I feel I am preaching to preachers. When I came here to this University I had hoped to talk to students; but how many are there now, perhaps two? This is terrible, because we could have had a much greater impact. I have been on the streets working for fifteen or twenty years, and now the only impact I could have is in talking to students so that they might do the same.

TURNER
I think we have to differentiate between two jobs that we are competent to do. Apart from designing buildings and finished products, let us say it is more difficult to do the other job, which, I think, is more important, and very relevant to what we are talking about. That is, to design the elements and procedures in the broader sense, so as to enable people to use their own skill and resources better than the architects can do. This is very challenging. In training an architect to work for example in Mali or Peru, it is necessary to analyse the independent and various components, and to make it possible for them to work it out through the use of materials and tools. This requires a deeper level of understanding than is normal, and a more direct and intimate knowledge of the situation.

I think that in general the design of dwellings is not one of the architect's problems, and never used to be. He used to design for the Kings and the Gods (kings and the banks) and governments; the large, the more complex, the monumental, these were the normal products of the architect. Building houses and localities was the problem of the local master-builder. This is a question of tradition. Given the fact that there are tremendous ruptures in tradition, as well as a total change in organization through population growth, movement, and so on, this demands attention, because new traditions and methods have to be introduced very quickly. The slow process of trial and error can no longer be depended upon. There will be many mistakes unless we inject into the situation the skills we possess; we can also develop those. It is very complex.

As I have said, there is a demand for the services of well-trained architects in typical third world countries, if a proper way can be found for using their skills. So long as they are only channelled (in the housing area) into making simple designs for repetitive projects, they are not only wasting their professional skills and talents, they are also imposing ideas on people who, given the right tools, would be capable of finding their own solutions.

MATTHEWS
As a practising architect I must admit that I feel slightly out of my depth in this discussion, because I disagree with so much that both Katan and Turner have said. As architects we have no right to abdicate; we have very much to contribute. However, I also agree with some points that have been made. Whoever is the designer, whether architect or master-builder or any other person, has an impact on the technology used. A building method has to be selected that will satisfy certain needs on different levels, including time; this applies whether high or low technology is used. If the needs are not satisfied, well, then the result will be bad. For example, the houses that were built in Mali for the Dam technicians were completely uninhabitable, and were an obvious misuse of technology. The U.N. programme in the Yemen had a project for the building of a U.N. village in earth blocks and traditional construction to house experts, but earth was not acceptable to the government in this case, who wanted it to be executed in cut stone, also a good local material, but more costly. This project designed by the U.N. expert Alain Bertaud was intended to prove that earth building could be acceptable. He had already built a house in earth and was living in it to demonstrate the point that this material could help to satisfy the enormous building need in the rapid expansion of Sana'a, the capital of the Yemen. The architect could have made a contribution.
if he had been allowed to. There are other problems. I should like to mention one of the Dutch financed projects in the Yemen, the provision of a Store for Seed Potatoes in a rural area. Alternative designs were worked out, one in local materials with thick walls, and the other prefabricated. The first would have been more economical in the amount of cooling required mechanically, as well as being an example which could easily be copied by the local people as a prototype. However the financing agency insisted on the prefabricated building, because they intended to reduce to a minimum the amount spent locally. The result is a high technology building that requires a greater energy consumption for air-conditioning than would have been needed with the structure in local materials, as well as being a less suitable prototype. This leads us to the fact that the architect certainly has a great role to play. Housing is not only houses; communities need many other types of buildings, and professional skill is essential in the design of these as well as in the design of lay-outs for houses if dreary results so often produced by public works departments are to be avoided. We have been shown beautiful examples of villages in Africa built in the traditional way, without architects, similarly there are the towns and villages in the Yemen created whilst there is or was a living tradition. The impact of higher technology has done much to break the link that existed in traditional work. Communities need all the skills available, from those that possess the required sensitivity, including good architects, if a new tradition is to be developed.

**TURNER**

I believe our profession has done a great deal of damage in invading those territories which are the domain of the local artisan and builder. Instead of contributing to the methods and the design process, we have simply taken over. For example in Algeria (I heard this at second-hand, from some Belgian friends) an extraordinary polarization has taken place in the building industry. As a result of a high degree of centralization, housing production has been highly industrialized. This has had disastrous results, with the imposition of miles and miles of standardised dwellings which are badly built and very unpopular, as well as having the side effect of destroying the intermediate skills of the building industry, which until then had very good building traditions.

**MATTHEWS**

This is a misuse of mass production, which first requires, in the process, a prototype which has to be made as perfect as possible before going into mass production. It looks as if they have not achieved that.

**TURNER**

No, they have not. What they are doing is bad, but they think they are doing well; it is really disastrous.

**MATTHEWS**

There need be nothing wrong with mass production. There were mass-produced houses in the 18th century, such as in some of the finest London squares. I do not agree with your comment that the design of dwellings is not one of the architect's problems. Small buildings are as important and significant as large ones. In addition the larger buildings have an effect on the smaller ones. As I said before, as architects, we must not abdicate, we must become more involved. We have to ensure that technology is used in the right way, and not just copy for its own sake. Minke said earlier that he had never met anyone who had solved the problem in convincing people that traditional technology is better for their needs. I was very fortunate in the Yemen in being in exactly that situation where they wanted to build in their traditional way. People have said to me, "how did you make the buildings in the Yemen?" The answer is that they "happened", much as buildings must have been built during the middle ages in Europe, where there were responsible craftsmen involved. In the Yemen, we introduced new ideas, but never lost sight of the local needs and possibilities. I hope that what I have shown you proves this.

**KAPLAN**

I want you to hear that I am one of those who abdicated; I want to disagree with both of you when you agree (laughter) and you say that monumental building is done by architects; you are contradicting yourselves in a way, I hope, because I came from a tradition of big design. I was trained in the Beaux Arts as a super designer. Then I went to the U.S.A. with a fellowship to M.I.T., and then I spent ten years when I was in the States becoming one of the greatest architects, getting all the top prizes, etc. I went to work with Louis Kahn, the big master, and was under his influence for two or three years. Then I began to question the relevance of what I had been taught in relation to the society I was living in. After some years of questioning, I decided to turn my back on conventional practice, and went to Harlem to work with different community groups for twelve years from 1963 to 1975, with blacks and Puerto Ricans. I tried to unlearn in the streets what I had learned in the schools, but I actually learned to be something else, which is, I hope, to be a new type of professional. I like the buildings that you (Matthews) have done, and I think that approach is good, and sensitive to culture and locality. There are very few architects like that, unfortunately! But I think that what disturbs me most is what has been the manner of thinking in the direction of developing tools for helping people to design themselves. And we speak about housing in the process of doing that, and I do not agree...I believe that also a police station, a community centre or anything like that is also part of the community, and should be controlled by the community, and if so, it should be designed by the community with proper guidance and expertise, so that they make the final decisions on how it is going to look. So far
as master plans for urban projects, or of the scale from a village up to a regional plan, are concerned, this has always been the domain of the technicians, because there are so many components, and it is thought that people need the computers and experts to solve those problems. I do not believe this. For example, in 1972-73 the Regional Plan Association initiated the idea of having the Regional Plan for New York, with a population of 18 million, done through a participatory system, for the 1976 Bicentennial Celebrations in the U.S.A. Some 3 million people participated, thanks to the media, the T.V., the radio and newspapers during a two or three year preparatory period, and a month of intensive questioning and participation with these 3 million. At least 1 million participated actively in answering questions and in putting forward ideas. I mention this just to show that a lot of big things can be done in common if there is a sense of community. And this, I feel, is the cause of our problem as architects.
"There is the origing of the housing problem? How did it appear? Mr. Sax, as a well - of bourgeois shouldn't know that this problem is a product of the bourgeois social formation... in which they herd workers into large cities. The herding takes place faster than the growth of new settlements for these workers. This system provides a mass of tenants even for the most filthy dwelling, in which each houseowner as a capitalist has not only the right..., but also the duty to unscrupulously extract the highest rent. In such a society the housing problem is not a hannerstance but a necessary institution which can be abolished with a fundamental change of the social order in which this problem occurs.

Bourgeois socialists are not willing to realise that the housing problems stems from the given circumstances. For them there is nothing left but to explain these problems cushioned in moral phrases, as a consequence of human malice or to say, to derive it from the original sin."

Friedrich Engels

One hundred years after Engels wrote these lines, a new society, which both he and K.Marx preached for, has become reality. Surprisingly, these fundamental problems which Engels stressed remain acute and unsolved even in the new social order.

How is this possible? With a bit of irony Mr. Pozenel stated: "that the housing policy is designed by those who are already provided with a dwelling and those that still lack a flat supposedly live under the same social circumstances as those who are well-of in this respect."

My line of free associations on this subject started when I saw a huge slogan hanging above the street saying: "Voje sanje le,jo stanovanje".

"Sty dreams - a beautiful flat."

It is a sheer coincidence that a word "stanovanje" begins with "stan" which is also a Slovene word denoting social class. Because of that "S" for shelter.

In the Yugoslav case, the new society created in 1945, inherited a very deficient housing fund, partly a consequence of destruction during the second World War (25% of all dwellings were demolished). Up to the early sixties financial funds for the construction of new dwellings predominently in social ownership. The construction of new dwellings could not keep pace with the rising needs of the society, though it did alleviate the acute problems that we faced immediately after the second World War. The mid sixties, an economic reform was promulgated which resulted in a decen­tralization of housing funds coupled with an increase in financial participation regardless of family income, family size and decision - making of the population involved.

This reorientation of the housing policy resulted in:

- an increasing share of private-owned dwellings
- a large discrimination between social classes (poor families could not afford to buy a flat)
- denial the size of household as a criterion for the size of the habitat

We tried to alleviate the extreme negative consequences of this policy by constructing so-called "solidarity" flats. These flats solved housing problems only for a tiny minority for those in need, situating them, at the outskirts of larger cities, not integrating them into the complex urban structure.

The western model of the market economy regarding the housing policy in the Yugoslav case resulted in a failure to meet basic human needs. Cosmetic modifications (solidarity) couldn't solve the acute needs for dwellings. On the other hand this orientation enabled building firms to realize high profits and manipulate financial funds. Certain institutions acquired monopoly rights on land use, pricing communal infrastructure.

Under this social surface a querilla warfare was going on. People were desperate and to solve their basic needs they started illegal actions or to say: "For illegally solving
the housing problems we can state that they are illegal physical manifestations of a constitutional right of the working people to a decent living i.e. habitat."

As an implicit admission of defeat the official policy towards uncontrolled or illegal habitats has been tolerant at their beginnings. Since our society which proclaims "self-management" - solving housing problems by means of uncontrolled settlements.

Uncontrolled or illegally constructed habitats are rising in the outskirts of large cities, along roads leading to industrial centres, in rural areas and villages it-self.

To grasp the dimension of this phenomena we can state that approximately 20% of habitats are uncontrolled ones. There are no precise national wide statistics.

What are the basic reasons for such a wide rise of uncontrolled settlements?

1. Housing development could not follow the dynamic growth of industrialization and urbanization.

2. Under prevailing conditions which were created by market economy people cannot afford to buy a flat or to build a legal individual house.

3. Because they built on land, which was not regulated by the state, they do not pay contributions for communal infrastructure. (Nevertheless approximately half of these habitats are connected to the communal infrastructure by various ingenious methods – neighbours solidarity).

4. 60% of illegal or uncontrolled settlements "grow" on agricultural land, which was inherited, given or bought, because of the same reason as was stated above. (Though we must state that this massive abuse of agricultural land is not specific only for illegal settlements).

5. If they built in uncontrolled way the time span (from 5–10 years) is suited to their financial abilities. (Traveling through Yugoslavia one invariably notices the incredible amount of housing construction going on. This is an optic illusion and nothing more).

6. Uncontrolled construction is possible in phases with rational use of materials (recycling).

7. They can move in before the habitat is completed. The completion of it and further intentions are done according to their financial abilities and needs.

8. The size and lay-out of dwelling is suited to their needs, aspiration and way of life.

9. The lack of financial abilities is substituted by physical participation (working in their free time with voluntary help of friends and relatives).

Bureaucratic and repressive attitude towards uncontrolled settlements could not stop its rise, because the uncontrolled habitats spring from basic social need and inability of the individuals to solve this problem by legal means.

Bureaucratic and repressive attitude towards uncontrolled settlements could not stop its rise, because the uncontrolled habitats spring from basic social need and inability of the individuals to solve this problem by legal means.

Facing the fact that we are not capable of solving the housing problem with the conventional highly organized housing policy leads us to a new evaluation of these movements. We could have to regard these movements as spring of:

a) positive human energy
b) selfinitiative
c) participation in the most broad sense and not like criminal deeds. If we shall introduce this new set of values, new to the objectively organized housing policy, we could reach our social aims. So to say the lack of financial funds can be compensate by positive human energy.

At the end I would like to state what I concluded as an architect looking at uncontrolled settlements which we can call "Architecture without Architects". Expecting that when people are not bound by any restrictions, their creative power would burst out. But unfortunately this is not the case. Where is the reason?

In quick social economic and political change we withdrew the past qualities (cultural inheritance, harmony with nature) without creating the new ones, or the link between them. This results in our habitat culture (as well) is evident in "Architecture without Architects" or in "Architecture with Architects".

So, my credo on this path is that we should think about:

a) evaluation of cultural inheritance according to new style of living
b) respect for individual way of life
c) how to involve people (selfinitiative, participation).
The largest part of human settlement in Egypt is uncontrolled by the government. That is (75%) of the houses in Cairo and almost all the houses in rural areas are built spontaneously by the people themselves. Many of these areas, especially the ones inside or near big cities, tend to become poor and densely populated slums, and are considered a problem. The present paper is not concerned with this type of settlement.

Indigenous architecture on the other hand presents many examples of how man can deal with his housing problem, without any external support and creates his own beautiful architecture. This architecture is in fact controlled. The control here comes from within the community through tradition, which is handed down from one generation to the next, bearing the imprint of the whole life style of the community, from daily customs to building methods. This tradition, which was created by the interaction of man with his religion, his society and his environment, is in fact the anonymous architect responsible for this beauty.

In Upper Egypt and in the Aswan region in particular, where the climate is hot and arid, the people have developed a traditional architecture which answers to all their needs. It is climatologically efficient as well as being very economical. Communication between Cairo and this region was poor for many years. Thus this tradition has been preserved and is still alive. It has not yet been significantly affected by modern technological influence.

Aboul Riche

The village of Aboul Riche, the subject of this paper, is situated directly north of Aswan and illustrates the spontaneous architecture of the people of this region. Nowadays, the agricultural land of the village, bounded by the Nile and the main road, is no longer sufficient to support the increasing population, at the same time the tourism boom in Aswan has provided favorable opportunities of employment in hotels and restaurants. Nevertheless the village has not lost the character of a rural community. Except for this external employment of the men, their traditional roles in the village have remained untouched. For example, the women's role has not changed, the house is her domain. Apart from

![Diagram of Aboul Riche](image-url)
cooking, she makes reed caroets and baskets and is responsible for the plastering of the house, as well as being able to build a new "mastaba" (built in seat). Her domestic routine includes keeping and raising goats, poultry and in some cases cows, as well as bread baking in the oven of the house.

The average width of the village is about 500 meters, but it extends for over 9 kilometers bordered on the west by the road and on the east by the hill. The orientation of houses and rooms in the entire village is towards the north. The village is built on a high rocky plateau, thus leaving the agricultural land to the west of the road, free of settlements.

The village extends partially onto the hill as the plateau is not wide enough. This intrusion into the wild nature is however done with a lot of tact. We perceive a natural harmony between village and hill. The villagers have manipulated the slopes in a natural manner. It seems as if they are not even concerned by the change in levels. On the other hand, the village continues the form of the hill side, which is itself accentuated by the parallel lines of vaults. Although the same materials and building techniques have been used in a nearby village "Soheil", the village has a totally different character.

This, in my opinion, is simply due to the fact that the hill against which the village is built is different. This characteristic harmony between the settlement and its local environment and the topography, is respected throughout the villages in this region.

Aboul Riche itself is divided into a series of "Nagaas". A "Nagaa" is a rural agglomeration of families concentrated socially around a mosque, which could be compared in this case with a neighbourhood in a modern urban setting. This study was made in two of the eight Nagaas of Aboul Riche. Nagaa "El-Khalassab", which is one of the oldest Nagaas of the village and a recent one, immediately to the south of the former, "El-Nagaa El-Gedid" which was started when the government gave the land to resettle the inhabitants of a nearby village "Baharif" after a flood in 1955.

The difference between these two "Nagaas" lays mainly in their streets. In the new Nagaa, the land was parcelled out to the people, therefore the streets, which are about 8 meters wide, are straight, long and perpendicular to the main road. In Nagaa "El-Khalassab" on the contrary, the streets are winding and rather narrow. Their width varies, the narrowest being about a meter. There are bent entrances, enclosures, and limited views of the sky, all features which reflect the inward life of intimacy and privacy of the Nagaa (Fig. 2). In most cases the entrances of the houses do not open directly on to the narrow parts, but each two or three entrances are gathered around a small space, provided with seats, forming an extension of the houses, thus creating a meeting point between neighbours. This is one of the features that strengthens social bonds in the village (Fig. 3).

Construction and building materials

Any man in the village can build his own house, with the help of his neighbours or friends. They are all acquainted with the process of building, except for roofing with vaults or domes. For their construction a special mason from the community is needed. They use all the materials available in their environment, thus reducing the building cost. The main material used is sun dried mud of the "ile. Essential for walls, roofs as well as in the decoration, the mud mixed with straw, is left to
"ferment" for a few days. The mixture, light and cohesive, is then ready for brick making or plastering. For the vaults, the bricks, which have special dimensions, have to contain more straw than usual for both greater lightness and strength. Without scaffolding or centering, the mason roughly outlines the parabolic form of the vault in mud on the end wall of the room, which is raised higher than the others. He then begins to lay the bricks one by one against this wall. After five or six courses, it forms an inclined parabolic arch leaning on to the end wall and supported by the two side walls. This arch is slowly extended until the whole room is covered. It is then plastered on both the inside and the outside. It is rare to find a house in the village without vaulted roofs, the people say, they are a natural air-conditioner. Mud brick domes are also used in many houses when the room to be covered is square. This technique of roofing is thousands of years old.

However, since the construction of the High Dam, mud now is in short supply, stone therefore has gradually replaced mud bricks as the principal material for constructing walls, using mud as mortar. The wall is raised up to a certain height, is then continued in mud bricks. This stone is dug from quarries in the adjoining hill and carried down on donkeys.

Another material used for roofing is palm tree trunks split into two or four. They are laid across the top of the wall about one meter apart and covered with palm leaves. The roof is then sometimes covered with a layer of plastic sheeting for protection against occasional rain, followed by a layer of mud for thermal insulation.

Aboul Riche is different from other villages, in that it uses special white plaster, which is one of its characteristics. The plaster covers ceilings, walls and also extends on to the floors. It is made out of clay, which only exists in caves on that hill, and is carried down in bags. Only the women are responsible for this plastering. This distinguishing white surface is achieved in three steps. After the building is completed, they first plaster the surface with the usual mud-straw mixture, which is used everywhere else in Egypt. This part of the operation could be done by women as well as men. The clay, after being left in water overnight, thus forming a thick liquid, is mixed for the second layer with animal dung and then spread by hand on to the plastered surface. It is left to dry until the application of the last layer. This final one is made exclusively of the white clay. It is renewed by the women almost weekly, very carefully and only by hand without the aid of tools. All sharp lines then tend to disappear, walls, ceilings and floors dissolve into one, creating a beautiful atmosphere, clean, smooth and peaceful, so difficult to describe.
The houses

The houses in Aboul Riche are very comfortable and suited to the life of their inhabitants. The simplicity of the plan is due to the fact that they were all conceived directly on site by the owner. Climate and social structure are automatically considered. In order to catch the prevailing northern wind, all rooms are oriented towards the north. Generally covered by a series of vaults, the rooms open on to the courtyard and have highly placed slits to the outside.

It is also for the sake of privacy in the family quarters, that there are no windows opened to the street, thus the only important elements of the facade are the decorated doorway and the "mastabas" (built-in seat) all along the walls (Fig. 5).

Each house in the village has its own character, although they have the same components and the same materials are used, we often notice this difference in the courtyard. It is the vital part of the house, private, secluded and reserved for the members of the family or their intimate friends. It is provided with mastabas all along the walls which makes it flexible for most activities; cooking, sitting and even sleeping in the hot summer nights.

Vegetables are also grown, and animals raised in the courtyard. The diversity of solutions is amazing. Some have two courtyards, the back one, with a separate entrance, is for the cattle, thus leaving the main one spacious and clean (Fig. 4). Whereas in another house, the courtyard could be shared with pigeons and chicken and is rather small and intimate (Fig. 8). In a peasant's house, who owns cows, goats and poultry, the same entrance is shared by all of them but the courtyard is divided into two sections. The inner one is clean and the floor is finished with white clay surrounded by the living area and bedrooms opening on to it. It is separated from the other section by a low brick wall about half a meter high. This section is reserved for the kitchen, the toilet and the cattle shed (Fig. 11).

The "Mandarah" (guestroom) is considered an important part of the house, as hospitality is a fundamental characteristic of these people. Directly accessible from the entrance hall, the "mandarah" is the only room that has windows open to the outside, nicely decorated with writing and pictures of actresses, it is usually roofed with a vault. In a large house the mandarah has a bedroom annexed to it, for overnight guests (Fig. 9).

The bedrooms are also covered with vaults, they have no windows, but have high slits for ventilation and the door is the only
Facade accentuated by the door.
source of light. The living room is just like a vaulted bedroom, however in some cases it has a high wall to wall opening above the door or is completely open on to the courtyard. In front of these rooms usually there is a flat roofed space known as "Kheima" which means tent, covered with palm leaves, more like a loggia with relatively high walls, above them the roof is raised about a meter higher by brick columns. This space is very cool in summer (Fig. 9,10). In some cases a second floor is added. It is done by filling on top of the vault in order to level it flat, thus creating a new space covered with a flat roof. (Fig. 11-13).

The forces that shaped the house are always changing as long as the family lives in it. Therefore the houses are subjected to continuous changes and modifications. For example a new space is created by covering part of the courtyard, or a living room which can turn into a bedroom. In general we always see people at work on their houses.
The whole village is like a living organism constantly growing and changing and as long as this change springs directly from the needs of the people and is directed by their inherited tradition, the outcome will certainly be beautiful.

Another example of this is the old mosque of "Nagaa El-Khalassab". In the last twenty years the mosque was subjected to a major modification. Its old courtyard was covered with a vault to increase the indoor space and at the same time two new courtyards were added. The first forming the entrance of the mosque and the other, very large at the back having at one end a new guestroom, a loggia and the ablutionary. Both before and after, the mosque remained a complete entity and retained its sacred atmosphere. (Fig. 14,15) and (Fig. 16,19).
The informal architecture, just like in folk music, the player, in interaction with his audience, can spontaneously change and improvise the piece he is playing, whereas the classical composer writes his music to the last note, thus only giving the orchestra a chance to play it as best as they can.

plans - sections - facades: Arch. R. El Dahan, Arch. T. Lazarides

The village of Abul Riche, vaults directed towards north.
In Colombia the housing situation is critical. The deficit has increased in the last few years due to factors such as land speculation, high urban migration and the increasing interest rates for construction loans, and in general, due to the incapacity of the state to cope with the housing shortage.

For low income groups, and even for middle income groups, access to housing is becoming steadily more remote. The informal ways of acquiring land, which are the only viable ones for low income groups, are coming to an end. Invasions are heavily repressed and the "barrios piratas" (illegal subdivisions) which up till now have been one of their alternatives to obtain land are being constrained by private developers who are taking control of minimum standard plots (unserviced or partially serviced) and incorporating them into the market.

The government has tried to deal with the problem through the I.C.T. (National Housing Agency) which has been implementing various types of programmes: mass housing, site and services, self-help and mutual aid, and projects, with few positive results. These programmes never reach their target group and the housing deficit is still on the increase.

Within this context and in different places throughout the country some independent organizations are emerging, organizations of settlers promoted by political groups, religious institutions or non governmental organizations which through collective efforts and the assistance of popular leaders, technicians and professionals are seeking for new solutions to their housing problem. Although some have achieved very positive results, the individual action of these groups does not provide the right housing solution to the low income population in our country. They must be understood as an alternative for organise communities willing to solve an intricate problem, their need for shelter, and through this, the start of a long and difficult struggle for social, political and economic participation in society.

The intention of the present study is to make a technical contribution to the "asociacion de destechados camilo torres" in Dosquebradas, Pereira, an organized community of almost 1500 families who have pooled their resources and efforts for the construction of their houses. This community is an example, of how low income groups, although facing big internal and external problems, can struggle for a betterment in their lives through the process of building their environment by mutual aid.

The "Association of the roofless" was founded by 22 families in 1978. After one year 190 more families joined in and with their own limited resources were able to buy a plot of 10,000 m2. "Firmes" a newly
formed opposition party got involved and through it several professionals who were willing to contribute with design or training. This was initiated by training community members on the administration and investment of their resources and further on in different production systems such as welding and carpentry and production of concrete elements and blocks as well as sundried bricks. For these purposes the community was organized in brigades and are now performing skilled and semi-skilled works under the supervision of trained craftsmen.

During that year and the next some houses were finished and handed over. More members joined, more land was bought and very efficient workshops for carpentry and welding were created. Also communal facilities such as roads, a bridge and a communal centre were built.

Thus, this process, which started around a common problem of a group of families, has become a very significant experience, followed up closely by other communities and institutions.

In fact, housing has passed from being the objective of every effort to be the means, the cohesive element, for the struggle of the community for its social and economic betterment as well as for political participation/activity.

At present the community has achieved some initial goals which can already be evaluated.
Analyzing this aspect of production one can identify five major points that might be changed or improved:

1. The planning:
The association is lacking of a general urbanistic plan. This hinders the design of a coherent program of operations and distribution of facilities as well as that of a layout which links the 3 stages of development.

2. Financing:
Community is using its own resources and it is not depending at all on financing agencies. Although this can be advantageous, the community should look for finance through private or public institutions - even if it implies high interest rates and individual loans - because it is clear that the slowness in the rhythm of production is mainly due to financial limitations.

I.C.T. has 15 year term loans at 162 interest rates with a 6 months grace period for repayment. This is the best possibility.

As individual ownership is not the main concern of community members and besides it could be a limiting factor for their participation in the collective process, internal mechanisms should be design in order to maintain the sense of communal property, even if loans will be given individually.

Families should be housed within the 6 months grace period so as to use the money they would spend in rents for the repayment of loans.

3. Decision making:
Although every decision is made through general assembly, community leaders and members of the technical team, are controlling the major decisions on what to implement, standards, etc.

This should be left to the families concerned. Also throughout the process of extension and improvement of the houses the technical team should remain as an advisory body, assisting the families or neighbour groups in their decisions.

4. The design:
In the first stage due to restrictions in the area of the plot (with respect to the 212 houses that were required) a very rigid and very dense scheme of row houses was planned. These were delivered to the families as a finished product. If evolutionary housing is designed, the technical team will take the decision on the type of layout which is more suitable, the technology to be used according to existing constraints, resources and needs ... Core units shall be designed on the one hand as supports for further extensions and on the other, a study of possibilities for extensions must be prepared in order to allow families to decide according to their own needs and expectations.

5. Labour organization and delivery system:
Building should be done entirely by mutual aid, organized by specialized brigades which work all together in the production of a small group of dwellings that are handed over by lottery to some members, after completion. This system has negative effects on members' motivation for work (before obtaining the house due to the long time and efforts required and when obtained most probably they might not be willing to work on other houses).

It can be suggested that labour should be organized differently in each stage of development using the existing brigades:

Actual condition:
Following the average pace of production (work and financial capacities) reached by the association in its first stage - April 1979 to December 1980 - the capacity of construction was two dwellings per month. Consequently, if the new production systems and the increase in the number of families (to 1,200) are taken into account, the capacity would be of about 12 dwellings per month. This implies that the last house will be handed over in approximately 8 to 10 years, which is too long a period even if the concern of the community is beyond building houses, because it is well-known that without palpable physical results the social dynamics will drop and the process will be jeopardized.
The following is an attempt to define a design methodology for an evolutionary housing approach as an alternative for the development of the third plot of the association.

**Study of lay-outs:**

For the lay-out a set of possible schemes are studied. In chart no.2 we can identify a range of lay-out alternatives which depend on the one hand on the pattern of grouping and the type of section with which the terrain is worked out and, on the other hand on the position of the rows of plots with respect to the slope and the plot shape and ratio.

**Group pattern:**

**L-linear:** the most obvious grouping for a sloping plot is the one following the contours. At first glance it implies less excavation and a better use of space.

**X-concentric:** Nevertheless, a concentric organization of space establishes better defined territorial boundaries.
a group of plots around a common area conform a clear unit.

For a mutual aid project (such as this one), where tasks and responsibilities must be established, there should be a hierarchy on spaces so as to also have a grading in responsibilities over space:
- public: responsibility of the city
- semi-public: responsibility of the community
- semi-private: responsibility of a group of neighbours
- private: responsibility of the family

Type of section:
Certain group patterns suggest the way in which slope must/can be worked out:

II: Leaving the terrain untouched. This implies a minimum cost in land works (leveling required only for walkways) Houses must be built over piles.
III: Leveling the ground/plot in terraces of one storey height, requiring retaining walls of the same height.

Plot position:
A. Row of plots parallel to the contours
B. Row of plots perpendicular (against) the contours
C. Combined position (parallel/perpendicular)

Types of plots:
Note: Plots will range from 50 to 90 m2.

1. Squarish plot: ratio 1:1
   usually allows 3 living spaces towards the front
2. Rectangular plot: ratio 1:1.5 - 1:2.5
   usually allows 2 living spaces plus one circulation to the front
3. Long-narrow plot: ratio 1:3 - 1:4
   usually allows 1 space plus 1 circulation towards the front

After a brief analysis, some alternatives were discarded. The study is limited to the 16 more relevant ones.

For examples:
- Section X8 was discarded since the alternatives were not suitable for the position of the cluster.
- Only one alternative of long-narrow plot (LB31 II) will be studies since when working with an inclined terrain, limitations for plot length are strict in order to avoid excessive excavation works.
The aim of the chart is to compare the implications of each alternative in terms of land use, densities and infrastructure.

One can assume that:

1. Land use: the more semi-private area and the less public area the better (Caminos-Goethert, Urbanization Primer)

2. Densities: the higher the density the better

3. Infrastructure: the less linear meter of pipes, channels and retaining walls the better.

Since there is no alternative with absolute advantage over the rest and the needs of the community - being a mutual aid project - can vary through time. It can be the case that by the time the project is going to be implemented, high density for example, will not be a main priority but a less dense scheme might be needed for the development of a new technology.

The shadowed columns in the chart are the alternatives which, due to their characteristics are worth being explained:

No. 2: Plots organized around clusters. Overlapping plots imply some problems in the design of the dwellings. It increases density having still a good plot area. One storey high retaining walls are required and among the "cluster" alternatives is the one needing less linear meters of infrastructure pipes.

No. 6: Does not have semi-private spaces and density is not very high but has no need of retaining walls. The works for terracing and leveling are minimal and infrastructure lines can be laid down very easily. It can be chosen provided the community develops a technology for piling, and density is not a main priority.

No. 7: This alternative has two possibilities of grouping plots:

7a: Plots are sharing in the rear an alley for infrastructure lines.

7b: Plots are longer for they are overlapping as in alternative 2.

Densities in this case are the highest but the investment in retaining walls and infrastructure lines is proportionally high.

No. 12: Density is high, plot areas relatively good and infrastructure provision relatively inexpensive but as the longer side of the plots is parallel to the contours the amount of linear meters of retaining walls is the highest.

Example:

The following is an example of how assistance in the selection of a design alternative can be given.

Layout alternative no. 2 was chosen and some assumptions were made in order to be able to develop and explain the way in which housing evolution can be foreseen and how an urban configuration would be at a further stage.

Assumptions:
- The municipality will connect infrastructure pipes in stages. In the meantime families will use provisional communal services (pit latrines, septic tanks...).
- Families will be housed in the core house and during a relatively long period will evolve and improve them depending on the organization reached by neighbours for a mutual aid effort.
- High density is not a priority. It is preferable to have large enough plots for the possibility of an income generating activity.
The core units are intended to guide the future growth. Nevertheless, this does not necessarily imply that extensions must follow them.

### AREA

- **Plot**: 66.00 m²
- **Core house**: 39.52 m²
- **Built area**: 25.29 m²
- **Open space**: 14.21 m²
- **Complete house**: 97.38 m²

**Core-Houses:**

The community will provide the families with the main structures (roads, walkways, retaining walls) and core units including one sleeping space, one cooking space and one space for toilet and bathroom installations which can be used in the meanwhile as a depot. Core house must point out the limits within which it can develop: minimum open area and maximum height. It must also support a rational growth according to the needs, resources and will of the family.

### URBAN SCHEME AT CORE STAGE

The community, through mutual aid and contracted labour will give the core houses to the families. Neighbour committees will be responsible of the clusters' semi-private spaces and of the installation of communal services. The shape of the urban environment will be the product of negotiations and agreements between the community and the authorities and between families with their neighbours.

### GROWTH POSSIBILITIES

The chart includes the possible variants in growth within the limits suggested by the support. Nevertheless, many other stages are still possible and within them also many variations in building standards and details. After neighbours have arrived at an agreement of technologies and materials to be used, a more detailed and specific study of growth possibilities can be made accordingly so as provide accurate assistance to the group of families.

In the chart, the thick line shows one growth alternative which will be studied in detail in order to test the potential of development in each stage.

1. Asymmetrical of internal spaces (kitchen, toilet, sleeping area) and external area (patio, corridor, stairs) and possibility of building for a further growth.
2. Volume of the core units as to be delivered to the families.
3. Terracing of the plots, infrastructure tunnels, and construction areas.
STAGE I

Building on the front an independent room (3.70 x 1.50) in level (0) with flat roof slab.

Paving of entrance (.90 x 2.70) its limit will establish a guideline for future growth.

These 2 stages are common for almost every alternative of growth, so, if there is an agreement amongst community members, the construction can be carried out by mutual aid, and, from here on, by family of neighbourhood effort.

STAGE 2

As the staircase is a main issue in the development of the dwelling, two criteria can be used:

1. Building the staircase as an independent construction volume to which spaces will be connected later.
2. Only the necessary piece of stair required at a given stage is built thus completed at the end of the process only. This implies partially uncovered circulations.
STAGE 3

New room towards the front of the plot (completion of the front)

STAGE 4

Front entrance can be closed. New room in the second floor.

STAGE 5

Building of the rest of the staircase and the terrace to new room in the front, 2nd floor. Circulation is uncovered.

STAGE 6

Building a new wet cell on top of the kitchen.

Conclusions:

Real conclusions can be made only by evaluating each step of the project as its implementation stage. In the meantime we can say that evolutionary housing by mutual aid is not an alternative to other forms of housing production for the low income population. It is the only alternative, since other possibilities are unaffordable; but it is dangerous to institutionalize this form of production as the solution for low income housing in our countries.

It is well-known that the problem goes deeper and the solutions lie in other spheres different to the purely technical ones.

But housing is a major concern of the low income groups and around it many grass-root movements, which must be supported, are arising, and thus the role of the technicians and the professionals becomes relevant so as to channelize the actions and resources of the communities. The attitude of professionals and especially that of the architects, must change: they should act as tool makers, enabling communities and individuals to make their own decisions about the solution of their housing problems.

This methodology is an example of how to produce such a tool as a starting point of a long term process.

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Stefano Anastassi stayed at the SfH from September 1981 to May 1982 and designed this project. It was financed for this period by a scholarship from the Dutch Ministry of Education.

Anastassi used the SfH concept of support structure and urban theme and our design method to make this project. Before leaving Holland and after being approved by the SfH he spent some time in the Netherlands doing a training trip at the Institute of Housing Studies (IEB) in Rotterdam, where he further developed this scheme for its technical design and execution. Anastassi is now back in Colombia to implement his scheme in the major project referred to at the beginning of this article.

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1978
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DBZ (Gütersloh) 3/1979

Baubeschreibung

Baukörper:
- Kuppel, deren Querschnitt einer umgekehrten Kettenlinie entspricht

Abmessungen:
- Hohe: 3,00 m; Durchmesser: 4,00 m;
bebaute Fläche: 13 m²

Konstruktion:
- ringförmig übereinander gestapelte
Schläuche aus unbeschichtetem Poly-
estergewebe (±20 cm, Gesamtlänge
220 m), die im unteren Bereich mit
Sand, im oberen Bereich mit Blahton gefüllt sind;
- kreisförmige Öffnung im Kuppelzenit,
die durch einen Druckring aus Stahl-
rohr stabilisiert und mit einem pilz-
förmigen, mit Schaumstoffabfall ge-
füllten Behälter aus PVS-beschich-
tetem Polyestergewebe abgedeckt ist;
- Eingang durch nach außen abgewink-
telte Schlauchenden, die ein paral-
elförmiges Tonnengewölbe entstehen
lassen

Materialaufwand:
- ca. 140 m² Polyestergewebe
- ca. 6 m³ Sand bzw. Blahton

Voruntersuchungen
Mit Hilfe von Modellen im Maßstab
1:10 wurden unterschiedliche Konstruktions-
formen für Gebäude aus sandgefüllten Schläuchen und unterschied-
lliche Schlauchanordnungen untersucht.

Herstellungsprozess
Mit Hilfe eines selbstgebauten Sand-
abfüllgerätes wurden die Schläuche aus Polyestergewebe mit Sand bzw.
Blahton prall gefüllt und dann ring-
förmig übereinandergelagert.

Bedingt durch die Form des Baukörpers, der im Schnitt die Form einer umge-
kehrten Kettenlinie aufweist, treten in der Wand ausschließlich Druckkräf-
te auf. Um diese statisch notwendige Form zu erzeugen, wurde das von der
Forschungsgruppe "Low-Cost-Bauen" entwickelte Gleichschalungsgerät verwendet,
das den jeweiligen Abstand der einzel-
en Schlauchlagen von der Baukörper-
achse angibt. Lediglich im oberen Be-
reich des Versuchbaus, in dem die
einzelnen Schlauchlagen relativ stark
noch innen auskragen, wurden während
der Montage zur interimsistischen Form-
stabilisierung Eisenstäbe eingeschlagen.

Mit dem Abfüllen der Schläuche waren
2-3 Arbeitskräfte 3 Tage lang beschäf-
tigt, die Montage erforderte 5-7 Ar-
beitskräfte und dauerte ca. 2 Tage.

Zum Ergebnis
Der Versuchsbau sollte lediglich de-
monstrieren, daß es sehr einfach ist,
mit textilverpacktem loserem Sand im
Selbstbau Gebäudehüllen zu errichten.
Um eine wetterdichte Außenhaut zu
erzeugen, können gebräuchliche An-
striche, Putze oder Folien- bzw.
Schindelabdeckungen angebracht werden.
Erdbebensichere Billig-Wohnbauten
Prototypen
Guatemala

San Lucas Toliman, Guatemala, 1978

Ausführung:
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Zielsetzung

Im Hochland von Guatemala sind Zement und Stahl unverhältnismäßig teuer und nicht in ausreichenden Mengen vorhanden. Sand und Lehm gibt es dagegen als natürliche Baustoffe im Über-

fluence. The recognition, that after the earthquake of February 1976 in Guatemala the traditional lime masonry techniques are more advantageous than expensive reinforced concrete constructions, led to the development of new, earthquake-resistant lime and sand techniques. The techniques described here are based on the investigations of the Research Laboratory of the prototype 1.

Prototyp 1 (Stampflehmhaus)

Baubeschreibung

Abmessungen:
- Außenmaße: 6,60 x 8,70 m
- bebaute Fläche: 42 m²
- Terrassen: 16 m²

Fundamente:
- bombusbewehrtes Natursteinfundament, konisch ausgebildet

Wandkonstruktion:
- bombusbewehrte Stampflehmwand

Dachkonstruktion:
- verzinktes Wellblech auf Holzentwirkskonstruktion, unabhängig von der Wand auf 6 tei lteingespannten Pfosten ruhend.

Als Fundament- und Sockelkonstruktion wurde für den Prototyp 1 Natursteinmauerwerk verwendet, wie es in der Gegend allgemein gebräuchlich ist. Um eine höhere Erdbebensicherheit zu gewährleisten, wurde diese Konstruktion jedoch konisch (noch unten breiter werdend) ausgebildet und mit einer Bombusbewehrung versehen. Der Fundamentstreifen ist je noch Baugrundfestigkeit 40-80 cm tief und im unteren Bereich 50 cm breit; er geht in einen 50 cm hohen Sockel oberhalb der Erdoberfläche über, der im oberen Bereich 30 cm breit ist.

In dieser Fundament- und Sockelkonstruktion verläuft im oberen Bereich ein horizontaler, etwa 8 cm dicker Bombus-Ringanker, der alle 80 cm mit vertikalen, gespreizten Bombuselementen verbunden ist. Der 50 cm hohe Sockel dient in erster Linie als Spritzschutz gegen das Regenwasser. Durch diese neuartige Bautechnik wurde ein erdbbensicheres Fundament ohne die sonst übliche Verwendung von Stahl und Beton geschaffen. 
Bambusarmiertes Stampflehm-Wandsystem

Als Wandsystem für den Prototyp 1 wurde das bereits am "Prototyp Kassel" getestete Stampflehm-Wandsystem aus gestempeltem, bambusbewehrtem Lehm verwendet. Der für dieses Projekt verarbeitete Lehm wurde auf der Baustelle unterhalb einer etwa 40 cm starken Humusschicht gefunden. Um die bei Lehmkonstruktionen üblichen und für die Erosionsfestigkeit nachteilige Schrumpfrißbildung zu vermeiden, wurde er mit Kiefernmeal versetzt. Da der vorhandene Lehm einen relativ geringen Tonanteil besitzt und überwiegend aus vulkanischem Bimssand besteht, wurde die Lehmmischung mit 5% Kalk angereichert, um die Wetterfestigkeit zu erhöhen (bei großem Tonanteil ist der Zusatz von Kalk nicht notwendig). Die Lebensdauer einer aus dieser Mischung erstellten Lehmwand kann wesentlich vergrößert werden, wenn folgende Regeln eingehalten werden:

1. Die Mischung muß mit einer minimalen Menge Wasser angesetzt werden; sie darf lediglich "verfeuchtet" sein.
2. Durch die Beimengung von Kiefernmeal läßt sich die Festigkeit wesentlich erhöhen.
3. Die Mischung muß mechanisch verdichtet werden (bei diesem Projekt wurde die Ausgangsmischung auf 60% verdichtet).


Prototype 2 (Stopelsackhaus)

Baubeschreibung

Abmessungen:
- Außenmaße: 7,65x7,65 m
- bebaute Fläche: 46 m²
- Terrassen: 16 m²

Fundamente:
- unbewehrtes Natursteinfundament

Wandkonstruktion:
- Baumwollwesbestücke, mit Bimsand und Bimsplatten gefüllt; durch vertikal Bambus- und Rundholzprofile gehalten; mit Kalk geschlemmt

Dachkonstruktion:
- verzinktes Wellblech auf Holzunterkonstruktion, unabhängig von der Wand auf 6 teillangespannten Pfosten ruhend

Wandsystem aus Bims- und bewehrtem Lehm

Die Idee, sondgefüllte Säcke als Baulemente zu verwenden, entstand aus der Erkenntnis, daß die Verwendung von Zement oder Kalk als Bindemittel für Sand relativ teuer ist. Aufgrund des in Kassel durchgeführten Untersuchungs über mögliche Sandsock-Bauweisen wurde eine für die Bedingungen in Guatemala veränderte Bauweise entwickelt:

Als Konstruktionselement für dieses System dient ein schluchtförmiger Sack aus Baumwollgewebe mit etwa 10 cm Durchmesser und Längen von 1,70 m bis 2,80 m. Diese Säcke wurden mit Bimsand und Bimsplatten gefüllt, übermäßig gestapelt und etwas zusammengepreßt, so daß sich der ursprünglich kreisförmige Querschnitt der Schlüche zu einem rechtwinkligen Querschnitt von 8 x 10 cm mit abgerundeten Ecken verformte. Diese Säcke wurden direkt auf einen 10 cm breiten und 80 bis 100 cm hohen Fundament- und Sockelstreifen aus Natursteinmauerwerk verlegt, nachdem sie vorher in Kalkmilch getaucht waren. Dieses Tauchverfahren gewährleistet, daß das Baumwollgewebe allseitig von Kalk umgeben ist und ein
Vertreten des Gewebes verhindert wird. Die übereinandergestapelten Säcke werden im Abstand von 45 cm beidseitig durch vertikale Bambusrohre gehalten, die miteinander durch Drahtschlaufen verbunden sind. Diese Bombustübe wurden unten am Fundament und oben an dem horizontalen Ringbalken befestigt. Alle 1,15 m bzw. am Ende eines Sackes wurden stärkere rundholz- oder Kehlholzprofile mit 6 bis 8 cm Durchmesser angebracht, die 30 bis 50 cm in den Boden eingerammten und eine zusätzliche Stabilisierung ergeben. Dieses Wandsystem hat eine ausreichende Flexibilität, um sich den unterschiedlichen Bewegungen eines Erdbebens anzupassen zu können. Das geschlossene Ringbalkensystem verhindert das Umfallen sowohl einzelner Wandteile als auch des gesamten Wandsystems. Nach der Fertigstellung der Wand wurden die äußeren und inneren Wandflächen mit einer Kalkschlämme zweiwöchentlich überstrichen, so daß der Regen nicht in den Innern der Säcke eindringen kann. Um ein "Ahnen" der Wand zu ermöglichen, wurde der Kalkschlämme Kochsalz und Alaus zugelegt (1 Sack Kalk, 4 kg Kochsalz, 2 kg Alaus, ca. 30 Liter Wasser).

Dachkonstruktion

Da das Dachsystem vom Wandsystem unabhängig ist, war es möglich, zuerst das Dach zu erstellen und dann im Regenschutz des Daches die Wandkonstruktion zu errichten.

Kostenvergleich
Die Materialkosten für den Prototyp 1 (Stampflehmwandsystem) betrug insgesamt 611,75 US Dollar (11,16 US Dollar je m² Grundfläche). In diesen Kosten sind Transparksosten in Höhe von etwa 100 Dollar enthalten, die bei einer anderen Lage des Bouplotzes und bei einer besseren Zugänglichkeit wesentlich niedriger gewesen wären. Die Materialkosten der Lehmmwand betragen nur 15,6%, die des Daches 30,5% und die des Fundaments 54,5% des Gesamt-Materialkosten.

Für den Prototyp 2 (Sandsackwandsystem) ergeben sich Materialkosten von insgesamt 630,75 US Dollar (11,40 US Dollar je m² Grundfläche). Die Materialkosten der Wand betrugen 32,1%, die des Daches 49,0% und die des Fundaments 8,6% der Gesamt-Materialkosten.

Erdbebensichere Billig-Wohnbauten

Prototyp Kassel

Forschungsabor für Experimentelles Bauern, Gesamthochschule Kassel
Kassel 1978/79

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Baubeschreibung

- Hauptbau:
  Außenmaße: 6,20 m x 5,00 m
  bebaute Fläche: 27,5 m²
  Terrasse: 3,5 m²
  Dach: 120° Neigung, ca. 46 m²

- Anbau:
  Außenmaße: 3,80 m x 3,30 m
  bebaute Fläche: 12,5 m²
  Dach: 120° Neigung, ca. 19 m²

Fundamente:
- Streifenfundamente aus Magerbeton bzw. aus gebrauchten Eisenbahnschwellen
- Wandausbildungen:
  - 2 verschiedene Lehmschichttechniken
  - 2 verschiedene Techniken mit textilem Verpackpamt losem Sand
- Dachausbildung:
  - Pfettendach aus Rundhölzern, 120° Neigung
  - Abdeckung mit PVC-beschriftetem Polyestergewebe und Grossoden

Wandkonstruktionsysteme

Zielsetzung


1. Stapelsockwand
Aufgrund der Erfahrungen aus dem Projekt "Sandsock-Kuppel" wurde im Frühjahr 1978 ein Stapelsockwand-Bauwitzentwicklung und an einem 8,40 m langen Teil des Versuchsbaus getestet. Die aus 0,50 m breiten Jutegewebsstreifen genannten, 2,60 m langen Schlauchschläuche wurden mit granulärem Schüttgut (Bimskies, Blättholz oder Sand) gefüllt und an den Enden verknopt. Die schlauchartigen, gefüllten Behälter wurden an den Enden jeweils U-förmig abgeknickt überlappend verlegt, so daß eine Breite von 1,20 m breite Wondelemente entstanden. Die Schläuche, die im verlegten Zustand eine Breite von etwa 22 cm und eine Höhe von etwa 12 cm aufweisen, wurden zum Schutz gegen Erdfeuchtigkeit und Spritzwasser auf einem 0,30 m hohen Sockel verlegt. Die Verbindung der Socke untereinander wird durch eingeschlagene, angespitzte Stabstäbe erreicht, deren obere Enden an den umlaufenden, flexiblen Ringonker befestigt sind. Eine zusätzliche Verfugung durch Mörtel ist möglich, jedoch bei richtiger Verlegung nicht notwendig. Zum Schutz gegen Feuchtigkeit und zum Schutz des Gewebes gegen Verrotten wurde die Wand mit einem Kalkmörtelstrich versehen.

2. Textile Schüttgutwand
3. Bambusarmierte Stampflehmmwand
Mit Hilfe einer neu entwickelten Kloppscholung wurden 0,80 m breite, geschübehöhe Tofelelemente stufenweise aus gestampftem Lehm errichtet. Die Stabilität der einzelnen Tofelelemente wird durch eine Bambusarmierung gewährleistet. Die Standsicherheit der Tofeln wird durch die Art der Profilierung (T-Element) sowie durch die Befestigung an den flexiblen Ringankern erreicht. Um eine ausreichende Wetterfestigkeit zu erzielen, wurde eine relativ fette Lehmmischung mit etwa 25% Tonanteil hergestellt. Um die Schrumpfrippbildung zu minimieren, wurde die Mischung erdfeucht, d.h. so trocken wie möglich, verarbeitet, mit Stroh versetzt, durch Stampfen mechanisch verdichtet und der Austrocknungsprozeß durch Abdeckfolien verzögert. Zwischen den Tofelelementen entstanden 2 cm breite vertikale Fugen, die nachträglich mit Lehm verfügt wurden und die als "Sollbruchstellen" für den Fall eines Erdbebens dienen. Die Wandoberfläche wies nach 18-monatiger Lebensdauer keine erkennbaren Erosionerscheinungen auf.

4. Monolithische Stampflehmmwand
Im April und Mai 1979 wurde eine einfache Lehmmischtechnik ausprobiert und an dem Anbau des Prototyps getestet. Hierbei wird eine erdfeuchte Lehmmischung in einer Scholung durch Stampfen mit einfachen Stampfern oder Holzloten verdichtet. Die Scholung besteht aus zwei parallel zueinander angeordneten Schalbrettern von 1,80 m Länge und 0,40 m Höhe. Die Lehmmischung wurde in der bereits erwähnten Lehmmischanlage aus 20% Ton und 80% Sand mit Schluffanteil hergestellt. Versuche ergaben, daß Kiefernnadeln eine bessere Stabilisierungswirkung ergeben als Strohhacksel. Dies liegt zum einen an dem besseren Oberflächenverband der beiden Materialien und zum anderen an einer geringeren Oberflächenverletzung durch Armierungspartikel, wodurch eine Veminderung der Erosion erreicht wird. Bei den 3,80 m langen Wandflächen entstand an den beiden Schalungsstoßen jeweils ein 1-3 cm breiter Schrumpfripp, der mehrfach ausgebessert werden mußte. Insgesamt betrug der lineare Schrumpf der Wandlänge ca. 1,5%, wobei jedoch nur etwa die Hälfte dieses Betrages als Rißbreite innerhalb der Wandfläche auftauchte; die übrige Längenverkürzung entstand am Rand bzw. an den Ecken der Wand. Untersuchungen ergaben, daß es sinnvoller am sinnvollsten ist, alle 1,20-1,50 m durch eine entsprechende Verjüngung der Wandstärke eine Schrumpfrippe einzuplanen. Diese wird dann vor dem völligen Austrocknen der Lehmmwand mit einer erdfeuchten Lehmmischung ausgeführt, die mit 5-10% Kalk und Kiefernnadeln veredelt ist.
Grassoden doch

Zur Konstruktion
Das grassodenbewachsene Dach (Grassoden) besteht aus einer Mittelplatte, zwei Fußplatten und einer auf Dachliegen befindlichen Balkenlage (Abstand ca. 0,70 m). Die Stützen sind sowohl im Erdreich durch Fundamente gehalten (teilweise in unterirdische Einsenkungen), als auch mit der Dachkonstruktion über jeweils 4 Kopfbänder angebunden, so daß eine Konstruktion entsteht, die durch ihre Flexibilität und durch ihre Unabhängigkeit vom Wandsystem eine besonders hohe Erdbebensicherheit aufweist. Alle Holzprofile bestehen aus unbehandeltem Rundholz Material. Anstelle einer üblichen Dachdeckung mit Holzschalung, Asbest- senmenttafeln oder Wellblechen wurde ein PVC-beschichtetes Polyestergewebe mit einem leichten Durchhang über die im Abstand von 0,60 m als Dachlatten verlegten, waagerechten Rundholzprofile gespannt. Auf dieser etwa 65 m² großen Dachfläche wurden 8-10 cm dicke Grassoden verlegt. Durch den Durchhang der Membran wird ein Abschluss der Grassoden vermieden und ein Wärmespeichereffekt erreicht.

Zum Ergebnis
Da das Dach tagsüber in der wärmeren Jahreszeit aufgrund der Photosynthese und der Wasserdampfentwicklung mehr Wärme verbraucht als es durch die Atmung erzeugt, bewirkt es einen Kühleffekt; nachts und im Winter dagegen erzeugt es Wärme aufgrund des Atmungsvorganges. Während an der Oberfläche von unbegrünten Dachern Temperaturunterschiede von 100°C auftreten können (im Sommer +80°C, im Winter -20°C), betragen diese bei begrünten nur maximal 30°C (im Sommer +25°C, im Winter -5°C). Durch die 10 cm dicke Erdschicht entsteht ein vorteilhafter Wärmespeichereffekt und eine relativ große Schalldämmwirkung von mehr als 40 dB. Da 1 m² eines ungeschnittenen Rasens (noch Olschowy) über 100 m² Blattoberfläche aufweist, wirken bei dem 65 m² großen Dach des Versuchshauses über 6.500 m² Blattoberfläche bei der Klimaregelung, der Luftreinigung und der Sauerstoffaufnahme. 25 m² Blattoberfläche erzeugen bei Sonnen- schen (nach Bernatzky) 27 g Sauерstoff je Stunde — etwa soviel wie ein Mensch zur gleichen Zeit verbraucht. Berücksichtigt man den Einfluß der Nacht- und der Winterperioden, so werden im Jahresdurchschnitt etwa 150 m² Blattoberfläche benötigt, um den Sauerstoffbedarf eines Menschen zu decken. Dennoch würde das 65 m² große Dach des Versuchshauses ausreichend Sauерstoff für etwa 45 Menschen erzeugen.

Dieses Dach weist gegenüber einem einfachen, konventionellen Dach wesentliche bauphysikalische, klimatologische und ökologische Vorteile auf und ist darüber hinaus - zumindest im Selbstbau - auch billiger.
Bauen mit Altreifen

Forschungs labor für Experimentelles Bauern, Gesamthochschule Kassel
Kassel 1979, 1980

Projektleitung:
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In Deutschland müssen Altreifen in der Regel auf Sonderdeponien gelagert werden; dem Reifenhändler oder Tankstellenwart kostet der Abrissprozess 0,40 bis 2,00 DM je Reifen.


Es wurden verschiedene Schindelsysteme aus Reifensteilen getestet (Abb.2-4), Abb.4 zeigt eine tonnenförmige, 35 m² große Dachfläche eines Versuchsbaus, die mit Schindeln aus Laufflächen abgedeckt wurde.

Bei dem im Juli 1980 erstellten 60 m² großen Versuchsbaus "Öko-Bau" (Abb.5) wurden Autoreifen als verlorene Schalung zur Herstellung der Fundamente, als Stiebellemente (Abb.5) und zur Stabilisierung der Grossoden in stellen Wandbereichen verwendet. Die Tragstruktur des Versuchsbaus besteht aus einer Gitterschale, die aus zwei Lagen sich kreuzender, 4-6 cm dicken Buchenstämmen hergestellt wurde (Abb.7). Die Buchenstämmen, die beim Ausforsten im Wald als "Abfall" anfielen, lassen sich im frischen Zustand relativ leicht in die gewünschte Form knüpfen. Zur Verbindung der Stämme wurden Scheiben aus Altreifen verwendet, die mit Schrauben angezogen wurden (Abb.6). Das Gittergerüst des Versuchsbaus wurde mit einem Hf-ver- schweißten, PVC-beschichteten Poly- estergewebe eingehüllt und mit Erd- und Grossoden abgedeckt. Die dicke der Erdschicht beträgt 15-20 cm, die Grossodenfläche 120 m². Um ein Ab- rutschen der Grossoden an den stellen Bereichen zu vermeiden, wurden Altreifen auf der Dachhaut festgesteckt. Diese dienen gleichzeitig als Wasserspeicher, so daß die Grossoden längere Trockenzeiten besser überstehen können.

Die Grossodenabdeckung dient als Schallschutz, zur Wärmedämmung und zur Wärmespeicherung. Sie weist bei heißem Wetter einen besonders vorteil- haften Kühlwirkung auf. Das Grosspolster erzeugt im ungeschützten Zustand bei einer Blattverdichtung von ca. 100 m² je m² Grundfläche im Jahr so viel Sauерstoff, wie 85 Menschen zum Atmen benötigen.
The intention is to consider options often used for appropriateness of technology and to describe some conditions which are necessary to make appropriate technology possible.

This will be done by discussing several projects executed in Upper Volta, Mali and Senegal.

The ONERA-project (Upper-Volta)

The Dutch government financed in Upper-Volta building activities for the ONERA project. The ONERA is a national service for cattle management.

Tasks of this service are:
- promotion of the production of cattle/meat;
- exportation of meat;
- improvement of hygienic slaughtering;
- a.s.o.

The building activities consisted of:
- the construction of the headquarters;
- the construction of market places;
- the extension of slaughter houses.

The task of our evaluation-mission: to examine the results of the Dutch intervention.

The headquarters of the ONERA

During the planning period the following criteria were determined for the construction of the headquarters:
- being a national organization the headquarters must be erected in the capital Ouagadougou;
- the construction must be modest and functional;
- 2 or 3 floors high;
- airconditioned only in the representative part of the building;
- protected from the sun;
- designed to allow cross-ventilation;
- designed to allow for extensions.

The design was executed by a local architect.

The result was:
- a very representative head-office with walls fully exposed to the sun;
- without cross ventilation;
- with overall air-conditioning.

Energy costs Dfl. 4.000,- each month.

Opinion concerning the results:
- the director of the ONERA is very happy with the headquarters because it has established the prestige of this service in the capital;
- other people ask themselves who will pay the energy bills of the headquarters: will it be the cattle owner or the meat consumer?

In quite some technological and economical senses this building seems not very adapted to the local conditions.

When you accept the representative function of this building it would have been possible to produce a climatically more appropriate design.

Conclusions: The local people were not very aware of the usefulness, did not see the importance of appropriateness for this building, in the sense we used it before. Is it a responsibility of financing agencies to promote appropriate technology?

Another part of the project consisted of the construction of market-places. A Dutch engineering firm consulted the local management of the ONERA. The financial responsibility was entirely in the hands of this management.

Studies about wishes and demands led to a high quality design of the marketplaces. One of the most important incidences was:
- executions only possible by one specialized steel contractor which led to high construction costs.

This type of contractor is in West-Africa normally a French firm or a firm working with French money.

Conclusion: Dutch tax-payers are supporting the French economy instead of the Voltaic economy.

Evaluation of the running costs of the marketplaces gave birth to an alternative, much more simple
Sheet 1

SOME OPTIONS FOR APPROPRIATE BUILDING TECHNOLOGY

- Make use of local materials
- Make use of local technology and local skill
- Introduce cheap and easy technology
- Imply labour intensive methods
- Promote energy saving methods
- Incorporate traditional patterns of building
- Response to the climate
- Response to existing ways of living
- Promote participation in planning and construction of the people
- Aim at self-reliance of the consumer.

Sheet 2

Inquiry about design- and execution elements for the project "les Écoles ruralisées"

<table>
<thead>
<tr>
<th>Element</th>
<th>Consumers</th>
<th>Ruralisation Committee</th>
<th>Financial Management</th>
<th>World Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>construction costs</td>
<td></td>
<td>XX</td>
<td>XX</td>
<td>X</td>
</tr>
<tr>
<td>maintenance costs</td>
<td>XX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>architectural conception</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>aesthetics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>architectural conception</td>
<td></td>
<td>XX</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>functional</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>climatic conception</td>
<td></td>
<td></td>
<td></td>
<td>XX</td>
</tr>
<tr>
<td>durability</td>
<td>XX</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>local materials</td>
<td></td>
<td>X</td>
<td>XX</td>
<td></td>
</tr>
<tr>
<td>locally adapted technology</td>
<td></td>
<td>XX</td>
<td>XX</td>
<td></td>
</tr>
<tr>
<td>execution</td>
<td>X</td>
<td>X</td>
<td>XX</td>
<td>X</td>
</tr>
</tbody>
</table>

136
design which also was executed. The construction, technologically less demanding, could be executed by small local contractors. The result is of moderate quality, but economically and socially more adapted.

One of the conclusions of the mission was, that the project-agreement between the Dutch government and the Voltaic government was too open-ended, to vague, so that there was very little pressure to respect cost-limits. This introduced the possibility for expensive unadapted constructions.

Cost limits can be a good means to promote appropriateness of building technology.

Centre de Formation Agricole NIONO (Mali)
Still working in MALI the Dutch government asked us to prepare the plans and the tendering procedure for the construction of this Centre Thinking about appropriate building methods in this particular case you could get inspiration in DJENNE, a little town 100 km from the building site, where mud technology is highly developed. And where the first efforts are made to improve durability by means of locally burnt bricks. Maybe even New Mexican solutions could be of use.

Moreover being in the centre of the rice-production in MALI rice-husk must be available (alternative cement).

Possibilities however are not sufficient.

This project is a training project.
Consumers, project management and financing agency do consider the buildings as a useful and necessary infrastructure which has to be erected with a minimum of trouble and experimentation. Starting the training-programs, that's the target.
This often occurs: building technology in these cases is of minor importance.

Conclusion: To promote appropriate building technology you have to be at the early start of a project to get it accepted, to get it integrated in a project.

The service in which the project is functioning is a very big organization dealing with rice production, irrigation, construction of infrastructural works. It has contractor-experience, based on modern western technology. There are good possibilities to construct with this service the considerable construction volume in a delay of 1 year by means of modern technology.

Under these conditions the possibilities for intervention are limited to designs, which respect the climatic conditions, saving as much as possible energy costs, and to choose economic solutions.

Conclusive remarks:
- This project could have been a very good opportunity to introduce appropriate building technology if starting conditions would have been more favorable;
- However, given the fact that modern materials are often wrongly applied it was considered useful to try to do it more adapted to the local conditions.

The project LES ECOLES RURALISEES (the rural schools) in South MALI

This project was financed by the Worldbank and was part of (5%) of the Second Educational Project executed by the Ministry of Education in MALI. Design, preparation of the tendering procedure and supervision of the execution of all construction-activities were in the hands of a, for this purpose, established design and construction section.

The rural school project was meant to introduce a reform of old French training methods in a more practical and less theoretical sense, so that this type of education could be of more use for the populations. Before starting the designs we made an inquiry about wishes, demands etc. of people concerned with the project. Consumers (directors of schools, parents), Committee for the Ruralisation of the Ministry, Financial management of the project and Supervisor of the Worldbank gave their opinion. (Sheet 2)

From the sheet can be deducted:
- that for the consumers the minimum of maintenance cost and a maximum of durability are of utmost importance (Money for maintenance is never available, decay of existing schoolfacilities is one of the tremendous problems).
- that the ruralisation committee searches to integrate school-life and village-life in accordance to the reform-intentions: architectural functionality, building technology correlated to indigenous architecture,
- that the financial management wants to be sure of the execution within the financial possibilities,
- that the Worldbank supervisor is very motivated to promote appropriate building construction. Moreover he brings our design and construction section in contact with the NIANING project and the Regional office of UNESCO in DAKAR (Senegal).

From the inquiry our design and construction section concluded:
Let we search for a solution, which uses as much as possible local materials, local skill, being climaticly sound, but be sure of
- the execution
- the durability.

Design-data collected by the Regional Office of Unesco could now be evaluated:
Sheet 3 shows the design recommendations according to the Mahoney climatic analysis, sheet 4 gives the inventarisation of the buil-
### SKETCH DESIGN RECOMMENDATIONS
FOR SIKASSO (acc. to MAHONEY)

<table>
<thead>
<tr>
<th>LAYOUT</th>
<th>orientation long axis east-west</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACING</td>
<td>open spacing for breeze penetration but protection from hot and cold wind</td>
</tr>
<tr>
<td>AIR MOVEMENT</td>
<td>single banked; permanent provision for air movement</td>
</tr>
<tr>
<td>OPENINGS</td>
<td>medium openings 20 - 40 %</td>
</tr>
<tr>
<td>WALLS</td>
<td>heavy external and internal walls</td>
</tr>
<tr>
<td>ROOFS</td>
<td>heavy roofs; over 8 hours' time lag</td>
</tr>
<tr>
<td>OUTDOOR SLEEPING</td>
<td>space for outdoor sleeping required</td>
</tr>
<tr>
<td>RAIN PROTECTION</td>
<td>protection from heavy rain needed</td>
</tr>
</tbody>
</table>

### BUILDING MATERIALS

<table>
<thead>
<tr>
<th>LOCAL</th>
<th>soil</th>
<th>lateritic stones</th>
<th>gravel</th>
<th>sand</th>
<th>grass</th>
<th>bamboo</th>
<th>wood</th>
<th>local binders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>often at great distance</td>
<td>often at great distance</td>
<td></td>
<td></td>
<td>very limited quantities</td>
<td>poor quality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LOCAL / IMPORTED</th>
<th>cement</th>
<th>lime</th>
<th>4/5 imported</th>
<th>very limited quantities</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>IMPORTED</th>
<th>construction steel</th>
<th>corrugated iron sheets</th>
<th>wood</th>
<th>etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VILLAGE CONSTRUCTION IN SOUTH MALI

Traditional construction

1) square dwelling with soil roof
2) circular dwelling with straw roof

Combination of 1) and 2)

Modern durable construction

square dwelling with sand-cement walls and corrugated iron sheet roof.
The final choice of the design introduced two experimental elements:
- the manufacture of cement stabilized soil blocks;
- arch masonry.

To get experience with these new technologies a pilot project was executed in the courtyard of the Ministry of Education in BAMAKO. The site-supervisors learnt with the consulting team from the errors which were made.

Conclusive remarks:
- Some appropriate, local construction methods could have been introduced if the consumers' wish for durability and minimum of maintenance wasn't accepted by the consulting section;
- Choices were influenced by risk-evaluation:
  - will the site-supervision be sufficient to introduce more than a certain number of experimental aspects?
  - will the skill of the workers on the site be sufficient to guarantee a reliable construction?
  - will the proposed solutions be durable enough?
- Choices were influenced by the fact that the consulting team had limited knowledge about appropriate building technology.
- The introduction of new building technologies asks lots of training and supervision.
- The construction costs were relatively low; This was largely due to the organisational structure of the execution: we were our own contractor.

The Agricultural Training Centre in NIANING (Senegal)

This centre is considered as a good example of a successful appropriate building design. The first ideas for the structural design were worked out by the Regional Office of the Unesco in Beyruth (BUSSAT 1973).
THE SUPPLY OF LAND FOR POPULAR SETTLEMENTS IN THIRD-WORLD CITIES

This paper surveys the mechanism of land supply for low-income house builders in developing countries and the emerging transformations which characterize the social articulation of the supply mechanism.

The concept of 'social articulation' refers to the practice through which prospective house builders get access to land in urban areas. In the text three terminologies will be used to describe forms of articulation: non-commercial, commercial and administrative.

The supply of land through non-commercial articulation refers to situations where those who build on it either do not pay for its ownership or use right or, if they do, the payment is a 'voluntary gift' according to social customs. In other words, land in a non-commercialized articulation of supply does not have a monetary transfer price; even if people are expected to pay something, it is in accordance with the 'worth' of the person and not the 'worth' of land.

The commercial articulation of land supply refers to the land market, now almost taken for granted in the analyses of land supply both in developed and developing countries, where land has a monetary transfer price. It is established by supply-demand equilibriums and access to building plots is regulated by paying capacity. An important character of commercial articulation is that owners can defend their property, for it is not land but landownership which commands a price.

The third form of articulation is administrative. This refers to the capacity of the state to acquire and dispose of land, change its form of tenure or regulate its use and development. While state intervention in developing countries rarely ignores commercial articulation either in the process of acquiring land or in allocating building plots (hence the distant location on fringe urban land of most of the sites-and services projects and plot charges for the beneficiaries), administrative power plays a dominant role for government participation in the management of urban land.

NON-COMMERCIALIZED ARTICULATION OF LAND SUPPLY

Customary land

The first wave of rapid urban growth in some developing countries occurred when large land areas within and around the cities were not in the hands of individual owners or commercial entrepreneurs. In many countries of Africa, and Papua New Guinea in South East Asia, tribes and ethnic communities retained their customary right to use and administer their traditional village land and allocate it according to prevailing social customs. This category of land is largely absent in Latin America. In most cases customary land could not be alienated or commercialized...
and access to building plots (or other uses) is restricted to members of the community, without payment. However, as more and more migrants arrive in the city searching for accommodation, customary land became a potential opportunity for popular settlement development. First, people belonging to the same tribe, ethnic or religious communities living in other villages and regions of the country could ask for temporary or permanent building plots on the basis of their distant affiliation with the urban community. Later casual friends from the city or tenants of the already established residents could also apply. Thus, access to customary land became more open to other poor families of the city although, at least in the first stages of growth, still controlled by the local tribal hierarchy.

Government land reserves
Colonial penetration into the traditional land tenure system in developing countries was largely achieved through the process of alienation of native land. The colonial powers bought, traded or conquered territories, which in turn passed to the 'guardianship' of the state. Later, part of it was sold or leased to the colonial settlers to facilitate the growth of plantation economies, crop production, city development and commerce, but a substantial portion remained in the domain of the state. The special character of this alienated land which, after independence has passed to the hands of the new government, is that it usually comprises vast tracts with no particular designation for use, is unimproved (jungles, savannas, desert), and often not even surveyed. The actual laws regulating the tenure and disposal of government land reserves vary from country to country, but the sheer size of these land holdings the lack of legitimate or obvious usefulness and the difficulty of policing meant that the transformation of those areas in an urban fringe into popular settlements could proceed in a fairly uniform way. Desert land in Egypt, Sudan, Morocco, Algiers, all land in Tanzania and Mozambique (which has been nationalized); non-cultivated land in Peru, Venezuela and Turkey; and the fringe desert land in Karachi are typical examples of nominal state control of land.

Abandoned properties
In some cities the non-commercialized articulation of land supply for popular settlements was facilitated either because property owners disappeared or the political situation was such that they could not resist squatting or, in the case of government land, the repressive/administrative apparatus of the state had collapsed. The war of independence, violent religious upheavals, revolutions and the establishment of the state apparatus by social groups having no political experience of exercising state power is the context within which popular settlements can evolve on abandoned properties.

Marginal land
In the last twenty years many popular settlements have grown, been bulldozed away, and grown again on land not suitable for housing. In fact, the image on squatters on river banks, marsh land, steep slopes, railway and road rights-of-way has dominated professional discussions about low-income housing, despite the fact that there has been a significant supply of other types of land for popular development, as discussed above. Settlements on marginal land may appear for two reasons, both as a by-product of the commercial articulation of urban land supply. First, when, in the city in general, there is no land supply articulated through the non-commercial and administrative access mechanisms, those who cannot pay for land at all (not even for the cheapest rents either) have no other option than to seek out parcels where nobody else wants to build. The city of Bogota in Colombia, Sao Paulo in Brazil, Manila in the Philippines and the Indonesian cities in general exhibit such a high degree of commercialization of the land market, thus restricting the supply of land for non-commercialized articulation to marginalized plots.

The second reason for the use of marginal plots for popular settlements is the significance of central area employment opportunities. Even when free or cheap land is available at the urban fringe, the cost of transportation and commuting may be prohibitively high for those urban poor who earn a living from casual employment. If for topographic or land use planning reasons, marginal land exists near the inner city, then becomes strategic locations for popular settlement development.

COMMERCIAL ARTICULATION OF LAND SUPPLY
The articulation of land supply through the market mechanism may take three forms: mini-plots, land rental and substandard subdivisions. In the first case people capitalize on their urban assets as a once-and-for-all transaction, often using the money to invest in their own houses or buy land in more secure settlements. The orientation of land owners in the land rental system is to generate a flow of income from property until the plot could be sold or developed for more profitable use. The case of substandard subdivision represents a consolidated business activity where vacant parcels of land are bought, assembled into larger estates and subdivided into uniform plots, usually without infrastructure.

Mini plots
The opportunistic fragmentation of land within existing popular settlements has been the principal mechanism for their densification and perhaps a major source of finance for the original settlers to improve their housing situation.
When the supply of vacant land for new popular settlements is restricted or only available at distant locations, the purchase of mini plots in existing settlements may be the only means available for newly-formed poor households to start construction. This market can be highly inflationary and sometimes speculative. Yet, in some way, it is merely a pathetic wheeling-dealing among the poor, conditioned by poverty. For those who sell parts of their plots to pay debts, improve their house or provide a wedding gift for their daughter must endure, as a consequence, greater crowding; and those who buy land in existing popular settlements purchase a degree of security of tenure which is associated with older settlements.

Even in its commercial articulation mini plot development has a considerable advantage for unorganized low-income house builders over the other two types of commercial provision of land. First, it is the poor who benefit by selling land. Second, there is a wide margin of negotiation between sellers and buyers as to the size of the plot, terms of payment and the price itself. Third, the numeral growth of the settlement by owner-builders enhances the neighbourhood's bargaining strength to maintain or improve their security of tenure and pressure for services. This outcome however, is not necessarily the only development trajectory of popular settlement growth articulated through the commercialization of mini plots. As densities increase and long-term tenure security remains uncertain, many owner-builders may turn their property into rented accommodation using the income from renters to establish new housing in more secure locations. The brutal environment of rented slums with thugs of rent collectors is a too familiar phenomenon in many cities of developing countries.

Land rental
If mini plot development represents the most elementary form of petty entrepreneurship of small land owners, the land rental system offers the possibility of illicit property development for large land owners who anticipate that their land holdings can ultimately be sold for urban uses yielding higher returns than popular housing. The economic rationale of the land rental system in Third World cities is similar to the use of downtown plots for parking in the American cities, they both yield a trickle of income during the transition phase for re-development.

The commercial articulation of land supply in the form of land rental for popular settlements is relatively rare in the Third World cities, for it is inherently a temporary phenomenon. In one sense I have already alluded to the temporary nature of the arrangement; popular settlements are likely to be evicted from rented land as soon as commercial opportunities arise for higher income-generating land uses. This, however, does not need to restrict the long term supply of rental land for low-income housing in other, less strategic locations. What is historically temporary is the social actor, the property owner, who is directly engaged in the urban development of this land holdings. With the emergence of property companies as dominant actors in the urban development scene, vacant land in the hands of inexperienced property owners is bought up as speculative investment.

Land rental, as a transitional form of urban use, is replaced either by illegal land subdivision or corporate housing development.

Substandard subdivision

Subdivision of land into regular, but unserviced plots for low-income home builders is a relatively new form of popular settlement development, though an increasing phenomenon in the fringe areas of Third World cities. The process is characterized by the following:

1. Lots are purchased from persons who have a conventional title.
2. Some "color of title" is given to the purchaser, often in the form of installment contract with a promise of recordable title at the end of the payment period.
3. The deviation of land has not been approved as subdivision by proper authorities.
4. Urban services required in conventional subdivisions are normally partially or completely lacking.
5. Housing is constructed by the purchasers without official building permit.

Commercial subdivision is rarely carried out by the original land owner, perhaps with the exception of of relatively small or exceptionally large property holdings. Rather, the system is dominated by an emerging commercial entrepreneur status of "property developers" who seek out parcels of vacant land, assemble it for suitable project sizes and parcel it.

Commercial land subdivision has become a major source of land supply for popular settlements in some Latin American cities starting from the 1960's; in the case of Mexico City, from the 1940's.

ADMINISTRATIVE ARTICULATION OF LAND SUPPLY

The participation of governments in the supply of land for popular settlements takes two forms: projects and rules. As the terminology indicates, administrative articulation in the form of projects implies a series of well defined schemes in the urban area which are released or sold to specific "target groups" for owner-built housing development. Rules, on the other hand represent administrative intervention in the urban land market, releasing for popular settlement development land which otherwise
would remain vacant or designated for under urban uses. The land ceiling act in India would fall into this category; and the acts of land nationalisation in Zambia, Tanzania, and Mozambique; and the law of urban land reform in Nicaragua. Legislation and decrees legalizing previously unauthorized land occupations by low-income house builders, such as the ones which in 1958 legalized gece-kondes in Turkey, or the series of decrees which provided legitimacy and government support in 1968 for the squatters in Lima, are also examples of such rules. Though rules are perhaps the most significant and sweeping form of administrative articulation of land supply for popular settlements, in this chapter only the project form will be discussed.

Projects

Governments have long accepted a degree of responsibility to house the urban poor. In the 1950's and 1960's it took the form of a meagre supply of "low cost houses". In the 1970's many governments began to develop projects projects which assumed the form of plots with various levels of urban infrastructure provision. They are called sites-and-services projects. The sites-and-services program is a technocratic response to the popular settlement development. It capitalizes on the ability of the plot allottee to construct the dwelling, aiming to reproduce the process of dwelling consolidation in other forms of popular settlements.

While it is difficult to name a developing country in 1982 which has not yet experimented with a sites-and-services type of project (under national or international sponsorship), it is practically impossible to find one where the administrative articulation of land supply in the form of sites-and-services projects represents alternative forms of popular settlement development. At best, they allow a small proportion of lower middle income groups to by-pass the market mechanism for building sites. At worst, they become massive rental housing.

Conclusions

The majority of people who came to the large cities in developing counties in the last two or three decades found or developed housing in in popular settlements. It was a historical epoch of non-commercialized or cheap commercial land supply. Its form and concrete articulation changed from city to city depending on colonial heritage, ruptures in state power and the extent of non-agricultural waste land around the cities. The evolutionary process of low income housing development was made possible and conditioned by a supply of land for which people did not have to pay or paid very little. This has been a temporary phenomenon in modern urbanization. The argument presented in this paper is that this era in many developing countries is drawing to an end. To more efficiently organized state gradually assumes control over the use and development of customary land, government land reserves and marginal locations, and it is ill equipped to articulate an administratively managed land supply system. The private corporate sector refines the commodity nature of land, benefiting as much by keeping it vacant as releasing it in trickles for urban uses that yield higher returns than popular settlements. In the process it renders the land rental system and the petty promoters of commercial subdivisions obsolete. And petty landlordism may cause existing popular settlements to degenerate into rented slums through mini-plot developments.

Thus the land supply system, which in the past absorbed a large number of low-income families, is breaking down. If we are to secure land for popular housing in the future, we must transcend existing articulations and their historical trajectories. I propose that we explore the possibilities of collective articulation. The concept of collective articulation is not merely a tenure form of collective ownership as neither were the other forms of articulations tenure concepts. Rather it is a reformulation of how low-income families can cope with and overcome the obstacles of exclusion from the emerging commercial and administrative land allocation practices. It is termed "collective" because it requires the organization of low-income families in pursuing housing action. The grouping of people offers new opportunities for resource generation, bargaining power, and support of professionals in dealing with the diminishing possibilities of obtaining land on an individual basis.

The collective articulation of land supply will not change only the mechanism through which land becomes available for popular settlements, but the concrete forms of popular settlement development as well. The individual self-help effort, constrained by the uncertainties of incomes, tenure and development potential of the settlement will be transcended by the planning and purposeful organization of housing resources based on the building and managerial capacities of resident families and the technical assistance of intermediate organizations. The notion of "popular settlement" will no longer be synonymous with the anarchic building activities of the marginalized urban poor, but will be resurrected as a term to be applied to residential areas where the values of local residential aspirations reflect the production and maintenance of building environments.
Social articulation of land supply for popular settlements

The concept of 'social articulation' refers to the process through which low-income house builders got access to land.

Non-commercial articulation
- Situations where housebuilders do not pay for ownership or use right or, if they do the payment, it is a voluntary gift determined by social customs.
- Customary land
  - Land holdings by tribal or religious organizations
  - Government land reserves
  - Abandoned properties
  - Marginal land

Commercial articulation
- Situations of established land markets where land has a monetary transfer price. Access to building plots is regulated by paying capacity.
- Mini plots
  - Irregular sale of small land holdings
  - Land rental
  - Substandard commercial subdivision
    - Illegal land development with purchased title
    - Projects
    - Administrative intervention in the land market (land ceiling acts, tenure legalization, etc.)

Administrative articulation
- Situation where government intervention permits legitimate access to land.
- Rules

Social articulation of land supply for popular settlements

A house built on a miniplot, in the largest popular settlement in Dar es-Salaam, Tanzania, 1970's. The family paid US $30 for an ill-defined plot of about 70 to 80 m², and has since spent around US $50 building a permanent foundation and, on this, a mud-and-pole house.

Madura. Substandard subdivision in Madura, India, 1981. Families buy small, in this particular case 30 m², plots, in subdivisions with minimal road and open space reservations. Prices in 1980 were about US $200 to US $300 per plot in the fringe areas where this was occurring. The developer provides no services, and does not pave roads. These the community will eventually arrange itself, often by persuading municipal agencies to make the necessary public investments.

Bangkok. Street scene in one of Bangkok's rental slums, 1980. The houses have been built by families on land they rent from a private landlord. Rent contracts may be written, but most commonly are verbal agreements for a six-month to three-year right of occupancy. Rent payments vary a great deal within the same neighbourhood, but, in places like the one shown here, typically ranged between US $5 to US $50 per month for a plot.
New York - center: 1. the Bronx - Bronx Frontier's Ranch - Banana Kelly
2. Brooklyn - Pratt Center
FUNDING

Frontier's Ranch and windmill have been supported by grants from the Community Services Administration, Department of Energy, National Center for Appropriate Technology and numerous private foundations.

LOCATION

The Ranch is located in the Hunts Point section of the South Bronx, on River Avenue at Barretto St. Frontier leases the 3½ acre waterfront site from the New York City Department of Sanitation.

tours and classes by appointment
THE RANCH MEANS BUSINESS

The Ranch is a commercial application of appropriate technology. The Ranch demonstrates a labor-intensive and ecologically sound approach to the planned redevelopment of the South Bronx by tapping locally abundant resources—waste, land and people. Drawing energy from New York City's first commercial windmill, the Ranch produces compost from leaves and vegetable wastes. Neighborhood groups use the compost to transform some of the South Bronx's 500 acres of decimated vacant lots into parks and gardens. The Ranch is a pioneering venture operated by Bronx Frontier, a nonprofit corporation committed to revitalizing the community.

WASTE TO SOIL

When leaves fall in a forest, they slowly decay, eventually becoming part of the soil. Composting makes use of the same natural decay process. On a typical day, the Ranch receives 50 tons of leaves and vegetable wastes. Using heavy equipment, trained Ranch hands move the waste into long piles called windrows. A machine called the Scarat straddles the windrows, chopping and aerating the waste regularly for six weeks. The finished product is screened and blended with dirt to make topsoil. Community greening groups use the free enriched topsoil to turn vacant lots into gardens, parks and recreation areas.

SCALING UP

The Ranch is scaling up to handle 200 tons of waste a day, or nearly 1% of the city's enormous and ever increasing waste stream. By using larger windrows, aerated by electrical blowers, the Ranch can compost through the winter and make an essential step towards becoming a self-sufficient business. More jobs will be created for local people as the Ranch expands.

BRONX FRONTIER'S RANCH

AEOLUS

The Ranch installed a windmill to meet increased electrical demand from the blowers and to demonstrate the viability of commercial wind energy in New York City. The 40 kilowatt machine, named Aeolus after the Greek god of the winds, towers 64 feet above the East River. Its four silver blades span 40 feet. The Ranch expects it to generate enough electricity to power the compost machinery and the needs of the Wind Center and office trailer. The windmill has batteries to store surplus electricity and is also wired into Con Edison's electrical system so that the Ranch can sell any surplus back to the utility. The Ranch plans to monitor the windmill's performance and lay the groundwork for businesses that want to interface wind machines with utilities in the future.

WIND CENTER

The Wind Center uses state of the art techniques in conservation and passive solar design to demonstrate efficient and economical energy use in buildings. The well insulated Center faces South and uses passive solar energy for heating and cooling. The Center houses the windmill's batteries, electrical equipment and monitoring devices and serves as a classroom for Frontier's 4E program. The 4E program — Energy, Ecology and Environmental Education — offers a text and slide show on Urban Environmental Issues and Alternatives for the general public and an Alternative Energy Action Primer for children K through 8.
LARGE SCALE COMPOSTING

Jack Flanagan, vice-president Bronx Frontiers

Purpose

This demonstration project transforms, by composting, organic wastes from the metropolitan area into a valuable product, compost or humus. The compost is being distributed in the South Bronx free of charge to community groups that are developing gardens, parks, and playgrounds. Later a portion of the compost will be marketed in order to sustain the operation.

Benefit

1. Reduces the landfill waste stream and produces a valuable product.
2. Provides jobs.
3. Provides an economically viable means of fostering urban land reclamation practices.
4. Demonstrates the feasibility of operating an integrated energy system consistent with federal guidelines.
5. Aids in developing a more stable, self-reliant community
6. Serves as an educational center to school groups and interested parties, demonstrating materials and energy conservation, and renewable, non-polluting energy sources (aerogenerator, solar-collector).
Banana Kelly Community
Improvement Association
916 Kelly Street #1A
Bronx, NY 10459
(212) 328-1064

Banana Kelly is a street in the South Bronx located between 163rd and Intervale Ave. It is called Banana Kelly because of it's shape, plus the oldest residents in the community have always known it as Banana Kelly.

In 1976 our block was being abandoned at an alarming rate. In 1977 around February a number of residents living on the block decided to try and do something about it. In looking at our block we saw the entire community in need of improvement from a number of levels. After three hard years of work trying to improve the community we can see a glimmer of light.

The garden comes out of need to gather people together for a common purpose. People love to see food grow. Some people like to work hard in the actual planting and harvesting of the garden.

What is unique about the Banana Kelly garden is that it is surrounded by abandoned buildings. Buildings under rehabilitation, bricks and rubble. Yet the garden thrives. It thrives because it reflects the community's will to live and survive and eventually deliver themselves out of what seems to be a hopeless situation.

Banana Kelly has started a food-cooperation and has plans for a greenhouse. The garden and greenhouse will provide fresh produce for the food-cooperation.
The growth of the neighbourhood housing movement in the last several years has led to increased local organizing around neighbourhood economic problems. Pratt Center has provided technical assistance for several commercial revitalization projects in neighbourhoods over the years; but the recent initiatives in a number of neighbourhoods have led the Center to look beyond commercial revitalization to make economic development a priority.

JENNINGS HALL

In 1975, the State of New York announced that the Jennings Hall Shelter for Boys was to be closed. A local neighbourhood organization, the Saint Nicholas Neighborhood Preservation and Housing Rehabilitation Corporation (St. Nick's) immediately began a study to devise an alternate use plan for this centrally located structure. They canvased local residents and held community meetings to determine the most urgent needs the property might serve.

The neighbourhood priority was senior-citizen housing. Pratt Center was asked to advise the group about the feasibility of such a project and to help in the negotiation process. In 1976, a coalition of neighbourhood organizations was formed to try to obtain HUD Section 202 funds for the building rehabilitation. Pratt Center developed preliminary architectural plans that combined renovation and new construction adding 89 units to the 54 units that will be housed in the existing structure. The Center assisted in the negotiations with architects and builders. Helping with research on environmental impact statements, zoning requirements, and corporation structure as well as architectural planning, the Center played an important part in the development of the proposal to HUD.
In 1976, negotiations with the City led to zoning changes that allow the needed construction yet protect other existing housing and small businesses on the block. In January 1979, after extensive negotiations with HUD, final approval of $6.7 million was received for the Jennings Hall Senior Citizens Housing Development Corporation. This is one of the largest 202 fund reservations in the United States. Construction is now underway; occupancy is expected in the spring of 1980.

Of particular significance in this project is the process by which building designs were developed. The staff of St. Nick's played a key role, encouraging community participation in the design process. Two of St. Nick's CETA employees developed detailed scale models for apartment design and furnishings. They presented their models to a design committee and at senior citizen centers. They facilitated dialogue between the designers and the potential tenants. While federal requirements forced some compromises, the design substantially reflects the community's input.
In 1969 an elderly Bedford-Stuyvesant woman learned that a forty foot high, 85-year-old magnolia tree, reportedly the only one of its kind north of Philadelphia was endangered by a planned housing development. Through protest and negotiation she and other supporters convinced the City to declare the magnolia a landmark and later to agree to preserve the brownstones behind it. Plans for an urban nature center for children were developed, requiring renovation of the buildings. Pratt Center became involved, assisting in the successful negotiations for a Community Development allocation of $150,000 in 1977. The Center prepared architectural designs, energy systems, and construction strategies, and helped to locate a construction manager. The Center will continue to provide oversight of the construction project, which began in June 1979 and is expected to be completed in spring 1980.
During the course of this conference we have considered many of the issues related to encouraging development in the context of recognized under-development. We have acknowledged the necessity of respecting the indigenous arts and materials while creating opportunities for the introduction of new building techniques. We have seen examples of failed attempts to impose unfamiliar, foreign materials or processes on traditional cultures. And we have grown in our admiration for the historically proven processes which often, in their simplicity, prove to be more durable and functionally superior.

Now I pose the question: How do we develop amidst over-development? Looking at the impoverished, subsistence economy of the inner-city Skid Row neighbourhood of Los Angeles, how do we precipitate construction of sturdy housing and full local employment? Many of the insights of the Climate-Habitat-Culture theme of this conference prove to be instructive.

My work for the past five years (until April 1981) has been a city-planner with the Los Angeles (L.A.) Community Redevelopment Agency. I had particular planning responsibility for the Skid Row area of the downtown as my skills include both physical planning and socio-economic expertise necessary to tackle the complex problems of the Skid Row Neighbourhood. The downtown area of Los Angeles was declared a redevelopment project in late 1976 by the L.A. City Council with the specific instructions to give first priority to solving the physical, social and economic deterioration of Skid Row. Only by solving Skid Row problems could we open the potential for the long-term revitalization of the entire downtown area.

Skid Row is the poorest section of Los Angeles and is also the generic name used for such neighbourhoods found in many large cities of the United States. It is the area, usually part of the commercial and business center, that houses the temporarily or part time unskilled labor force. It is characterized by "flop house" hotels, charity institutions which provide free meals, many liquor stores, and day labor offices which offer the opportunity of cash for a day's labor, no questions, no long term commitment. The neighbourhood is often assumed to include only transients, while research in Los Angeles and other Skid Row neighbourhoods reveals that a major proportion are permanent residents.

Who are the residents?

During the winter, there are as many as 10,000 residents in the Los Angeles Skid Row area. Approximately 30% of the population is alcohol dependent, a percentage consistent with research findings for other cities. The Skid Row drunk is the identifying neighbourhood image in the perception of the public. Actually, the area has a large proportion of elderly, physically and mentally disabled and veterans; perhaps 25% of the residents receive some social benefit payment.

The population of Skid Row is tra-
ditionally all-male over 50 years of age and, until recently predominantly white. Current economic and demographic changes have brought many more Spanish immigrant families, and younger black men into the neighbourhood. A sizeable percentage of the men work on a regular basis, though different days each week, or at intermittent intervals. Most Skid Row residents support themselves on a minimal income.

As the area is adjacent to the older business district of downtown Los Angeles, the fellows often walk to the other parts of the downtown to ask for handouts, sit in the parks, or gather throwaway food and merchandise from the downtown commercial areas. The true meaning of the City Council Skid Row mandate was a charge to mitigate the negative impact of these disreputable inhabitants on the rest of the downtown area without scattering them to vulnerable, adjacent neighbourhoods.

Development Indigenous Strengths

Climate-Habitat-Culture suggests the interconnectedness and mutual reinforcement of physical and social elements in a society. Dwelling types are not a simple product of available space and material, but also a reflection of traditional social dynamics and cultural patterns. Any aim toward change must come as part of this system. The situation of Skid Row provides an excellent example. Any attempt to upgrade the area which did not begin from a recognition of social and economic necessities of the neighbourhood and the long-established community patterns would only scatter the residents to other parts of the city while contributing little to the solution of existing problems. Furthermore, to simply hand out resources would repeat and reinforce the typical Skid Row experience with authority as the anonymous and unpredictable overseer.
Only by recognizing the existence of Skid Row as a community, by affirming the existence of the people living there and their way of survival could we aim toward benefit for this neighbourhood. The key to this effort was a community-based economic development corporation which would organize the collective strength of the community and provide the opportunities for individual growth. The Skid Row Development Corporation was the construct which would be the underpinning of the community will and provide the possibility of resident generated projects. Much of the existing activity in Skid Row was directed at solving immediate emergency situations with no facility for the residents to gather the resources to build something for themselves. We spent the entire year of 1978 working together in the community, devising the process for the selection of the Board of Directors for the Corporation, the by-laws, its responsibilities and the role in the community. In late 1979, after installation of the Board of Directors and official incorporation, an Executive Director was hired and an office secured in Skid Row on start-up funds from the Community Redevelopment Agency.

Once the corporation was in place, it began to take on the projects useful for the community. These projects are initiated and sheltered by the corporation in the beginning phases but will eventually be fully independent. Following are some of the currently operating projects initiated or managed by the corporation since its 1979 beginning.

**Community-based Economic Development**

1) A food buying cooperative for the alcohol recovery homes of the community makes quantity purchases of food staples at reduced prices, or acts as a receiving terminal for surplus foods or giveaway, mismarked canned goods. The Recovery Coop is now operating independently of the corporation, includes eleven members and is expanding its members and product line. Saving on food helps the recovery homes stay operational in a time of reduced funding.

2) The Corporation organized the Paper-back Recycling business on initial start-up funds from the Redevelopment Agency. The community based business employs Skid Row residents to collect recyclable wastepaper from down-town corporations.

Before the corporation was initiated, many Skid Row residents earned their living by collecting aluminum cans and other throwaway items for sale to recycling companies in the adjacent wholesaling neighbourhood. It seemed appropriate to channel this activity into a community based non-profit business which hires local residents and returns any profit to the community.

3) The corporation is owner and operator of a 34,000 sq. ft. warehouse being built with Redevelopment Agency funds as incubator space for new, community based businesses. The corporation, as the manager, will lease various sized industrial spaces to businesses interested in hiring and training Skid Row residents. The building will include the Catholic Workers Justice Bakery, started in the Catholic Workers’ free meal soup kitchen. The bakery will employ Skid Row residents to bake bread for sale in the down-town community.
4) The corporation has secured a grant for $1,600,000 from the U.S. Housing and Urban Development Department to purchase and convert a local industrial building into transitional housing for Skid Row residents. This transitional housing offers a place to stay for longer than the 3 day limit set on the emergency shelter, and will refer interested residents to conventional housing outside of Skid Row. This facility will provide some transitional housing for the growing number of women in Skid Row.

5) 17 apartment units scheduled to be moved from their original location were donated for use by the corporation. The owner of the units receives a tax reduction for a donation instead of the customary demolition, and the corporation secured vacant properties for the apartments' new location. These units will provide new homes for Skid Row residents able and interested in a self-sufficient lifestyle.

6) Neighbourhood legal services and a community services employee are part of the corporation's current activities. Legal counselling aids many residents with hotel manager problems, immigration or other police matters often part of Skid Row daily life. The community services person has aided the local residents in forming a voluntary part maintenance crew for the small neighbourhood park built as part of the Community Redevelopment Agency Skid Row project. Apparently, this crew has startled downtown business owners with their ability to maintain the park in such a problem area. This crew is, no doubt, the core beginning of a building maintenance business intended as a user of some space in the commercial light industrial building.

Community Participation in Design

In addition to the initiation of the corporation, the Community Redevelopment Agency saw the necessity of improving the housing and physical amenities of the neighbourhood. Again, the question of imposing strange or inappropriate value standards on the community was crucial. There was a disastrous lack of public amenity in the area: no legal places to sit out of doors, no parks, public benches, public toilet facilities or water, while the typical resident was living in a single hotel room of a total 150 square feet.

However, it was clear that we could not simply construct standard housing and parks in that neighbourhood and assume that they would be well-maintained and appropriate. For both the new housing and the community park, the architects and community cooperated in extensive work sessions using everything from actual room-size models to colored paper and parsley to facilitate the residents describing their ideas for the housing and parks. The housing is an innovative single-room occupancy project of 270 units in five separate buildings. The room sizes, room configuration (some rooms have shared living space between them), and the level of service were all determined in the group meetings. The design of the park, also a result of programming sessions, includes elements and design considerations unique to this community.
In conclusion, I would simply like to say that the guide to the approach of this development project was the recognition and understanding of the human being as an invaluable resource. The corporation for Skid Row was designed as a mechanism that could utilize the energy of that community. The housing and parks were designed by using the input and living patterns already established in that community. The human and physical resources of that neighbourhood are left to dissipate, all too often, because the individuals do not conform to the standard working schedule, or commonly accepted material values. Rather than applying standard or pre-fabricated resources to this situation, it was necessary and productive to create the opportunity for human initiative.

*New single room occupancy housing under construction in Skid Row. The room sizes and configuration were designed through the input of the Skid Row residents.*
A PARTICIPANT:
If you start to look for the roots of the housing problem, you will start reasoning up for it. You try to find a solution, through whatever program that comes out of themselves or one suggested by vocal community corporations. Hopefully these are managed by inside community kaders and not by outside people, who try to push and shove programs down to the community just to get a good conscious out of it. What is the part of the people? What kind of ethnical groups are there? What is causing this sheltering reflex? The living habits? The wishes of the people? That is the huge problem of all the ghettos in the USA.

How to solve this problem is difficult because the system works against a decent solution and I don't say that there are no people trying to solve these problems. There are hundreds of them. I would like to have seen that for instance in Sue Grinel's project; participation beyond the green park and in the planning of the housing; and they ask how they come together?
How many people can live together, how many single rooms? Are we being too much or too little? The interest here is: what kind of people are going to live there? What kind of form, what kind of culture? If they are black, white, puertorican, where do they come, how do they live? What are their habits/needs? Where do they come from?

What are their habits? And usually that has been overlooked because laws and regulations + getting building permits is so big hassle that they usually say: "Forget about it."
But that is all part of the fight: the same as you have to put up a fight for putting up a green area, there should be a fight for putting up houses that fit the needs of people and not just housing. But anyway it is better than nothing, than sleeping in the streets but then where do you start?

GRINEL:
Well, I like to answer this question. You have to know their lives, their interior lives, their experiences. There is no way we can do that and that is the bottom line fact of life. No one knows your own life better than you do.

So how do we close this gap of communication, civilisation, generation. Maybe we should just take our hands off and these people will survive their own nomadshions with natural infrastructuros.
Yet the world is getting smaller, we have to learn to share the resources of the world.
We have a perspective that they don't have, their choices are different than they were 2000 years ago. I think the crucial point is to take the responsibility for ourselves to know that we do may change anyway.

MAGGY BULTEN:
We saw on the exposé of Mr. R.EI Dahan concerning the rural settlement in Egypt that in these communities the human life has a very clear role and function. I think that nowadays the human doesn't have a clear function and what we can "help" disturbs the existing harmony in these regions.

EL Dahan:
According to my experiences in Italy and and Upper Volta, I could see that in these rural areas they take care of themselves. But when they come to live in the cities, they are helpless. Look at our western cities, in the slums alcohol and drugs are close: it is the only way out for them.

EL Dahan:
There is a fatal mistake in there. Everyone should be free to live where he wants. In Egypt there is a personal encounter between rich and poor, because they are neighbours. This system of social help works in Egypt. In western societies people of different social classes are living so far apart, that the rich can afford not to be involved, and not to help, because there is not such a personal encounter and daily direct confrontation.
Therefore it is logical that, to be able to "make things work out" as an urban town planner-architect, who is setting up urban and rural areas, you have to acknowledge this certain way of life.
SOME CONCLUSIONS

"Human beings not only discern geometric patterns in nature and create abstract spaces in the mind, they also try to embody their feelings, images and thoughts in tangible material. The result is sculptural and architectural space, and on a large scale, the planned city. People of different cultures differ in how they devise up their world, assign values to its parts and measure them. Man is the measure. The human body is the measure of direction, location and distance. In large measure culture dictates the forms, and range of our awareness." 

Yi-Fu Tuan.

"Some correlations can be found between certain aspects and at certain levels. We are to find which are these aspects and where are these levels."

Claude Levi-Strauss
Anthropologie Structurale.

...We live in space. Space is freedom and place security.
The inhabitants are to be considered experts in "habitat" matter. Each one having a sufficiently long experience of the way of life which is most suitable to him/her, to know what he/she wants.

In the execution of their dwellings and community buildings the rural people being still attached to the traditional local way of building (which is in general the most appropriate one for that particular region), definitely don't need any expert assistance.

There also are surroundings in a town which were never designed but are the result of a communal act. Because in these times people were not only taking their time to live but also to express their own collective poetry.

In urban areas the social structure in which men lives makes of him/her a specialist on only on narrow field, and the rest being under the responsibility of the "others".

A dwelling is an act. But today this act, instead of giving birth to harmonious surroundings, generates sterility and uniformity.
The inhabitant is abandoned by the architect who creates him/her as a anonymous client.

Since the architect, the engineer and the town planner under estimate the future inhabitant - user it is obvious that today more and more they will be underestimated.

There is a gap in the information an education until today in most universities, which has as an end product: the blind expert, which makes architecture/engineering students "executives" when in professional life.

By definition the architect, if he is well trained during his educational time, will represent the artistic personality, creativity and petry of his civilisation and people. Not everybody in society has this sense of conception because not everybody is trained for that.

Thus scientific solutions are not fit by themselves. They have to be combined with all available traditional, local functions in order to see the real adaptability of technology to our real needs.

The architect + engineer must give a new definition to the nature and range of his work, and the relationship between formgivers and users are to be settled again.

Design should be a problem solving tool:

"It is the dynamic integration in man's quest for truth, beauty, harmony and well being."

Robi Sularto Sastrawardojo.

The solution of such an important complex is directly related to the choice of a language in order to make an objective analysis of environment. The language has to be human, technically healthy and just one.

This language is the basis for the environmental research proposal to achieve the aim of arriving to a common design criterion.

This criterion will be the space language understandable and usable by all future inhabitants and users.

Finally, the human comfort has to be taken out of its functional considerations and released to form with the environment harmony to live-work and recreate.
PHOTOS

PARTICIPANTS + COCKTAIL

A. ABUT
TENTOONSTELLING
BOUWEN IN YEMEN
ARCHITECT RIBA
DEREK H MATTHEWS
KRUISPUNT THE
19MAA 9APR1982

PUBLICITY

AFFICHES
Nieuwe benadering van bouwers

Internationaal derde wereld-seminar aan THE

Van 31 maart tot en met 2 april organiseert de sectie AM (bouwtechniek en milieu-integratie) van de afdeling Bouwkunde een seminar onder het motto ‘Klimaat, habitat en cultuur’. Doel van dit seminar is te bezien in hoeverre verbetering van de woon- en leefomstandigheden in de derde wereld kunnen worden verbeterd. Dit seminar is onderdeel van een onderzoekproject binnen de afdeling Bouwkunde, met name de vakgroep Architectuur en Stedebouw. Op verschillende manieren (voordrachten, expositie, discussie) zal worden getoond hoe wordt ingespeeld op de behoeften aan bouwen en wonen binnen de derde wereld.

Van de redactie

Hoewel het seminar in eerste instantie is gericht op de derde wereld wordt ook aandacht besteed aan ‘bouwen dicht bij huis’. Volgens Albert Abut, een van de initiatiefnemers, moet de bouwkundig ingenieur waar hij ook bouwt uitgaan van de lokale situatie, door gebruik te maken van lokale materialen en historische, wat Abut noemt, bioklimatologische gegevens. Ook woonruimte voor de mensen te maken moet de architect-ingenieur, voordat hij aan een ontwerp begint, zich een groot aantal zaken realiseëren: het geografische milieu, cultuur en tradities, de wetgeving, transport- en communicatiesystemen, wetenschap en techniek en tenslotte economie.

Vanaf het begin van de jaren '70 is er binnen de bouwkundige ingenieurs en architecten een nieuwe stroming om door middel van een andere ideologie te komen tot een oplossing voor de groeiende huisvestings- en voorzieningenproblemen.

In het seminar wordt over dit alles uitvoerig gesproken. De sociopolitieke, culturele en biotechnologische aspecten van het bouwen werden aan de orde. Ook het milieubewustzijn, energieefficiëntie en bouwproductiemethoden in de derde wereld worden geanalyseerd. We zoeken als het ware een nieuwe benadering voor de huisvestingsproblemen in de derde wereld, uitgaande van een werkelijke uitwisseling van techniek en wetenschap tussen de derde wereld en de ge‘industrialiseerde’ landen, aldus Abut.

Het seminar wordt ondersteund door drie exposities:
- bouwen in Noord-Yemen, door Derek H. Matthews (op het Kruispunt, hoofdgebouw);
- humaan-economische en energetische aspecten van het bouwen, door Albert Abut (loopbrug hoofdgebouw-auditorium);
- projecten in de derde wereld van THE-medewerkers (eveneens in de loopbrug).


Expositie 'Bouwen in Noord Yemen'

Op het kruispunt in het hoofdgebouw staat momenteel de expositie 'Bouwen in Noord Yemen' van de Britse architect Derek Matthews. Deze tentoonstelling is een onderdeel van het internationale seminar over 'Klimaat, habitat en cultuur' dat door de afdeling Bouwkunde (vakgroep BAS), volgende week wordt georganiseerd in samenwerking met het bureau Ontwikkelings-samenwerking. Derek Matthews heeft jarenlang in Yemen gewerkt. De expositie bevat veel fotomateriaal waaruit zijn interesse voor de plaatselijke bouwcultuur blijkt. Van de expositie is een catalogus verkrijgbaar bij de TH-boekhandel.
The scientific and practical work of so many individuals and groups - researchers, designers, consultants, .. now came together in and for 'Climate Habitat Culture'.

In this international seminar with the speeches, slides shows, films, discussions, poster shows and three large exhibitions, we were able to collect a lot of ideas, thoughts and even feelings, many facts, designs, models, strategies and future rules and aids.

Here in this book we can see the concentrated power of so many positive attempts for the ways to build our habitats. I am once more greatly thankful to all participants and helpers who made it possible to produce this result, which brings the message from the international 'Climate Habitat Culture' further in space and time than Eindhoven 1982.

The final message is based, not in the last place, on the framework of fundamental and developing building research, which sooner or later leads to application.

The human(e) ecological and biological architectural completion in relation with our health (HEBAP research BAS 27), nowadays Integral bio-logical Architectural Completion, formed this framework and gave on the approach and intention to 'Climate Habitat Culture'.

Certainly also on behalf of the creative participants I may hope, that this report will be a step toward the future work of its bearers as well as an instrument for those, who influence the building activities and the creation of our habitats in the various parts of our world on large scale.

May the often directly and indirectly formulated and argumented message for the necessity to build in harmony with the human needs, the culture as well as the natural circumstances, the climate reach all the responsible planners and builders in such a way, that we can work more and more together on a world with more equilibrium, peace and unity.

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