TOWARDS A THIRD WORLD HOUSING APPROACH

CASE STUDY: LEBANON

by

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Cambridge, Massachusetts, October 1975

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PREFACE

The purpose of this study is to develop an approach to low-income housing in Third World countries.

The usual combination of quick urbanization (or high housing demand) and scarcity of resources and technology makes the supply of housing extremely difficult in Third World countries.

In these conditions, a housing system, in order to be significant, can not be defined a priori, based on static and often imported standards, but should be a dynamic concept which is defined directly from the characteristics of the considered region or country, at the time of consideration.

This study tries to develop a methodology to evaluate both the housing demand and all available resources of a Third World country, then deduce a "housing definition" appropriate to the needs of the country.

The study of the housing needs includes the evaluation of the gap between the demand and the market supply of dwellings (and the related facilities) and the observed priorities of the people who lack the housing facilities.

The study of the resources consists in the analysis of all aspects which relate to the problem of housing in the considered country. They include the following:

1. Financing (public: G.N.P. and housing budgets; and private: distribution of incomes and expenditures).
2. Technology (industrial equipment and knowhow, and structure of the supply market and communications networks).
3. Construction materials (local vs. imported).
4. Labour (skilled, unskilled and unemployed).
5. Land (location and cost, related to the housing needs).
6. Climatic conditions.

The model shows how to evaluate these variables and relate them to each other to design a realistic housing approach for the considered country, including financing, planning and construction proposals.

The financial proposals consist of general strategies to best use the available public and private (often untapped) resources. Cooperative systems are discussed which can organize and guarantee the lowest income groups to allow for more users' participation.

The planning proposals consist of optimized layouts and densities which minimize the overall utilities and construction costs while respecting the patterns of life and the participation of the considered people.

The construction proposals consist of a building system adapted to the defined resources of the country, including incremental and self-help alternatives to take care of the extreme cases.

The costs of the optimized alternatives are then estimated, and a parallel is drawn between the range of construction costs, the range of the available land costs, the range of income of the people needing the facilities and the government's housing budget to distribute consequently the required subsidies.

The methodology is fully illustrated by a detailed case study of Lebanon. A range of detailed alternatives is proposed. They illustrate the rationale and flexibility of the described model.

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October, 1975
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introduction

Most Third-World countries suffer from an extremely large gap between the demand of their people for basic vital facilities and the supply that their political-economical system is able to provide. Such vital needs are food, medical care, education and shelter.

Shelter, or housing, although less immediately vital than food, is nevertheless essential for short and long term survival. Yet an everyday increasing number of people in Third-World countries lack even the minimum of the vital housing facilities, due to the quickly increasing global housing demand and the relative decreasing housing supply.

high demand

The high demand is the result of two major factors:

- natural high demographic growth
- urban migrations.

1. The natural high demographic growth seems to be a characteristic of all people of all countries and civilizations below certain income and education levels. Some estimate the economic threshold at 800 actual U.S. dollars per year. Educational thresholds are much more difficult to define precisely.

2. More important to the problem seems to be the internal migrations from rural to urban areas within a region or a country. As a result, in the less developed Third-World nations, the rate of increase of the urban population is around 4.5% yearly, while it is only 1.3% yearly for the rural populations of the same nations.

Many complex reasons lead to the rural exodus, and especially*:

1. The priority given to industry over agriculture.
2. The mechanization of agriculture.
3. The progress of non-agriculture activities.
4. The natural demographic acceleration (due to better health care and services).
5. A desire for freedom (from the usually more traditional rural areas).
6. The quality of public services in the city such as health, education, etc.
7. The availability of more opportunities leading to social and economical upward mobility.

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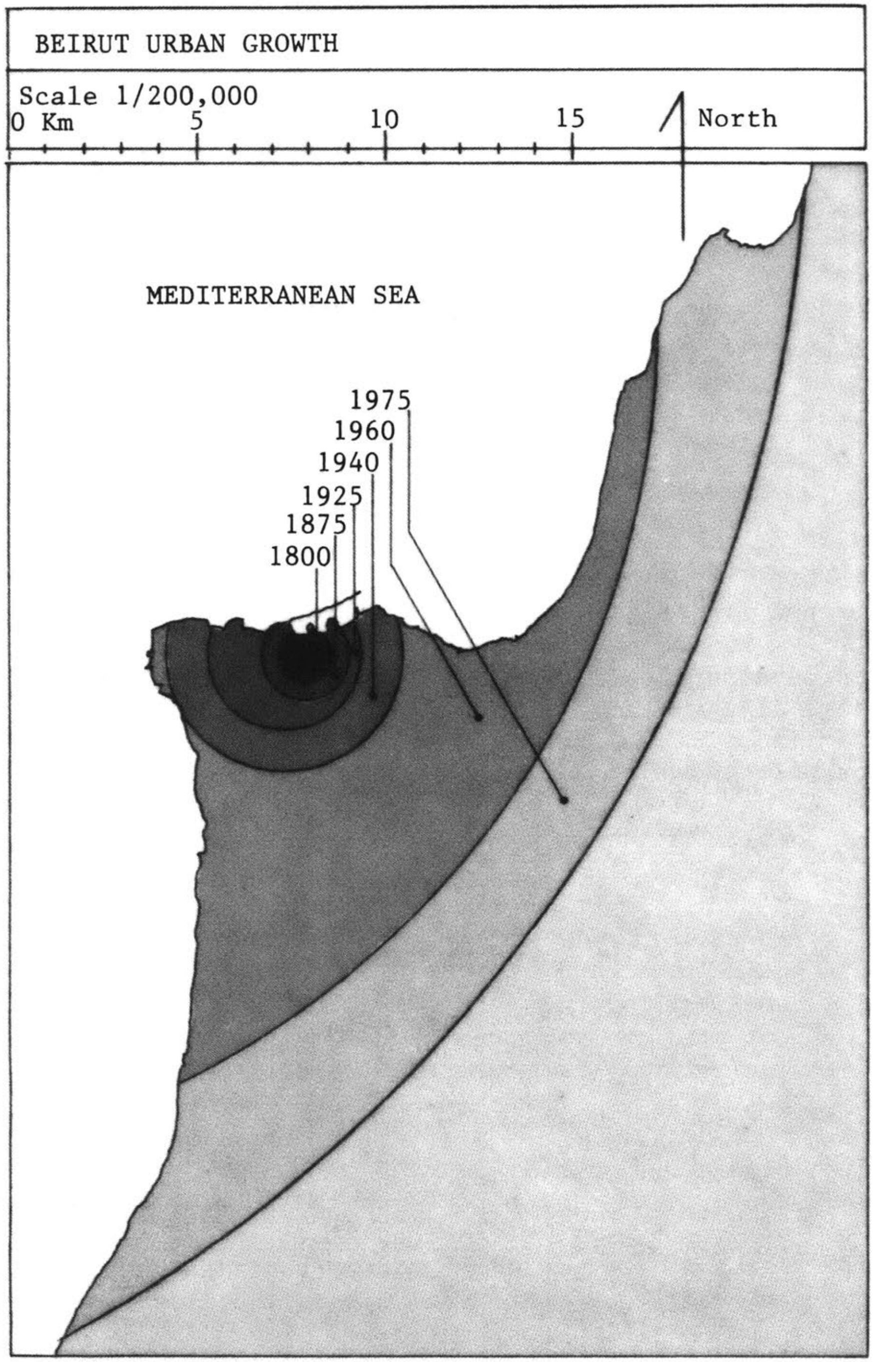
* *Reference 16*



As a result, the growth of many cities has been recently incredibly accelerated, challenging all previsions and disrupting existing facilities for housing and other basic city infrastructure and services.

Beirut*, to illustrate the case, has developed slowly through the past centuries on a very old historic site (see graph), reaching an area of 200,000 m^2 in 1800 A.D. Then, due to the start of commercial relations between Europe and the Middle East, its growth has suddenly accelerated and its area sprawled outside its protective walls by 1875.

In the next fifty years (until 1925) the area of Beirut practically doubled. From 1940 to 1960, i.e., in no more than twenty years, Beirut quickly grew from the compact nucleus it still was in 1940 to a relatively immense agglomeration more than three times its 1940 size. The rate of growth of Beirut is still about as strong (see line 1975).

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* *Reference 6, page 17.*

family planning & decentralization

Facing such "invasions," even the most organized markets would not be able to supply the needs. Moreover, in most Third-World countries, the resources, including technology, are scarce, making the supply of dwellings insufficient.

Planners suggest different general policies to alleviate the acute problem. At the level of the housing demand, the advocated policies generally gravitate around two major focal points: family planning and decentralization.

Family planning is advocated to diminish the natural population explosion. But often, it has been noticed that propaganda for family planning is not effective below certain economic and education levels, and when a population reaches these levels, it "naturally" stabilized without the need for any propaganda.

Decentralization, on the other hand is advocated to diminish the differences between rural and urban areas, and especially between the rural areas and the primate cities of the Third World. This policy thus leads to more geographic equity for the people, which decreases their need to move to the capitals.

industrialization of housing

But on another level, the level of the supply of housing, which is more the concern of this study, action has to be made on short terms to provide the essential housing for the people who need it today, and who will need it in the future until the longer term general policies prove effective.

At this level, the reaction of most planners and politicians is to industrialize as much as possible the housing sector in order to provide quickly and "better" the urgent housing requirements.

The example of European post-Second World War reconstruction is always cited as an example of how a radical industrialization of housing can "solve" a housing crisis as important as the one of the European post-war cities.

It seems, however, that the similarity between the two contexts is only superficial and that it is wrong to assume, a priori, that the methods applied in the first case will necessarily work in the second (different) case.

The accentuation of urbanization started in Europe after the Industrial Revolution. Before that, protection was the major incentive for city living. The walls of the city, protected by a feudal lord's or a king's army, were the major attraction of a city. But at the same time, the cities were considered as "the tombs of the races." The hygienic and health conditions were much better in the rural areas that were less crowded and less dirty than the cities, in an epoch where medicine was not able to make up for the misdeeds of urban life.

Later, industries developed in the cities because they could find a certain concentration of labor and a potential market for their manufactured products. They started very quickly to attract more and more people because the job opportunities were greater, and at the same time, because of the availability of industrial products.

Urbanization started to accelerate. But it was much less intense than the one that the Third World faces today, because of many reasons:

1. Industrialization came more gradually in Europe than in the Third World, where it was transplanted (or at least its products) without gradual preparation.

2. The rural areas were more structured in Europe than in the Third World, so people were less reluctant to leave them for the attraction of the city. The "push" was less important from the rural areas.

3. The difference between rural and urban areas were in Europe less important than in the Third World, making the "pull" of the city less powerful as well. In the Third World the difference between rural and urban life is sometimes extremely great, especially in the distribution of important services like health, education, etc.

4. The demographic growth was much less acute in Europe than in the Third World which profitted from the progress in medicine before the equivalent country structuralization.

5. Finally, the European cities were much more structured to accept a relatively less drastic change compared to the one that the Third World countries faced.

To these important differences another major event sho should be added: the Second World War. This war obliged all countries involved to accelarate their industrialization to gain fighting supremacy. This accelerated industrialization, although oriented towards war products, tremendously developed the general infrastructure of the country to support the logistic needs of war; it has also generalized industrial expertise and technology.

At the end of the war, the infrastructure and the expertise were ready to switch to non-war objects. The war had in the meantime destroyed a significant portion of the housing stock. Fast housing construction was urgently needed; it was a political priority over cost, to decrease the socio-political post-war unrest.

The industry was waiting for such a challenge (and such a market!), and very quickly industrialization of housing appeared as the solution to the problem.

Similar exceptional conditions do not exist, in the present, in most Third World countries. Most of them still lack all kinds of technological expertise and infrastructure (supply networks, etc.) and, except for a few, they have limited financial resources.

As a result, a mega-industrialization of the housing sector, similar to the post-war european experience, seems inefficient, risky and utopian.

Industrialization can only come gradually, along with a "mature" structuralization of the whole country, to avoid dramatic failures. And due to the complexity of the housing package, its industrialization requires enormous investments (already made in the european post-war context). As a result, a mega-industrialization of housing would not prove to be economically advantageous.

Industrialization of housing should therefore be thought of as a gradual, long-term development, while easier industrial developments could immediately begin the general industrialization of the countries.

So, given the immediate urgent housing needs of these countries, only mixed or intermediate solutions should be envisaged which take into consideration the real possibilities of the considered countries.

dangers of a full scale housing industrialization

Besides the incapacity of most Third-World nations to venture into full-scale housing industrialization, similar to the European post-war development, there are many dangers involved in such an experiment.

The main problem is that what is by origin an emergency solution has the tendency to become an "eternal" solution (as it has in Europe). This is due to many reasons, the most important being that the industry is usually unwilling to abandon a market once it has it.

Rentability criteria immediately become the most important factors in the design of the housing solutions, as opposed to human requirements.

Stereotyped repetitive products, which are easier to handle and therefore more profitable to the industry, become the housing "optimal" solution.

To justify this concept, man's needs and aspirations (or the household's) are reduced to few artificial "statistical" categories, corresponding to an "average" man or household (that do not realy exist).

Monotony is the direct result for the housing product and therefore for the streets, the neighborhoods and the new cities themselves. This is not only an aesthetical problem, but more importantly, a social and psychological problem; the people are not given the possibility to express their individuality and character in environments, so close and important to them, which are their own houses.

Consequently, they do not develop feelings of posession and responsibility in these monotonous, static and impersonal dwelling structures. Vandalism is the only possible expression, neglect and decay are the only possible outcome. And, as it has happened in so many new cities in Europe, industrial housing quickly becomes "industrial slums."

To summarize, a full-scale industrialization of the housing sector does not seem to be the obvious solution for most, if not all, Third-World countries. This would imply too many compromises and would be far above the "real" means of most of the considered countries.

More realistic solutions will be discussed in the next chapters, starting with the study of the "real" needs, aspirations and resources of the people in a specific country to define a housing system that would have "man" in mind, before industry, and using the "real" resources of the country to avoid building "up-to-date slums."

autonomous housing system

Finally, it is necessary to stress the importance of housing systems that rely as little as possible on foreign resources (capital, labor, materials, technology)

Solutions based on important resources should be restr tricted to emergency situations, and even then, be used with caution because of many reasons, the most important of which are the following:

1. The local problems are more than often percieved by the outsiders in a distorted way, reflecting their own way of thinking rather the one of the people concerned.

2. The importing country faces the risk that the hidden purpose of the exporting country is more to sell its own service or product than to objectively analyse the local problem, which could be contrary to their own interests. The importing Third World countries do not often have enough expertise or self-assurance to judge the imported suggestions.

3. Relying on imported packages often implies a long-term technical dependency, due to the fact that only the exporters are effectively able to handle the equipment, maintain it and replace the defective parts.

This may retard the maturity of the country and increase its political dependency towards the exporting nation (especially when the matters involved are as vital to a nation as its food, energy or housing).

4. Finally, it perpetuates the import-drain of the relatively poor Third-World economies, and decreases importantly their potential multiplier benefits.

All these arguments favorintroverted solutions, i.e., solutions coming "from within", using imported resources only when there is no "inside" alternative available.

the model and the case study

The purpose of this study is to develop a methodology to define a realistic approach to housing in a Third World country, given its "real" needs, aspirations and resources. The methodology is presented here through a case study to show the applicability of the approach and avoid the trap of theories inherent to many general models.

The choice of Lebanon is due to the author's knowledge of the country, to the fact that Lebanon stands halfway between the richest Third-World countries (the oil-producing countries) and the poorest, and to the fact that its small size (2.8 million people) makes it easier to handle for the purpose of methodological study.

As this task is extremely complex, the present study, given its time and resources limitations is mainly a simplified model showing an approach to a problem; a methodology which tries to interrelate all the aspects of the problem and show their implications without necessarily solving all the details.

If and when the model is to be implemented, the details will have to be studied. More time and resources should be available to study the details along the main lines in this model.

The model will first define the housing needs of the country (the dwellings and their related utilities and facilities). It will then evaluate all resources related to housing, available in the country: financing (private and public), labour (skilled, unskilled and unemployed), construction materials, technology (knowhow, equipment and infrastructure), land and climate.

A housing approach, including a range of financing, planning and construction systems will then be defined, which is a directed result of the evaluated housing needs and resources.

the housing needs

DEMOGRAPHY

definitions

The purpose of this section is to analyze the housing needs of Lebanon. Housing needs include a series of needs besides the obvious physical quality of the dwelling and its immediate environment.

In order to be a livable unit, a dwelling needs utilities, public services, community and commercial facilities. The main elements* in each of these categories of needs are:

A. The Utilities

- streets
- sidewalks
- sanitary and storm sewers
- water
- electricity
- telephone

B. The Services

- street cleaning and repairing
- maintenance of sewers and water system
- street lighting
- refuse collection
- garbage collection
- police and fire protection
- mail distribution

C. The Community Facilities

- schools, hospitals, clinics, health centers
- social services
- parks, playgrounds, meeting halls, museums, libraries
- other buildings and services

D. The Commercial Facilities

- market, stores, repair shop, entertainment and business facilities

In most developing countries, few statistical data are available, or reliable. As a result, indirect methods will have to be used to obtain the needed information. Sometimes only fair guesses will be possible. In all cases assumptions will be clearly notified.

In actual implementation studies, more time and resources should be available to obtain more precise informations or verify the available ones.

Most of the data that will be used in this study are drawn from the last survey made in Lebanon, in 1970, by the "Direction Centrale de la Statistique" in "Enquete par Sondage sur la Population Active au Liban."**

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* *Reference 4, page 52.*
** *Reference 12.*

the 1970 housing needs

The table below summarizes the 1970 data showing the number of people and households living in Lebanon. The urban zones figures include 45,765 people living in agglomerations from 1,000 to 10,000 people.

The table shows that 60.1% of the total population lives in urban zones, but if urban zones are defined by agglomerations larger or equal to 10,000 people, then the ratio becomes 58%.

The ratios of the households are slightly different from the population ratios due to the notably smaller household average size in Beirut.

The survey deals only with residents, that is, the population that has been in Lebanon at the time of the survey for more than 6 months. The seasonal foreign workers, mainly syrians, as well as the Palestinians living in the camps were not covered by the survey while the Palestinians integrated into the city were covered.

For the seasonal workers and the camps Palestinians' some figures exist, but they seem to underestimate the respective numbers of the two groups, because many workers, on one hand, work illegally, and on the other hand, the movements of the Palestinians, to and from the camps, are quite uncontrollable. The official figures (the best available approximations), are nevertheless the following:

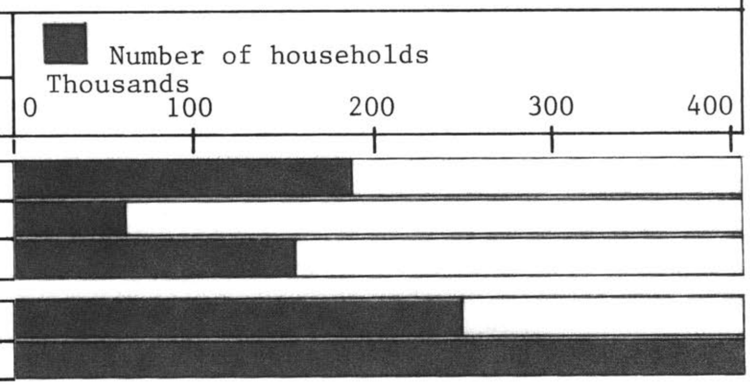
foreign workers*:	6,163
Palestinians officially living in camps**:	85,058

The foreign workers usually arrive in Lebanon without their families, when the agricultural season is low at home, and they usually live in Lebanon on their respective job sites, with very poor hygenic conditions.

* *Reference 13, page 93*
** *Reference 23, page 66*

NUMBER OF PEOPLE AND HOUSEHOLDS IN 1970 (NATIONAL SURVEY)

ZONES		POPULATION		AV. NUMBER PEOPLE PER HOUSEHOLD	HOUSEHOLDS	
		Number	%		Number	%
BEIRUT		938,940	44.2	5.01	187,230	46.2
OTHER CITIES		339,090	15.9	5.49	61,740	15.2
RURAL AREAS		848,295	39.9	5.42	156,405	38.6
TOTAL	URBAN ZONES	1,278,030	60.1	5.13	248,970	61.4
	LEBANON	2,126,325	100.0	5.25	405,375	100.0



Should better conditions be provided to them, and if 4 workers would share a unit, this would raise the dwelling needs by 1,534 dwellings.

As for the Palestinian's camps, they are sharing the provisional "facilities" units with their families. These are estimated to hold an average of 5.7 people per family.* Their needs for dwellings would therefore "officially" be 15,168 dwellings which would have to be provided if political reasons do not allow them to go back to Palestine.

As a result, the total 1970 dwelling needs in Lebanon would officially amount to the following:

Residents:	405,375
Palestinians from camps:	15,168
Foreign seasonal workers:	1,534

Total number of dwellings: 422,077.

Finally, this last number does not take into consideration non-residents or visitors in Lebanon for less than 6 months at the time of the survey. But it is reasonable to assume that a large proportion of them are housed in hotels or semi-hotels and furnished apartments, that are outside the scope of this study.

* *Reference 43, page 29*
** *Reference 21*
*** *Reference 13, page 95*

projection of housing needs from 1970 to 1985

The annual growth of population is estimated by the United Nations experts** to be around 3%. It is more difficult to forsee the growth of Palestinian refugees and Syrian workers.

The Palestinian refugees number is closely linked to the sporadic Israeli occupations of Arab land and the degree of warfare in these regions. These activities are difficult to estimate for the future. But if the situation does not change dramatically, the growth will probably be similar to the one of Lebanon, that is, about 3%.

Finally, the number of Syrian workers is also difficult to estimate because:

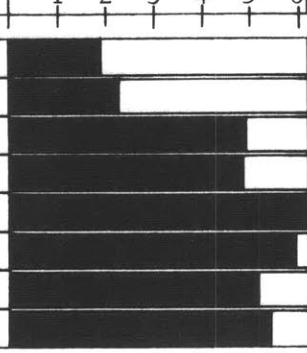
- they come seasonally, without their families, so natural growth can not be taken into consideration

- the past year's official numbers*** show an irregular growth (see next page table)

- a certain number of them work unofficially.

The ratio of the yearly construction output to the official number of foreign workers (M^2/worker) is not constant at all through the years, so no precise evaluation is possible, based on the projection of the future yearly construction outputs.

Only a very rough projection will be used which is the extrapolation of the number of foreign workers in Lebanon from 1966. As these figures vary in an inconsistent way as well, the projection will be quite rough.

ANNUAL FOREIGN WORKERS IN LEBANON FROM 1966 TO 1973				
YEAR	NUMBER OF FOREIGN WORKERS	FOREIGN WORKERS Thousands 1 2 3 4 5 6 	AREA (M^2) BUILT IN LEBANON	AREA (M^2) PER FOR. WORKER
1966	1,875		3,163,900	1,687
1967	2,240		4,134,500	1,846
1968	4,902		3,268,600	667
1969	4,805		3,314,000	690
1970	6,163		2,504,200	408
1971	5,924		2,058,200	342
1972	5,150		2,951,200	573
1973	5,368		5,327,000	992

But, on one hand, no more precision is possible with the available data. On the other hand, the relative number of foreign workers is verv small compared to the total housing demand, so the imprecision of this figure does not much affect the overall projections.

The projected numbers of people are shown in the following table for the period between 1970 to 1985.

The resulting number of needed dwellings depend on the household sizes of the different categories of people in the time period considered.

The average number of people per household is likely to diminish slightly from 1975 to 1985, mainly due to rises in economic and education levels. The estimated decrease is around 0.1% per 5 years* for the Lebanese residents. The household sizes would therefore have the following decreasing values:

5.25 in 1970
5.15 in 1975
5.05 in 1980
4.95 in 1985.

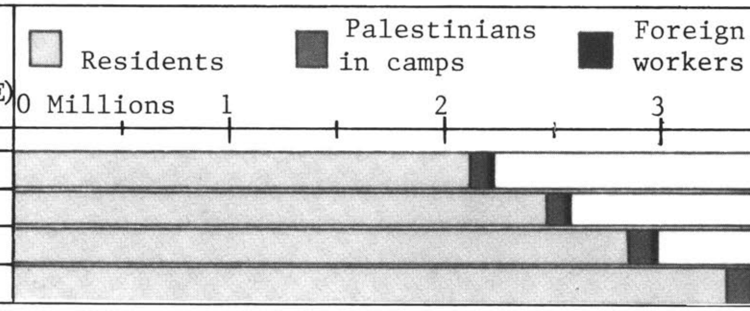
As for the Palestinians, their household size will also decrease with time, but less rapidly, due to their slower social and economic mobility. So from 5.7 people per household in 1970, the size will probably become around 5.6 from 1975 to 1985 and 5.5 in 1985.

The foreign workers, coming seasonally and temporarily in Lebanon, without their families, do not follow natural growth patterns. But it will be assumed that, if given housing facilities, each four might share the equivalent of a dwelling unit.

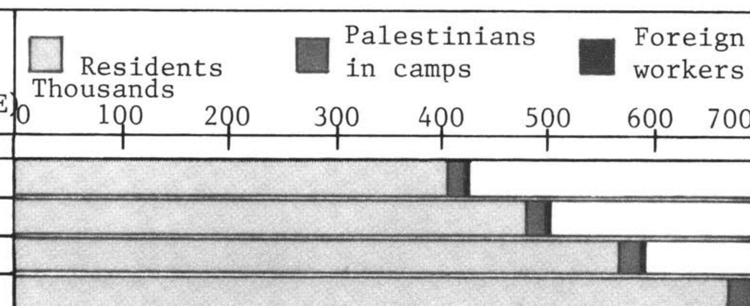
The following table accounts for the projected dwellings needed in Lebanon from 1970 to 1985 by the three different groups of people.

* *Reference 36*

PROJECTED POPULATION OF LEBANON FROM 1970 (SURVEYED) TO 1985				
YEAR	RESIDENTS	PALESTINIANS IN CAMPS	FOREIGN WORKERS (ROUGH ESTIMATE)	TOTAL POPULATION
1970	2,126,325	86,459	6,136	2,218,920
1975	2,464,993	100,230	8,000	2,573,223
1980	2,857,603	116,194	11,000	2,984,797
1985	3,312,745	134,700	14,000	3,461,445



PROJECTED DWELLING NEEDS IN LEBANON FROM 1970 (SURVEYED) TO 1985				
YEAR	RESIDENTS	PALESTINIANS IN CAMPS	FOREIGN WORKERS (ROUGH ESTIMATE)	TOTAL POPULATION
1970	405,375	15,168	1,534	422,077
1975	478,639	17,898	2,000	498,537
1980	565,862	20,749	2,750	589,361
1985	669,241	24,491	3,500	697,232



HOUSING SUPPLY AND DEMAND IN 1970

The purpose of this section is to investigate the proportion of the housing needs (defined in last section) that are being covered by the Lebanese market supply.

As stated above, there is no available detailed information about all the categories of housing needs. There is, however, enough information about the main housing needs to give a general sense of the housing needs supplied by the market, and those left uncovered.

The available data* cover the following aspects of the housing stock for 1970:

Quantities and occupancy of the dwellings.
Basic utilities (water, electricity and telephone but no sewage survey).
Dwelling equipment (w.c., bathroom, kitchen and heating).
Physical soundness of the dwellings.
Overcrowdedness.

All these data are regionally available (i.e., following the three major categories: Beirut, the other cities and the rural areas.

the dwelling categories

The first distinction that should be made in the Lebanese context is the distinction between "principal," "secondary," and empty dwellings.

1. The "Principal" dwelling is the main residence of a household.

2. The "secondary" dwelling is the summer dwelling or the vacation-ski-sea dwelling. Many upper- and medium-income households spend the summer in summer towns, while many lower income households live in summer in their original villages where they kept a "secondary" dwelling. Distances being short, commuting to Beirut or the other cities is accepted for the freshness of the mountain summer nights.

3. The empty dwellings are the non-secondary dwellings that were empty at the time of the survey, although available to the demand.

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* *Reference 12*

The following table gives a summary of the situation in Lebanon in 1970:*

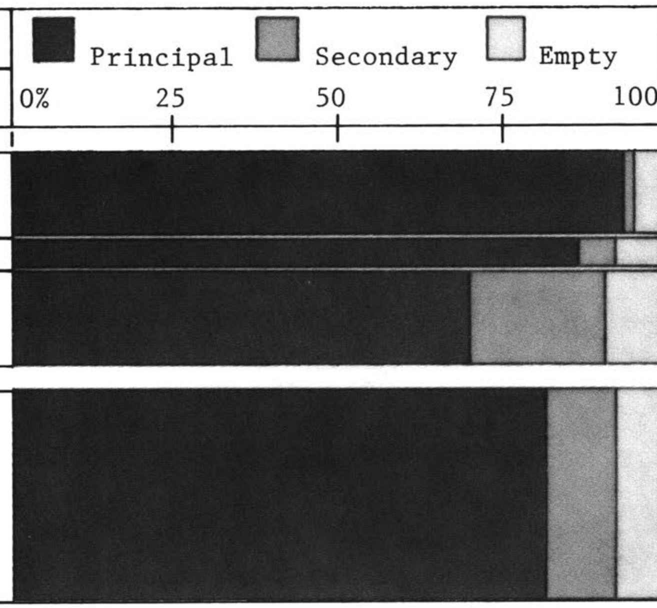
1. Regionally, in Beirut the dwelling stock is mostly used for principal residency, while 6% or 11,910 dwellings remain empty. In the rural areas the situation is the worst with 20.6% of the stock being secondary dwellings and 9.2% of the stock empty. The secondary dwellings' importance is natural because rural areas are mainly up in the mountains, while most cities (Beirut, Sidon, Tripoli, Tyre) are on the coast. But this indicates unfavored rural conditions, as far as principal dwellings are concerned.

2. In Lebanon, as a whole, 81.8% of the stock only is being used as principal residences; that means 395,820 dwellings, while 51,068 (10.6%) are secondary dwellings (usually for the urbanites) and 37,020 remain empty--mainly due to speculative construction.**

* *Reference 12, page 9*
** *See page 44*

TOTAL LEBANESE DWELLING STOCKS V/S PRINCIPAL, SECONDARY AND EMPTY STOCKS

ZONES	TOTALS		PRINCIPAL			SECONDARY		EMPTY	
	Number	% of Leb.	% of Leb.	Number	% of Zone	Number	% of Zone	Number	% of Zone
Beirut	197,175	40.7	46.2	182,865	93.7	2,400	1.2	11,910	6.0
Other Cities	69,318	14.3	15.2	60,330	87.0	3,798	5.5	5,190	7.5
Rural Areas	217,415	44.9	38.6	152,625	70.2	44,870	20.6	19,920	9.2
Lebanon	483,908	100.0	100.0	395,820	81.8	51,068	10.6	37,020	7.7



utilities

The only available data are about running water, electricity and telephone for the "principal" dwellings*. There is no data about the sewer system. It seems, however, fair to assume that running water and sewers are usually installed together.

By definition, a dwelling which has the utility has it inside the dwelling and not outside. This applies especially for running water and sewers.

Finally, when totals do not add up to 100%, the difference (usually insignificant) accounts for the indeterminate cases.

1. Regionally, the data show that in running water and electricity, which are the two important utilities, the cities seem quite well equiped (around 92-94% in water and 98% in electricity). The situation is much less satisfying in the rural areas where only 64.8% of the principal dwellings have running water.

As far as telephones are concerned, only 25.9% of the dwellings have the utility in Beirut, only 6.6% in the rural areas. But telephones are a much less vital element than the other utilities, and the effort should be first made to fill the needs in running water and electricity.

2. In general, there are no data about the sewer supply for the dwellings. Sewers are, however, as necessary as running water, if not more, because the lack of sewers is at the origin of many diseases.

But is seems reasonable to assume that sewers come more or less with running water, as it does not make sense to have sewers and no running water or vice-versa, especially in urban areas. In rural areas, private pits are installed with relative ease, once running water is present.

Therefore, in Lebanon, out of the 395,820 principal dwellings, 67,860 lack running water (17.1%) while 26,130 (6.6%) lack electricity. Most of these needs are in rural areas, where it is probable that the same dwellings that lack electricity are part of those lacking running water.

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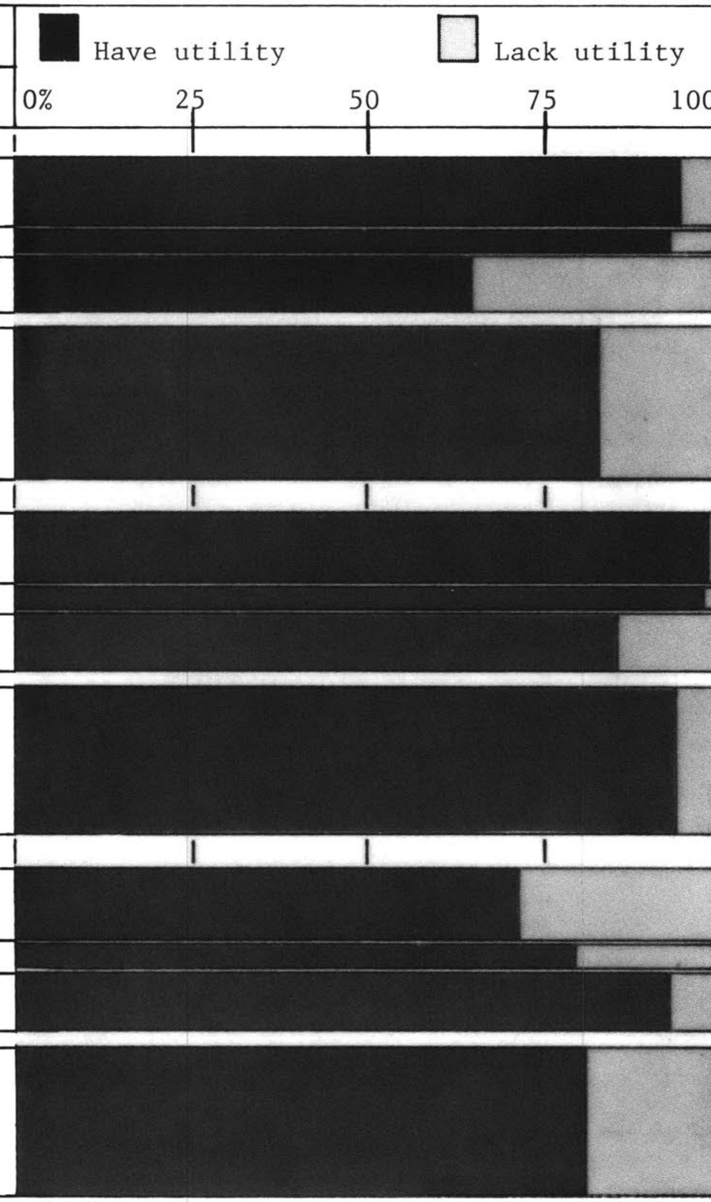
* *Reference 12, page 14*

PRINCIPAL DWELLINGS UTILITY SUPPLY: RUNNING WATER, ELECTRICITY AND TELEPHONE

UTILITIES	REGIONS	TOTAL PRINCIPAL % of Leb.	TOTAL PRINCIPAL Number	HAVE UTILITY Number	HAVE UTILITY % of Reg.	LACK UTILITY Number	LACK UTILITY % of Reg.
RUNNING WATER	Beirut	46.2	182,865	172,260	94.2	10,425	5.7
	other cities	15.2	60,330	55,785	92.5	4,455	7.4
	Rural areas	38.6	152,625	98,850	64.8	52,980	34.7
	Lebanon	100.0	395,820	326,895	82.6	67,860	17.1
ELECTRICITY	Beirut	46.2	182,865	179,835	98.3	2,970	1.6
	Other cities	15.2	60,330	58,950	97.7	1,365	2.3
	Rural areas	38.6	152,625	130,530	85.5	21,795	14.3
	Lebanon	100.0	395,820	369,315	93.3	26,130	6.6
TELEPHONE	Beirut	46.2	182,865	130,620	71.4	47,370	25.9
	Other cities	15.2	60,330	47,730	79.1	12,060	20.0
	Rural areas	38.6	152,625	140,880	92.3	10,080	6.6
	Lebanon	100.0	395,820	319,230	80.7	69,510	17.6



equipments

The available 1970 data about the dwellings' equipments include data about W.C., bathroom, kitchen and heating. The defined difference between W.C. and bathroom is that bathroom have washing facilities, while W.C. do not.*

The next page table shows the available data, the main features are the following:

1. Regional Comparisons

a. W.C.: Quite a number of dwellings do not have W.C. inside: 9.7% in Beirut, and in the rural areas: 42.1% or 64,245 dwellings lack the utility. Out of these, a few share the W.C. with others or have it in the building where their apartment is. But 1.4% do not have it at all in Beirut (2,520 dwellings) while 27.0% (41,250) do not have it at all in the rural areas.

b. Bathrooms: The lack of complete bathrooms, that is, W.C. with washing facilities, is even much greater, 16% of Beirut principal dwellings do not have it, while up to 51.5%, that is, 123,240 dwellings lack it in the rural areas.

c. Kitchens: 5.0% of Beirut principal dwellings lack a kitchen. It is curious to see that kitchens have a priority over bathrooms, and even over the basic W.C. In the case of Beirut, this is probably due partly to the recent exposure of the lowest income groups to private bathroom facilities, and partly due to the difficulty of self-installing a W.C. or a bathroom compared to a kitchen that is just one room with a sink, without needing running water necessarily, as would W.C. or bathroom facilities.

But this certainly emphasizes the importance of the kitchen in the family and the social life of the region. Nevertheless, there are up to 31.4% or 47,855 dwellings with no kitchen.

d. Heating: It is interesting to note that in the case of heating, the rural areas are more equipped than the other cities, Beirut having the worst conditions. 35% or 63,930 dwellings do not have heating in Beirut, while only 14,13% or 21,510 do not have it in the rural areas. This is due to the fact that the rural areas are situated, in large part, in the mountains where temperatures might go down to freezing point absolutely requiring heating. In Beirut, the milder climate decreases the priority of heating over other facilities and makes of heating a less vital element.

In Beirut, however, as would be expected, the number of central heating systems is by far most important (17.3% of Beirut dwellings) while this luxury asset is less important in both the other cities (4.3%) and especially the rural area (1.3% only).

2. Generally the dwellings which lack the different above-mentioned equipments are mostly the ones lacking the related facilities--especially running water, although a few dwellings have running water without having yet all equipment like W.C., bathroom or kitchen. As a summary, out of the 395,820 principal dwellings in Lebanon:

- 17.1% or 67,860 lack running water
- 22.8% or 90,075 lack W.C. inside the dwelling and 11.4% or 45,210 lack it even outside their dwelling
- 31.1% or 123,240 do not have a complete bathroom
- 15.6% or 61,727 do not have a kitchen
- 25.4% or 100,700 do not have heating.

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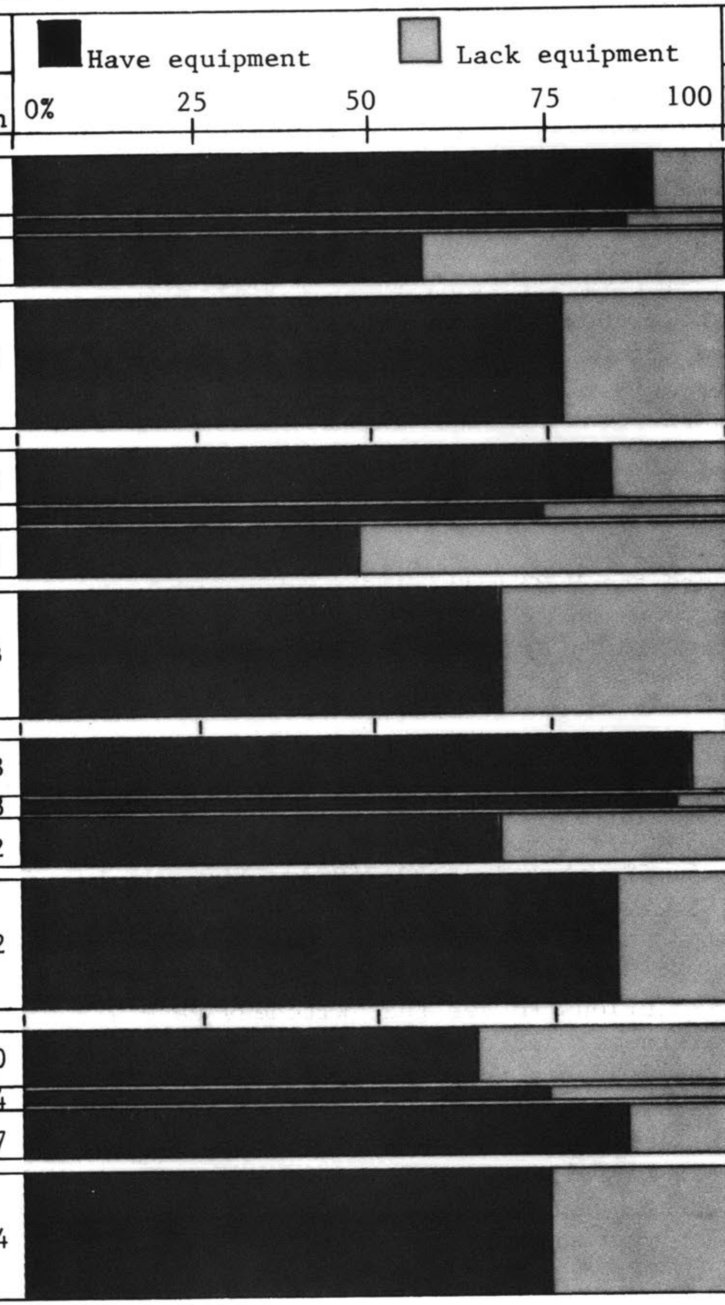
* *Reference 12, page 14*

PRINCIPAL DWELLINGS EQUIPMENT: WATER CLOSET, BATHROOM, KITCHEN AND HEATING

EQUIPMENT	REGIONS	Total Principal		Having Equipment		Lacking Equipment	
		% of Leb.	Number	Number	% of Region	Number	% of Region
WATER CLOSET	Beirut	46.2	182,865	164,775	90.1	17,685	9.7
	Other Cities	15.2	60,330	52,095	86.4	8,145	13.5
	Rural Areas	38.6	152,625	87,735	57.5	64,245	42.1
	Lebanon	100.0	395,820	304,605	77.0	90,075	22.8
BATHROOM	Beirut	46.2	152,610	152,610	83.5	29,325	16.0
	Other Cities	15.2	60,330	44,700	74.1	15,285	25.3
	Rural Areas	38.6	152,625	73,035	47.9	78,630	51.5
	Lebanon	100,0	395,820	270,345	68.3	123,240	31.1
KITCHEN	Beirut	46.2	182,865	173,430	94.8	9,210	5.0
	Other Cities	15.2	60,330	55,680	92.3	4,560	7.6
	Rural Areas	38.6	152,625	104,130	68.2	47,955	31.4
	Lebanon	100.0	395,820	333,240	84.2	61,725	15.6
HEATING	Beirut	46.2	182,865	118,815	65.0	63,930	35.0
	Other Cities	15.2	60,330	44,895	74.4	15,270	25.3
	Rural Areas	38.6	152,625	130,815	85.7	21,510	14.1
	Lebanon	100.0	395,820	294,525	74.4	100,700	25.4



It seems that priority should be given, after running water, to the provision of bathrooms to the dwellings which lack it. Just a W.C. would be unsufficient from the hygienic point of view.

Kitchens would come next in priority, as it is not unhealthy to cook in a living room or room, although it might be unpleasant. But that decision could be left to the desires and responsibilities of the people themselves.

Heating could be provided last, or not at all, until the other equipments have been provided, as the localized ways (petroleum burners, etc.) have proven to be effective and relatively cheap when needed.

* *Reference 12, page 14*

the improvised dwellings

The physical quality of the dwelling stock has not been directly surveyed in the 1970 national survey. The only related survey is about the "improvised"* dwellings. "Improvised" dwellings mean here, self-help dwellings, and they usually refer to the squatters areas around the cities or the individual, more or less temporary shacks in the rural areas.

Observation shows that these housing facilities are generally in a quite bad physical environment, having been erected quickly with the few available materials found in the neighboring streets: pieces of wood, cardboard boxes and cans...

Sometimes they phsyically improve, with time. Concrete blocks replace the cardboard walls and windows are even opened in the walls.

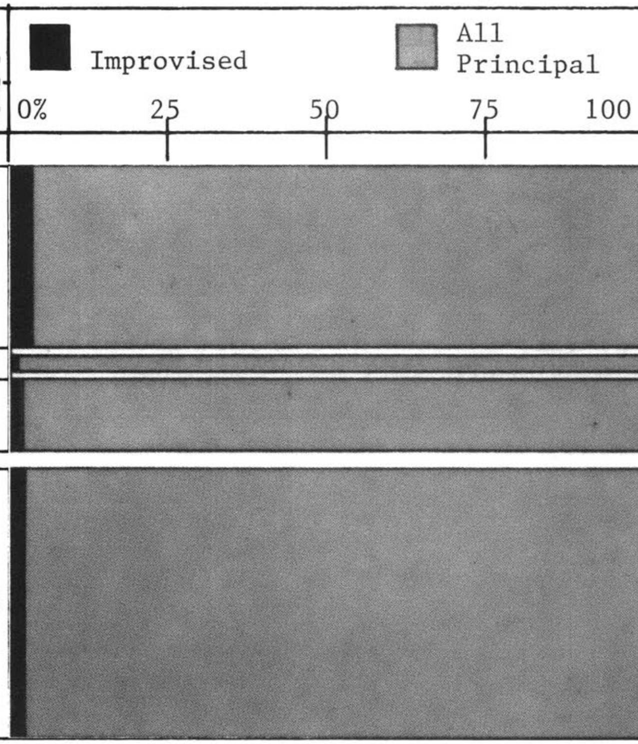
But, having been erected hap-hazardly by the settlers, they scarcely have enough ventilation or sun to meet the most elementary hygienic requirements. It is also quasi-impossible to post-install complex utilities networks like sewers and running water. As a result, many of these improvised dwellings remain without them and without bathrooms or W.C.

In these conditions, long-term improvement is completely jeopardized. The following two tables show the official number of these "improvised" dwellings and their supply of utilities and equipments. The figures are compared with the figures of the total dwelling stock in Lebanon.

The official number of improvised dwellings seem extremely low: 7,965 dwellings or 2.0% of the total dwelling stock in Lebanon. These figures will, how-

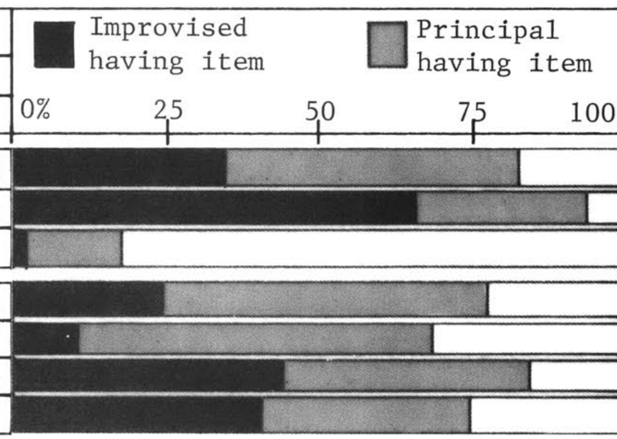
PERCENTAGES OF IMPROVISED DWELLINGS LACKING UTILITIES AND EQUIPMENT

REGIONS	IMPROVISED NUMBER	% OF REG. PRINC. DWELL.	% OF TOTAL IMPROVISED	LACKING: RUN. WATER	ELECTRICITY	TELEPHONE	W.C.	BATHROOM	KITCHEN	HEATING
BEIRUT	5,370	2.9	67.4	56.7	19.0	98.0	72.1	87.4	48.9	77.7
OTHER CITIES	450	0.7	5.6	56.7	30.0	100.0	63.3	83.3	46.7	36.7
RURAL AREAS	2,145	1.4	26.9	89.5	74.1	97.2	87.4	95.1	77.6	18.2
LEBANON	7,965	2.0	100.0	65.5	34.5	97.9	75.7	89.3	56.5	59.3



SUPPLY OF UTILITIES AND EQUIPMENT TO ALL PRINCIPAL V/S IMPROVISED DWELLINGS

CATEGORY	ITEMS	HAVING ITEM: PRINCIPAL Number	%	IMPROVISED Number	%	LACKING ITEM: PRINCIPAL Number	%	IMPROVISED Number	%
UTILITIES	Run. water	326,895	82.6	2,748	34.5	67,860	17.1	5,217	65.5
	Electricity	369,315	93.3	5,217	65.5	26,130	6.6	2,748	34.5
	Telephone	69,510	17.6	167	2.1	319,230	80.7	7,799	97.9
EQUIPMENT	Water-closet	304,6 5	77.0	1,935	24.3	90,075	22.8	6,030	75.7
	Bathroom	270,345	68.3	852	10.7	123,240	31.1	7,113	89.3
	Kitchen	333,240	84.2	3,465	43.5	61,725	15.6	4,500	56.5
	Heating	294,525	74.4	3,242	40.7	100,700	25.4	4,723	59.3



ever, be accepted until more precise information is available on the matter.

On the other hand, the Palestinian refugees camps were not included in the survey and they probably make the bulk of the improvised dwellings.

As has been seen above, the number of Palestinian families living in the camp is officially 15,168; there is no way to verify the validity of these figures. But the conditions in these camps are probably as bad if not worse than the Lebanese ones surveyed in 1970.

As can be seen from the graph, the differences between the improvised buildings and the general conditions are extremely wide, 10.7% of the improvised dwellings having bathrooms against 68.3% for the general cases. The difference can get even wider for a luxury iten such as telephones, where the percentage of improvised dwellings having telephones is 8 times smaller than the number of principal dwellings in general having a telephone.

And, for the most vital element, running water, only 34.5% of the improvised dwellings have it against 82.6% for the inclusive total principal dwelling stock.

* *Reference 12, pages 9, 24*

crowdedness

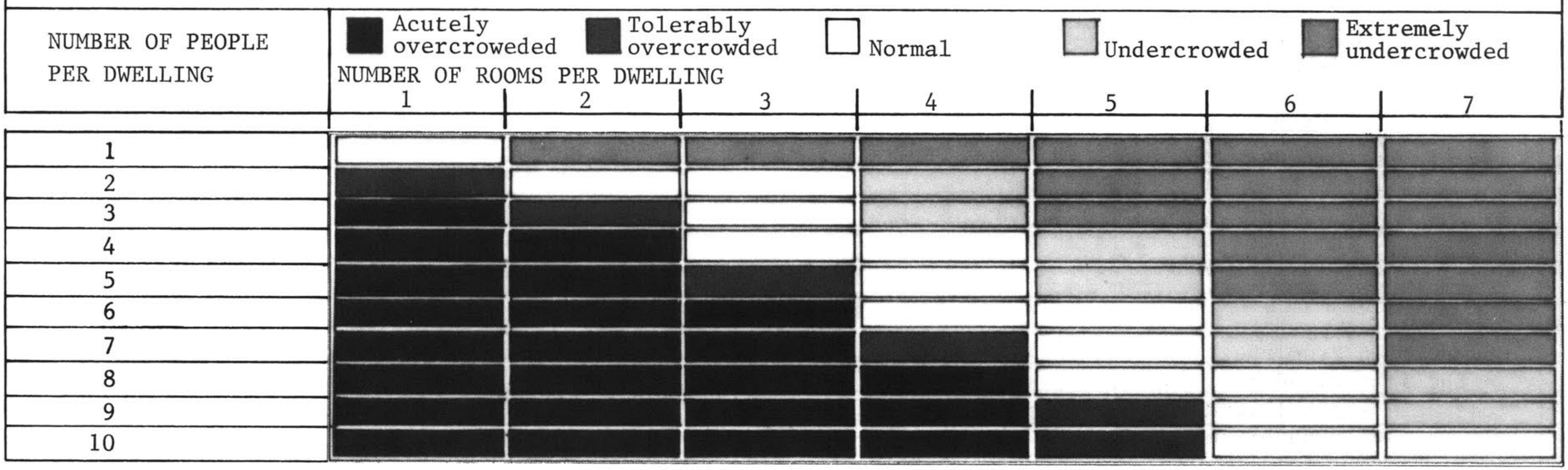
The definition used in the 1970 survey to delimit the different levels of crowdedness in the dwelling stock is a French-based definition, expressed in the adjacent page top graph*.

The lower table-graph shows the general features of the dwelling occupancy in Lebanon. Dwellings and people have been separated in two different graphs to emphasize that they are not necessarily proportional to each other, as the household size varies from a region to the other. Indeed, 38.8% of the principal dwellings are in the rural areas, housing 39.9% of the population of Lebanon.

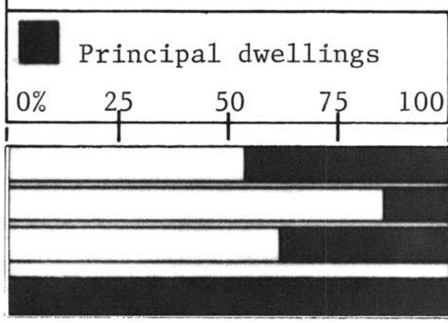
Similarly, the larger number of people per room occurs also in the rural areas, with an average of 1.9 people per room, while in the rest of the country, the average is slightly inferior: 1.7 people per room.

It is also interesting to note that the bigger number of rooms per dwelling occurs in the secondary cities (3.38 rooms per dwelling), rather than in the capital Beirut (3.1); this seems to be due to the more important internal migration towards Beirut, where the newcomers are generally younger, have separated from their extended families and can not generally afford large places in the more expensive Beirut houses.

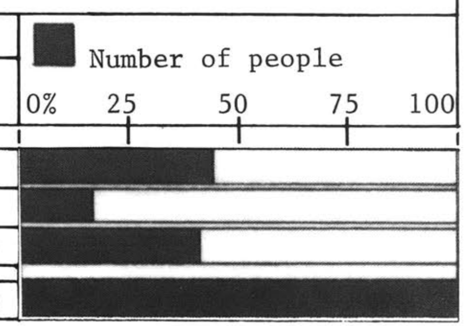
DEFINITION OF THE LEVELS OF DWELLING CROWDEDNESS



REGIONAL DISTRIBUTION OF PEOPLE IN THE PRINCIPAL DWELLINGS: ROOMS PER DWELLING, PEOPLE PER ROOM AND DWELLING.

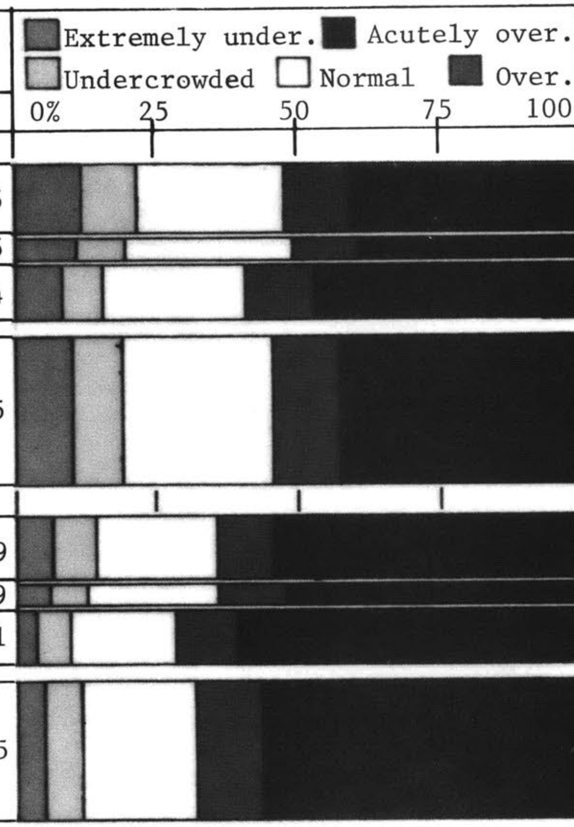


PRINCIPAL DWELLINGS %	PRINCIPAL DWELLINGS Number	REGIONS	ROOMS PER DWELL	PEOPLE PER DWELL	PEOPLE PER ROOM	PEOPLE TOTAL NUMBER	PEOPLE %
46.2	182,865	Beirut	3.10	5.13	1.7	938,335	44.2
15.2	60,330	Other cities	3.38	5.62	1.7	338,475	15.9
38.6	152,625	Rural areas	2.99	5.55	1.9	847,230	39.9
100.0	395,820	Lebanon	3.10	5.36	1.7	2,123,940	100.0



RELATIVE CROWDEDNESS IN TERMS OF PRINCIPAL DWELLINGS AND NUMBER OF PEOPLE

SUBJ.	ZONES	EXTREMELY UNDERCROWDED		UNDERCROWDED		NORMAL		TOLERABLY OVERCROWDED		EXTREMELY OVERCROWDED	
		Number	%	Number	%	Number	%	Number	%	Number	%
DWELLINGS	BEIRUT	20,505	11.2	18,585	10.2	48,510	26.5	20,790	11.4	73,035	39.9
	OTH.CIT.	6,075	10.1	5,400	9.0	17,820	29.5	7,365	12.2	22,980	38.1
	RURAL	12,450	8.1	10,650	7.0	38,760	25.4	18,975	12.4	70,020	45.9
	LEBANON	39,030	9.9	34,635	8.8	105,090	26.5	47,130	11.9	166,035	41.9
PEOPLE	BEIRUT	59,685	6.4	72,525	7.7	196,260	20.9	96,810	10.3	505,725	53.9
	OTH.CIT.	18,315	5.4	22,530	6.7	77,460	22.9	42,315	12.5	174,150	51.4
	RURAL	28,440	3.4	42,015	5.0	161,490	19.1	94,515	11.1	511,140	60.3
	LEBANON	106,440	5.0	137,070	6.4	435,210	20.5	233,640	11.0	1,191,015	56.1



The above table shows details about the crowdedness of the dwellings. These figures emphasize the trend already perceptible in the last (less detailed) table.

It is very "shocking" to see that 67.1% of the people living in Lebanon live in crowded conditions in 53.8% of the principal dwelling stock. Even more shocking, 56.1% of the total population live in "extremely" overcrowded conditions (see definition on last page) in only 41.9% of the principal dwelling stock.

On the other hand, 18.7% of the principal dwellings are undercrowded, housing 11.4% of the Lebanese population (9.9% being extremely undercrowded and housing only 5% of the population).

Regionally, the rural areas are the most overcrowded with 71.4% of their population living in overcrowded houses (68.3% of their principal stock).

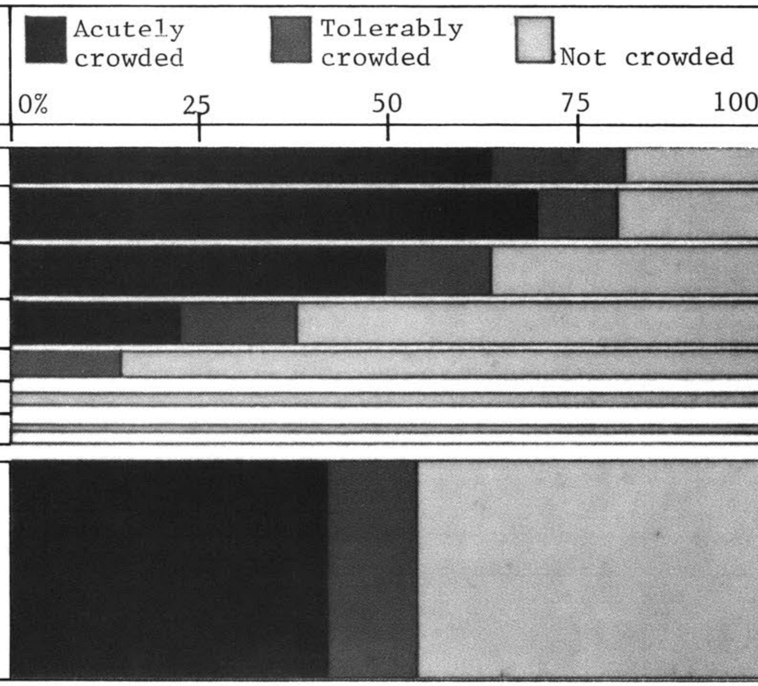
It is interesting to note from the table below, that most of the overcrowded dwellings are the ones having 3 or fewer rooms. 81.0% of the one room dwellings are overcrowded, 80.1% of the two room dwellings, 49.4% of the three room and only 32.8% of the four room dwellings are overcrowded.

It is also interesting to note that 62.0% of the total principal dwelling stock consist of dwellings having three or fewer rooms and that more than 75% of these dwellings are overcrowded.

The reason for the overcrowdedness of these dwellings is probably less due to the unavailability of larger dwellings than to the fact that the overcrowded people can not afford the available larger dwellings.

The existing 37,020 empty dwellings, which comprise 7.7% of the total dwelling stock emphasize the speculative aspect of the Lebanese dwelling industry, where the demand and supply of the dwellings do not necessarily meet. This aspect of the Lebanese housing industry will be detailed later.

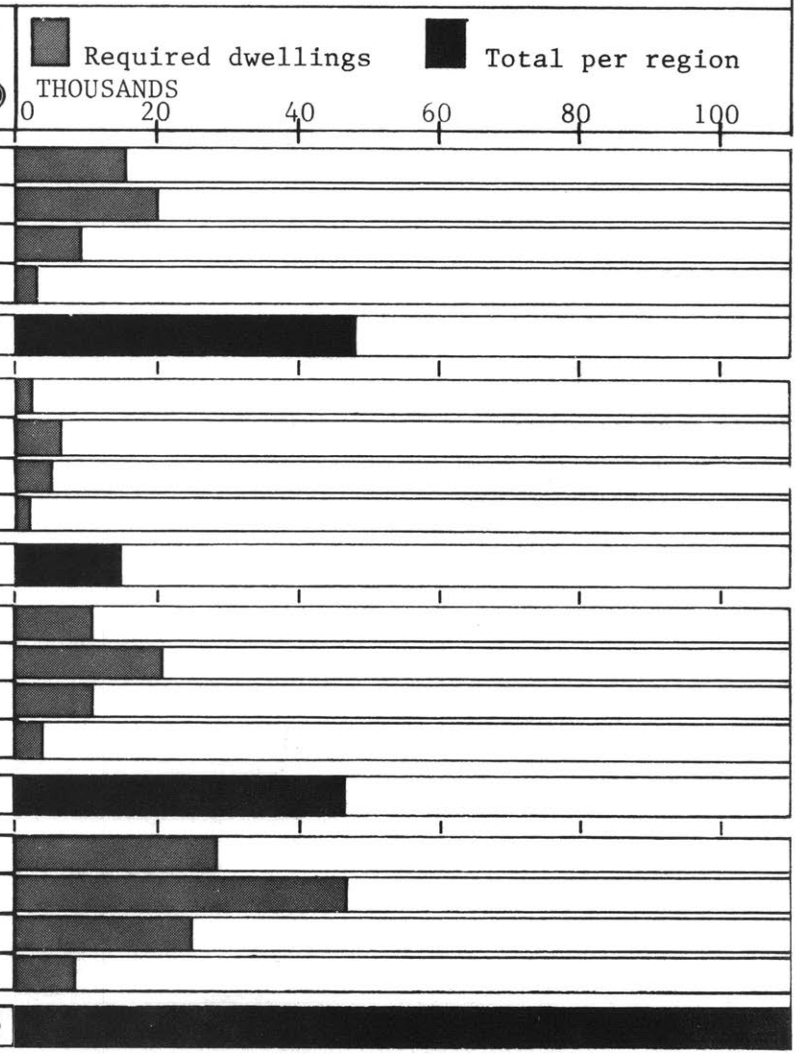
OVERCROWDEDNESS V/S NUMBER OF ROOMS PER DWELLING



ROOMS PER DWELLING	% OF TOTAL DWELLINGS	% OF OVERCROWDED DWELLINGS ACUTELY	TOLERABLY	TOTAL
1	15.1	63.3	17.7	81.0
2	24.2	69.7	10.4	80.1
3	22.7	49.4	13.9	63.3
4	19.7	22.1	10.7	32.8
5	10.5		14.1	14.1
6	4.2			
7	2.8			
TOTAL	100.0	41.9	11.9	53.8

REQUIRED NEW DWELLINGS FROM THE OVERCROWDED DWELLINGS

REGIONS	ROOMS PER DWEL.	ACUTELY CROWDED		PEOPLE PER DWEL.	MAX PEOPLE PER DWEL.	PEOPLE TO RELOCATE		NEEDED DWEL. (5.25P/D)
		PEOPLE	DWELLING			PER DWEL.	TOTAL	
BEIRUT	1	124,230	21,075	5.89	2	3.89	82,080	15,634
	2	194,025	29,535	6.57	3	3.52	105,420	20,080
	3	133,020	16,785	7.92	5	2.92	49,095	9,351
	4	54,450	5,640	9.65	7	2.65	14,970	2,851
	TOTAL	505,725	73,035				251,565	47,916
OTHER CITIES	1	17,475	3,060	5.71	2	3.71	11,355	2,163
	2	57,750	8,385	6.89	3	3.89	32,595	6,209
	3	65,880	8,145	8.09	5	3.09	25,155	4,791
	4	33,045	3,390	9.75	7	2.75	9,315	1,774
	TOTAL	174,150	22,980				78,420	14,937
RURAL AREAS	1	83,355	13,635	6.40	2	4.11	56,085	10,683
	2	195,225	28,770	6.73	3	3.79	108,915	20,746
	3	155,040	19,440	7.98	5	2.98	57,840	11,017
	4	77,520	8,175	9.48	7	2.48	20,295	3,866
	TOTAL	511,140	70,020				243,135	46,312
LEBANON	1	225,060	37,770		2		149,520	28,480
	2	447,000	66,690		3		246,930	47,035
	3	353,940	44,370		5		132,090	25,159
	4	165,015	17,205		7		44,580	8,491
	TOTAL	1,191,015	166,035				573,120	109,165



required additional dwellings

In Lebanon, the main reason for overcrowdedness does not seem to be the lack of available dwellings but rather their prohibitive cost. The important quantity of empty dwellings in the total stock (7.7%) underlines the speculative aspect of the housing industry.

In the present socio-economic conditions, and until anti-speculative laws make some effect, a large number of additional dwellings are needed (at affordable costs) to decrease the acute overcrowdedness of the dwellings stock.

In 1970, as seen in the adjacent table, approximately 110,000 units would be needed to reach tolerable overcrowdedness limits.*

The figures, given the available data, have been calculated in a simplified way: In each region of Lebanon, the table shows the different categories of dwellings (their number of rooms). From the number of rooms, the maximum tolerable number of people is deduced by definition (2, 3, 5, 7). This number (in each category) is subtracted from the existing number of people per dwelling (of the same category), and the difference is multiplied by the number of dwellings of the considered category.

Finally, dividing this last number by the average Lebanese household size (5.25 people per household, 1970), the number of additional dwellings needed is obtained.

This method is simplified, given the framework of this study and the available data. A more sophisticated analysis would be needed to deduce the different categories of dwellings needed.

community facilities

Community facilities are essential to the social and family life of the neighborhood dwellings. Following many case studies, when new housing quarters are built, they lack required community facilities, and

1. people do not move in with enthusiasm, and the critical mass is slowly if ever reached;

2. the area has a greater tendency to generate into slums.

Therefore it is essential that community facilities are provided along with the houses, even before, because once houses are built, facilities are often forgotten. And no housing is complete without the community facilities. To put it in a formula type: Housing = Dwelling + (Utilities and Services) + Community Facilities.

Unfortunately, the time allowed for this work and the lack of available data does not permit a study of available and necessary community facilities. These will, however, be taken into consideration in housing-budget allocation in a global, undetailed way, based on previous case studies.

The reason is that, given a certain housing budget, a proper amount must be left to community facilities and utilities and only the rest of the budget to dwelling construction.

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* *See page 31*

summary of the 1970 housing needs

The number of families in Lebanon in 1970 is 405,375. The dwelling number is 483,908. But 51,068 are being used as secondary dwellings, and 37,020 dwellings remain empty, so only 395,820 are available as principal dwellings.

This means an overcrowdedness, especially due to the fact that 81.7% of the dwellings are of 4 or fewer rooms. From the acutely overcrowded ones, 573,120 people should be given 109,165 extra houses, equivalent to the 5.25 average Lebanese family size. Moreover, in order to make the 395,820 principal dwellings acceptable, 7,965 non-improvable dwellings should be rebuilt. The total number of required new dwellings is therefore 117,130.

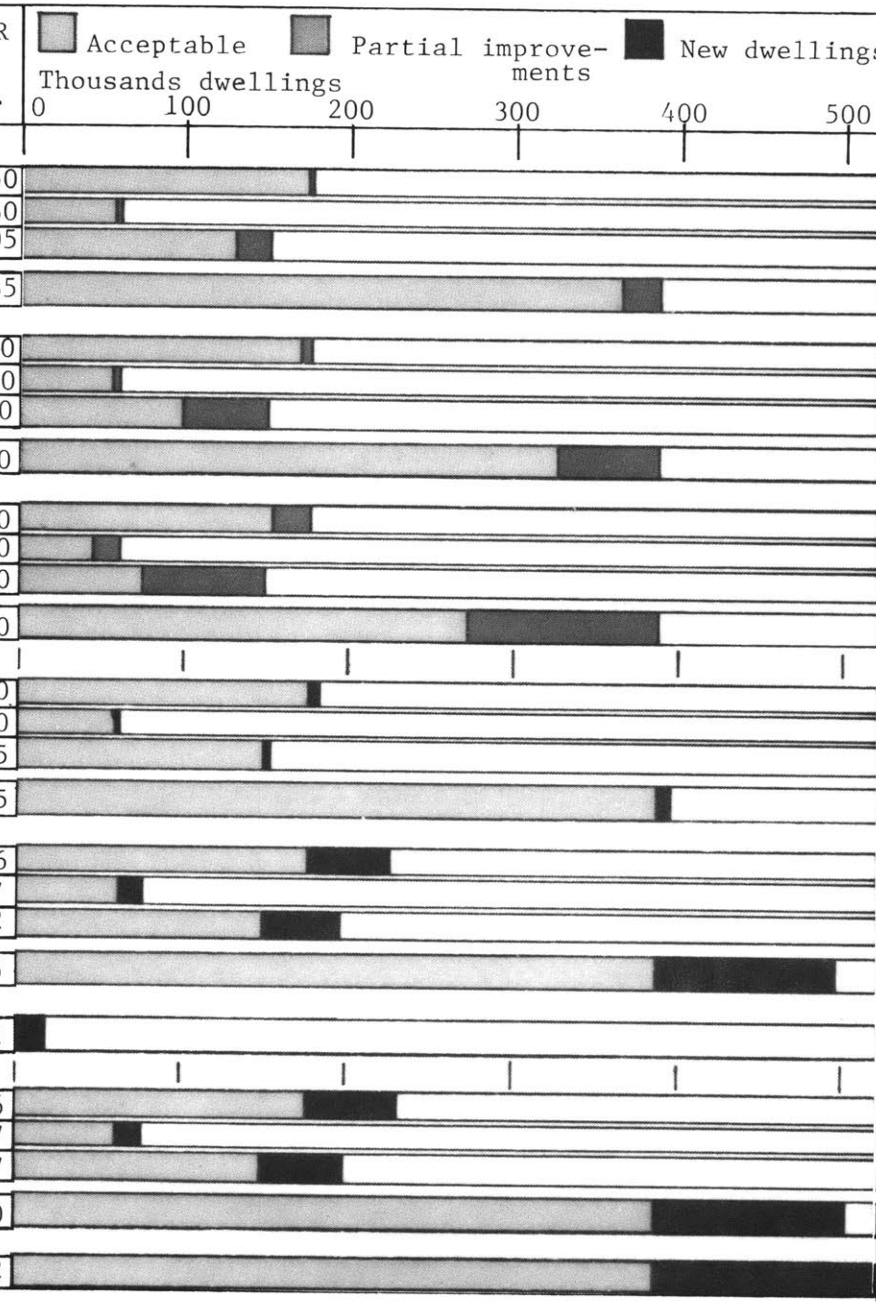
The total number of projected dwellings thus becomes 504,985 units for the established population and 521,687 including the Palestinian refugees and the seasonal workers. This number is larger than the respective numbers of families. This is due to the fact that the existing dwelling stock includes an important number of small dwellings that contain less than the average 5.25 people per household.

It is also important to provide at the same time, if not before, the equipment and utilities required for the well-functioning of the existing dwelling stock. 23,085* dwellings should be provided electricity, 62,640* should be provided running water (and sewers) and 116,130* should be provided with bathroom units.

Cooking and heating could be left to the individuals' initiative as they are easier to obtain than the previous items.

1970 HOUSING REQUIREMENTS: IMPROVEMENTS AND NEW DWELLINGS NEEDS

NEEDS	CATEGORIES	REGIONS	NUMBER OF DWEL.	TOTAL (PROJ.) STOCK
PARTIAL IMPROVEMENTS OF EXISTING STOCK	ELECTRICITY	Beirut	1,950	177,495
		Other Cities	1,230	59,880
		Rural Areas	20,205	150,480
		Lebanon	23,085	387,855
	RUNNING WATER	Beirut	7,380	177,495
		Other Cities	4,200	59,880
		Rural Areas	51,060	150,480
		Lebanon	62,640	387,855
	BATHROOM	Beirut	24,630	177,495
		Other Cities	14,910	59,880
		Rural Areas	76,590	150,480
		Lebanon	116,130	387,855
NEW STOCK NEEDED DUE TO:	PHYSICAL OBSOLESCENCE IN EXISTING STOCK	Beirut	5,370	182,865
		Other Cities	450	60,330
		Rural Areas	2,145	152,625
		Lebanon	7,965	395,820
	OVERCROWDNESS IN EXISTING STOCK	Beirut	47,916	225,411
		Other Cities	14,937	74,817
		Rural Areas	46,312	196,792
		Lebanon	109,165	497,020
	PALEST-FOREIGN	Lebanon	16,702	16,702
TOTAL NEW STOCK NEEDED	LEBANESE POPULATION	Beirut	53,286	230,781
		Other Cities	15,387	75,267
		Rural Areas	48,457	198,937
		Lebanon	117,130	504,985
	WITH PAL.-FOR.	Lebanon	133,832	521,687



SUPPLY AND DEMAND PROJECTION OF HOUSING FROM 1970 TO 1985

The purpose of this section is to project for the 1970 to 1985 period the gap (number and cost), if any, between the supply and demand of housing in Lebanon.

The projection is based on the extrapolation of the housing mechanisms of the last twenty years. It is therefore assumed that no major change will occur in the Lebanese system during the period of projection.

dwelling areas authorized in lebanon from 1959 to 1972

There is no direct data about the number of dwellings built per year. The only data available is the area of construction (M^2) allowed per year in either Beirut or Lebanon in general, from 1950 to 1972*.

The data about Beirut is expressed in two categories: the city (called here Metropolitan) and the suburbs of Beirut.

There are very few details (see adjacent table) about the construction of dwellings, specifically. Most of the data is about the construction in general.

But a parallel drawn between the two can lead to fair estimations of the area of dwelling construction allowed yearly in Lebanon.

Between 1969 and 1972 (the most recent years covered by the available surveys) there is no available data about metropolitan Beirut and the data about Lebanon in general exclude metropolitan Beirut.

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* *Reference 13, pages 178, 182-184*

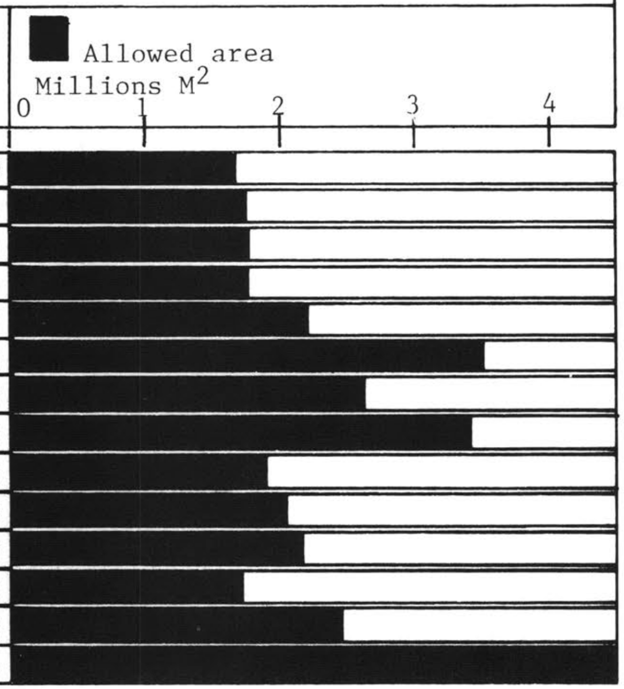
AVAILABLE DATA FOR THE AREAS GIVEN CONSTRUCTION PERMITS IN LEBANON FROM 1950 TO 1973

ALL CATEGORIES OF CONSTRUCTION				YEAR	DWELLING CONSTRUCTION			
BEIRUT		Metro, Sub., Lebanon	LEBANON		LEBANON LESS METRO	Metro, Sub., Lebanon	BEIRUT	
METRO.	SUBURBS	0 Million 2 3 4 5				0 Million 2 3 4 5	SUBURBS	METRO
268,953				1950				
234,140				1951				
321,539				1952				
317,681				1953				
723,037				1954				
642,393				1955				
530,480				1956				
430,929				1957				
389,321				1958				
606,230				1959				
704,211				1960				
664,845				1961				
572,184	298,625		1,911,500	1962				536,303
797,378	444,963		2,456,800	1963				683,909
732,243	1,225,412		3,954,800	1964				680,358
1,016,747	431,105		3,163,900	1965				
1,243,000	590,000		4,134,500	1966				
714,000	503,509		3,268,600	1967				
674,000	544,502		3,314,000	1968				
630,360	381,300		2,504,200	1969	1,595,000		349,000	
580,950	270,700		2,058,200	1970	1,180,000		247,000	
546,186	609,800		2,951,200	1971	1,950,000		567,000	
1,575,800	1,526,100		5,327,400	1972	3,066,000		1,425,000	
1,168,458				1973				

CONSTRUCTION AREAS ALLOWED FROM 1969 TO 1972				
CATEGORY	GENERAL	DWELLINGS		
YEAR	METROP. BEIRUT	METROP. BEIRUT	LEBANON LESS MET. BEIRUT	TOTAL LEBANON
1969	630,360	578,670	1,595,000	2,173,670
1970	580,950	533,312	1,180,000	1,713,312
1971	546,186	501,399	1,950,000	2,451,399
1972	1,575,800	1,446,584	3,066,000	4,512,584

DWELLING AREAS ALLOWED IN LEBANON FROM 1959 TO 1972

YEAR	AREA (M^2)
1959	1,672,000
1960	1,743,000
1961	1,770,000
1962	1,764,000
1963	2,197,000
1964	3,522,000
1965	2,635,000
1966	3,423,000
1967	1,896,000
1968	2,034,835
1969	2,173,670
1970	1,713,312
1971	2,451,399
1972	4,512,584



There are, however, data about metropolitan Beirut for the period between 1962 and 1964. And it is interesting to note that the ratio of dwelling construction to general construction is farily constant (around 91.8%):

It is for metropolitan Beirut: 93.7% in 1962
85.8% in 1963
92.4% in 1964

And for the suburbs of Beirut: 91.6% in 1969
91.2% in 1970
93.0% in 1971
90.3% in 1972.

It is therefore possible to deduce the dwelling areas for metropolitan Beirut from 1969 to 1973, by comparison with the total construction areas available for metropolitan Beirut for the same period.

The estimations are shown in the adjacent upper table; they include the available figures for Lebanon as a whole.

These results seem to fit quite precisely the estimations in "La crise du logement au Liban"* for the period between 1959 to 1967. The adjacent lower table shows the estimations for the whole period between 1959 and 1972 for Lebanon.

It is interesting to note the decrease in the allowed area for the period just after 1966. It is probably due to the instability following the crush of the "Intra Bank" in Beirut in 1966 and the 1967 Arab-Israeli war.

These figures, however, only show the areas given a permit of construction, and not necessarily the built areas.

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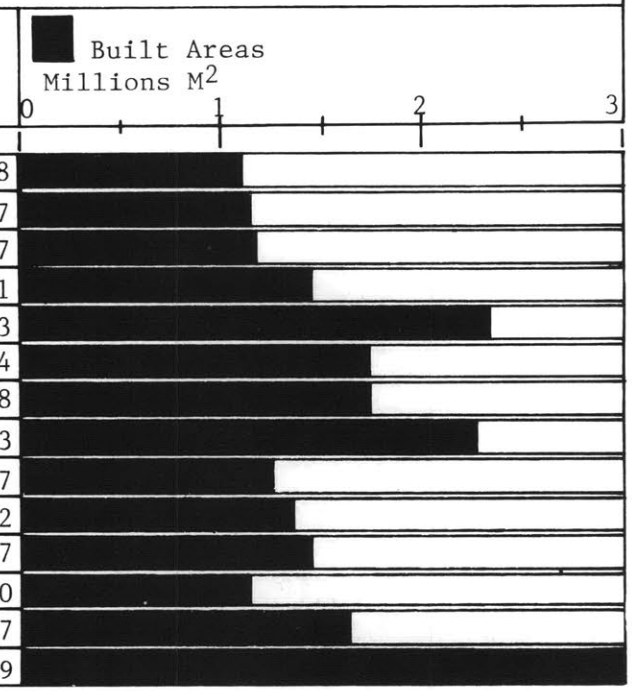
* *Reference 43, page 48*

dwelling areas built in lebanon from 1960 to 1973

DWELLING AREAS BUILT IN LEBANON FROM 1960 TO 1973

YEAR	AREA (M^2)
1960	1,105,378
1961	1,152,317
1962	1,170,167
1963	1,452,461
1964	2,328,433
1965	1,740,044
1966	1,742,028
1967	2,262,983
1968	1,253,467
1969	1,345,252
1970	1,437,037
1971	1,132,690
1972	1,620,647
1973	2,983,319



This section will try to estimate the dwelling areas built in Lebanon from the information about the areas authorized in the country.

The construction permit is not free of charge, it is proportional to the volume of construction involved. Permits are therefore generally required when the commitment to build is quite final. Financial or other reasons may, however, delay or cancel the implementation of certain permits.

Unfortunately, there is no data about the proportion of implemented permits. From observation, however, 85% seems a fair estimation of implemented permits and one year seems the average time of implementation. (The actual time may vary from a few months to a few year, following the importance and/or difficulty of the specific projects.)

On the other hand, these figures are gross areas that include non-dwelling areas. Some available studies* estimate that 2/9 of the "dwelling construction areas" are used for related facilities, mainly shops, parking, shelter and outside circulation.

Therefore, in order to obtain the dwelling areas built in a particular year (adjacent table), the authorized area (last page table) of the precedent year is multiplied by 85/100 and by 7/9.

For example, the area built in 1960 is equal to the area authorized in 1959 (1,672,000 M^2) multiplied by 85/100 and 7/9. It is therefore equal to 1,105,378 M^2.

These coefficients are approximate estimations that are not proven. They are used as such in this study due to the impossibility of getting more precise information, but they should and could be checked by surveys, given more time and resources.

Finally, these figures do not give a clear idea of the number and type of dwellings built during the period considered. To obtain these figures, the average area of the built dwellings should be estimated. This will be done in the next section.

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* *Reference 43, page 51*

average dwelling area

To obtain the number of dwellings built in Lebanon during the last few decades, the total areas of built dwellings will be divided by the estimated average dwelling area.

This method is only an approximate method because the process of "averaging" contains inherent simplifications that are unavoidable.

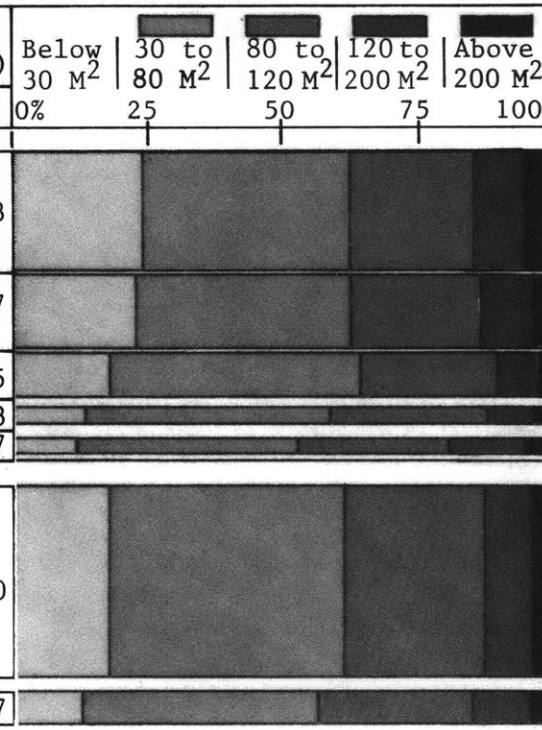
The table below shows the different categories of areas for the dwellings built in Lebanon from 1920 to 1970*.

It is interesting to note the decrease in the proportion of the smallest dwellings (smaller than 30 M^2), while the larger ones have increased through the 1920-70 period, and especially during the 60-70 period.

* *Reference 12, page 10*

EVOLUTION OF THE DIFFERENT CATEGORIES OF THE PRINCIPAL DWELLINGS AREAS BUILT IN LEBANON FROM 1920 TO 1970

YEARS	BELOW 30 M^2 (Av.=25 M^2)		30 - 80 M^2 (Av.=55 M^2)		80 - 120 M^2 (Av.=100 M^2)		120 - 200 M^2 (Av.=160 M^2)		ABOVE 200 M^2 (Av.=260 M^2)	
	Number	%	Number	%	Number	%	Number	%	Number	%
BEFORE 1920	11,955	24.0	19,230	38.5	11,640	23.3	4,350	8.7	2,595	5.2
1920 - 1945	15,600	22.6	27,330	39.6	17,055	24.7	6,840	9.9	2,100	3.0
1945 - 1960	27,870	17.5	74,820	47.0	40,545	25.5	11,850	7.4	3,810	2.4
1960 - 1965	9,360	13.0	32,685	45.5	21,015	29.3	6,315	8.8	2,340	3.3
1965 - 1970	5,175	11.6	18,360	41.2	12,330	27.7	6,315	14.2	2,295	5.2
ALL AREAS	70,275	17.8	172,950	43.7	102,750	26.0	35,715	9.0	13,140	3.3
1960 - 1970	14,535	12.5	51,045	43.9	33,345	28.7	12,630	10.9	4,635	4.0



This might show an upward economic mobility of the users or a speculative orientation of the dwelling-supply mechanisms. The latter seems the more important factor because of the following indicators:

1. The fact that the large dwellings (120 to 200 M^2) have most increased (from 8.7% in 1920 to 14.2% in 1970) is an indication of the speculative trend of the housing-supply mechanisms.

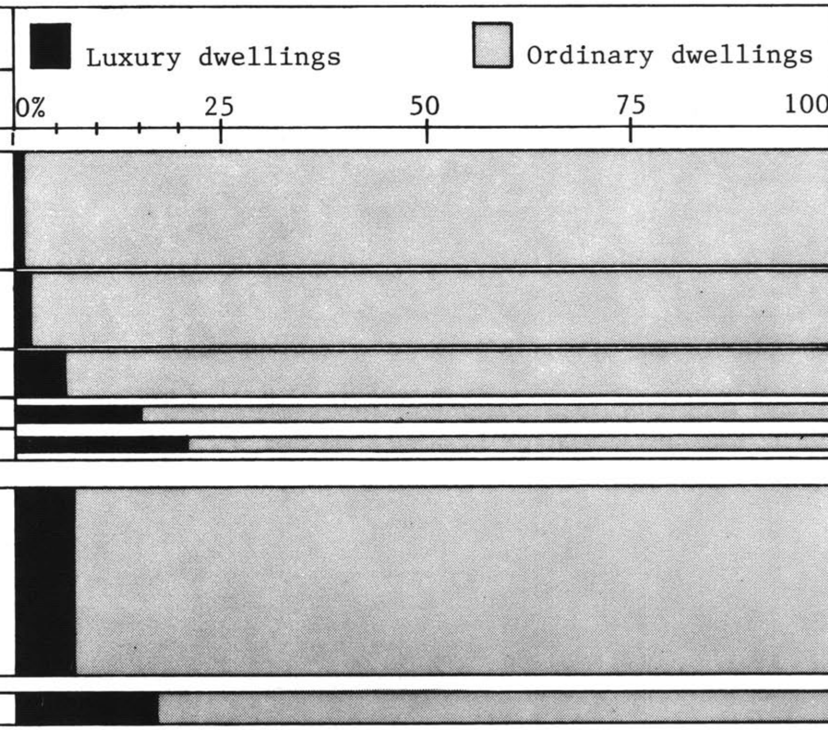
2. Also, looking at the 1960-70 period figures, it is surprising to see that 43.6% of the built (principal) dwellings are larger than 80 M^2), and 14.9% are even larger than 120 M^2. These very high proportions indicate an economic distortion between the supply and the demand of housing.

3. This indication is further emphasized in the table below, which shows the evolution of the proportion of luxury to non-luxury dwellings.

A luxury dwelling is defined here (and legally in Lebanon) as a dwelling having current hot water, heating and air-conditioning, a mail-box and a doorman.

EVOLUTION OF THE PROPORTION OF THE LUXURY V/S ORDINARY PRINCIPAL DWELLINGS BUILT FROM 1920 TO 1970 IN LEBANON

YEARS	LUXURY		ORDINARY		ALL PRINCIPAL	
	Number	%	Number	%	Number	%/Tot.
BEFORE 1920	390	0.8	49,500	99.2	49,890	12.6
1920 - 1945	1,185	1.7	67,860	98.3	69,045	17.4
1945 - 1960	9,870	6.2	149,400	93.8	159,270	40.2
1960 - 1965	10,725	14.9	61,110	85.1	71,835	18.1
1965 - 1970	9,315	20,9	35,235	79.1	44,550	11.3
ALL YEARS	31,515	8.0	364,305	92.0	395,820	100.0
1960 - 1970	20,040	17.2	96,345	82.8	116,385	29.4



The dramatic increase of luxury dwellings (from 0.8% in 1920 to 20.9% in 1970) is certainly much quicker than the upward mobility of the population. Also the main luxury jump is around 1960, which coincides with the new rent law, passed in 1960, fixing the rents of all the non-luxury dwellings.

As a result, people started producing an ever-increasing number of luxury dwellings, artificially attracted by a fluid, rich housing demand resulting from the economic boom experienced in Beirut, which in turn resulted from the neighboring oil markets.

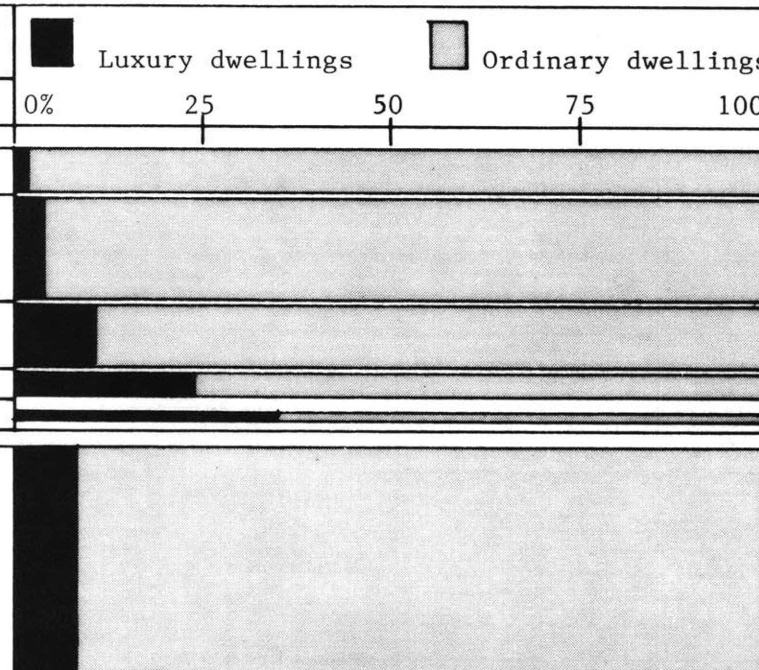
It made more and more sense to the developers to invest in luxury dwellings even with the relatively high risk of keeping them empty some of the time.

This explains the large proportion of empty dwellings in the dwelling stock surveyed in 1970 (7%), accompanied by acute overcrowdedness in more than 43% of the principal stock.

Naturally, as shown below, the luxury dwellings are in greater numbers in the categories of large dwellings, especially those above 80 M^2. They even reach 34.5% of the stock of dwellings larger than 200 M^2.

AREAS OF THE PRINCIPAL DWELLINGS: LUXURY AND ORDINARY

AREA CATEGORIES (M^2)	TOTAL		LUXURY		ORDINARY	
	%/Tot.	Number	Number	%	Number	%
LESS THAN 30	17.8	70,275	1,170	1.7	69,105	98.3
30 TO 80	43.7	172,950	6,545	3.8	166,410	96.2
80 TO 120	26.0	102,750	10,755	10.5	91,995	89.5
120 TO 200	9.0	35,715	8,445	23.6	27,210	76.4
MORE THAN 200	3.3	13,140	4,530	34.5	8,650	65.5
ALL AREAS	100.0	395,820	31,515	8.0	364,305	92.0



The average dwelling area, for the whole period, is quite high, relatively to many countries, industrialized or not. This average, nevertheless, shoots up dramatically since 1960, reaching an average of 89.6 M^2 during the period between 1965 and 1970.

This high figure does not, however, imply a general available opulence among the people, but rather, as could be noticed from the last two tables, that a relatively small proportion of very large dwellings rise artificially the general averages.

But as the purpose here is to get the number of dwellings and not their sizes, these averages can be used without affecting much the results.

EVOLUTION OF THE AVERAGE DWELLING AREA

YEARS	PRINCIPAL DWELLINGS		
	Number	% of total	Average area (M^2)
BEFORE 1920	49,890	12.6	78.1
1920 - 1945	69,045	17.4	75.9
1945 - 1960	159,270	40.2	74.0
1960 - 1965	71,835	18.1	80.3
1965 - 1970	44,550	11.3	89.6
ALL YEARS	395,820	100.0	77.6
1960 - 1970	116,385	29.4	83.8

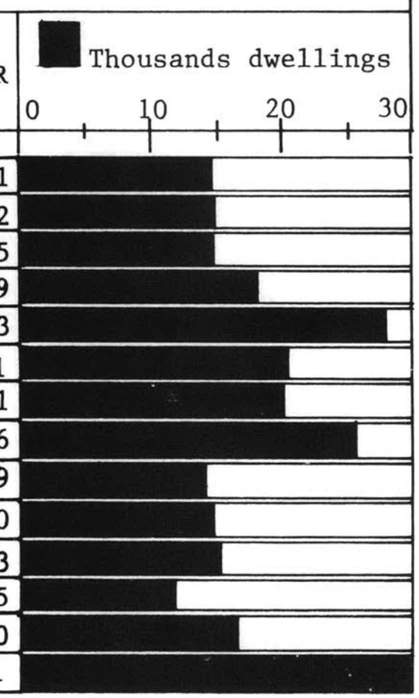
dwellings built in lebanon from 1950 to 1973

The table below shows the number of dwellings built yearly from 1960 to 1973. The built areas are shown on the second column of the table, the calculated yearly average areas on the third and the number of dwellings on the last one, (obtained by dividing the yearly built areas by the yearly average dwelling area).

As in the rest of the tables a noticeable break is clear after the Intra-Bank crash and the 1967 Arab-Israeli war.

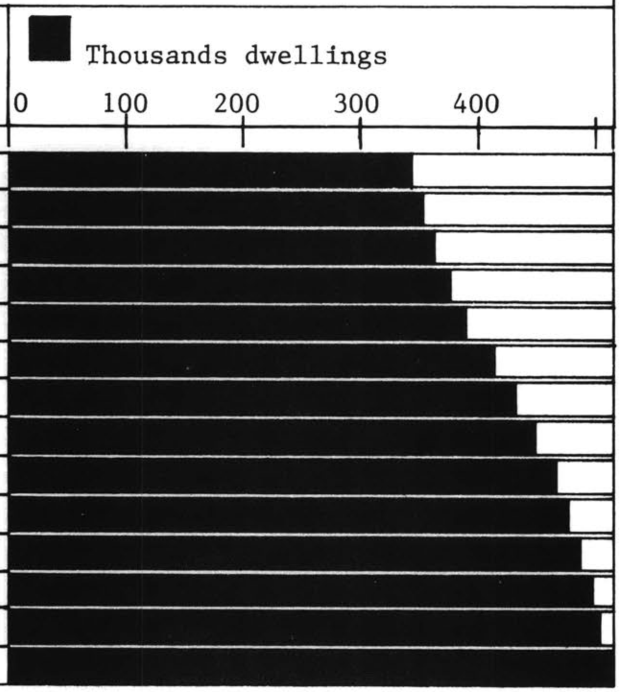
DWELLINGS BUILT FROM 1960 TO 1973

YEAR	BUILT AREA (M^2)	AVERAGE AREA (M^2)	NUMBER
1960	1,105,378	75.60	14,621
1961	1,152,317	77.48	14,872
1962	1,170,167	79.36	14,745
1963	1,452,461	81.24	17,879
1964	2,328,433	83.12	28,013
1965	1,740,044	85.00	20,471
1966	1,742,028	86.88	20,051
1967	2,262,983	88.76	25,496
1968	1,253,467	90.64	13,829
1969	1,345,252	92.52	14,540
1970	1,437,037	94.40	15,223
1971	1,132,690	96.28	11,765
1972	1,620,647	98.16	16,510
1973	1,983,319	100.04	29,821



DWELLINGS AVAILABLE FROM 1960 TO 1973

YEARS	NUMBER
1960	341,269
1961	352,269
1962	363,603
1963	374,602
1964	388,595
1965	412,483
1966	428,667
1967	444,275
1968	465,120
1969	474,207
1970	483,908
1971	494,140
1972	500,845
1973	512,181



In order to be as accurate as possible, the averages for the two five-year periods (1960-65 and 1965-70) have been broken into yearly averages.

This assumes a constant increase for this 10-year period. Such an assumption is only approximate, but it is certainly more realistic than the single averages for each five years.

The adjacent left table shows the available number of dwellings including the existing stocks. A rate of obsolescence is taken into consideration to remove from the existing stock all the dwellings that have to be discarded.

There is no direct information about the rate of obsolescence. The Wardini study* estimates this rate at 1% yearly. This figure will be used here until more precise and direct estimations become available.

The basis of the computations will be the 1970 surveyed total number of dwellings (483,908) to which will be applied the rate of obsolescence and the annual newly built dwellings. For the post 1970 years, the new yearly dwellings will be added to the previous year's stock while the obsolescence rate will be deducted. For the pre-1970 years, it will be the opposite, as exemplified below:

Calculation for 1971:

Basis: 1970 surveyed dwelling stock:	483,908
New dwellings built in 1970 (added):	+15,223
	499,131
1970 annual obsolescence (deducted):	- 4,991
Dwelling stock available in 1971:	494,140

Calculation for 1969:

Basis: 1970 surveyed dwelling stock:	483,908
1969 annual obsolescence (added):	+ 4,839
	488,747
1969 new dwelling built (deducted):	-14,540
Dwelling stock available in 1969:	474,297

* *Reference 43, page 57*

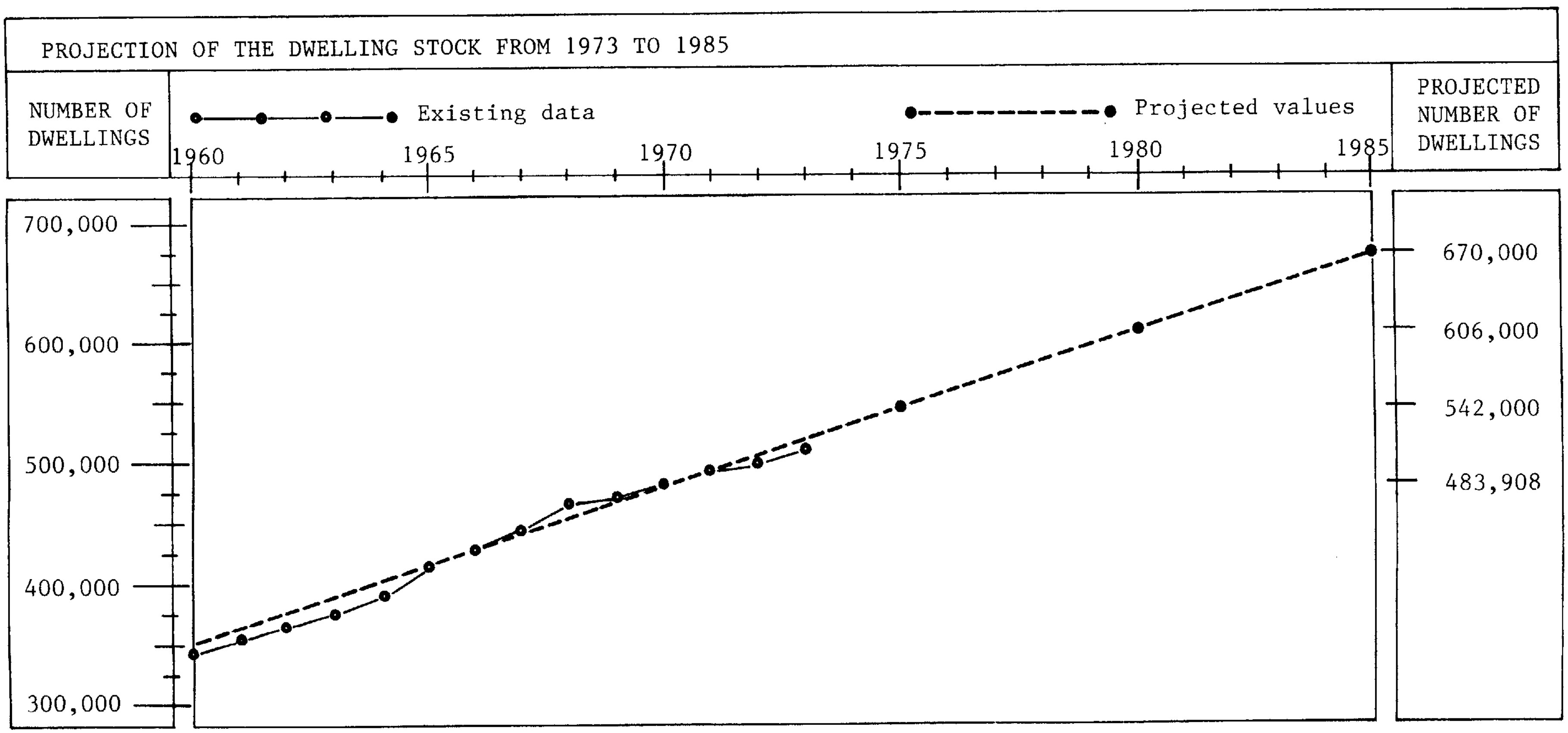
projection of the dwelling stock from 1973 to 1985

The graph below shows the projection of the available dwelling stock from 1973 to 1985. The projection is based on the extrapolation of the estimated data from 1960 to 1973. This period is not very long, but as the increase of the dwelling stock seems quite linear for the whole period, a rough projection seems possible.

The projection assumes that no major socio-economic change will occur during the 1975-85 period, that would change significantly the housing supply mechanisms.

The right column summarizes the results of the projections for 1975, 80 and 85. These figures, however, do not represent the real available stock as many dwellings remain either empty or are secondary vacation dwellings for the upper-income groups of the population.

These marginal dwellings are quite a big proportion of the 1970 surveyed dwelling stock: 7.7% for the empty dwellings and 10.6% for the secondary dwellings, making a total of 18.3% of the total stock.



What may be done here is to estimate the probable gap between the projected demand of dwellings and the projected market supply if these two mechanisms continue to evolve the way they have evolved during the last 15 years.

It is unfortunately very difficult to forsee the evolution of these proportions because many different issues are intricately related to the problem. Such issues might be the modification of the rent law, the promotion of anti-speculative laws, or, externally, major social or political developments in the region.

* *Average number calculated from data in reference 12, page 21*

** *See page 31*

*** *See page 20*

the dwelling needs for the 1975-1985 period

The next table shows the evolution of the uncovered dwelling needs from 1970 to 1985 and the consequent yearly extra dwellings to be built from 1975 to 1985 to cover all the population's needs by 1985.

The starting points of the comparison are the population and the total dwellings projections (columns 2 and 3). From the total number of dwellings the principal dwellings stock is obtained from the assumption that the proportion of principal to total dwellings will remain approximately the same as in 1970 (assuming that the socio-economic conditions of the country remain as they were during the last 15 years).

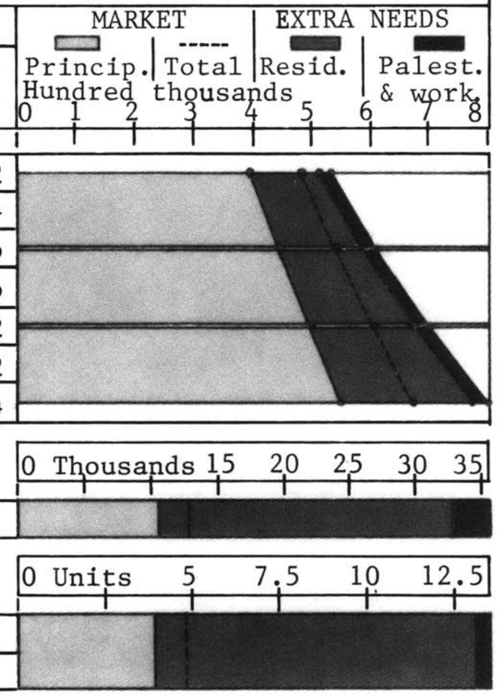
The number of people per principal dwelling is obtained by dividing the projected population by the projected number of principal dwellings. The maximum tolerable number of people per dwelling is estimated to be 4.24 people per dwelling. It corresponds to the surveyed 1970 principal dwellings, having an average of 2.59 rooms,* which (from the overcrowdedness definition**) corresponds to a maximum tolerable number of 4.24 people per average dwelling. Here also the conditions are assumed to remain the same during the 1975-1985 period.

The number of people to relocate are first obtained per dwelling unit, and then for the total number of dwelling units. The obtained figures are only approximate figures due to the fact of dealing with average figures.

The consequent extra dwelling needs are calculated on the basis of the estimated evolution of the family size during the 1975-1985 period.***

PROJECTED POPULATION, MARKET SUPPLIED DWELLINGS AND UNSUPPLIED DWELLINGS DEMAND IN LEBANON FROM 1970 TO 1985

YEARS	POPULATION	MARKET SUPPLIED DWELLINGS		PEOP. PER PRIN. DWEL.	PEOPLE TO RELOCATE		FAMILY SIZE	EXTRA DWELLINGS NEEDS		
		TOTAL	PRINCIP.		PER DWEL.	TOTAL		RESIDENTS	PALEST. & WORK.	TOTAL
1970	2,126,325	483,908	395,820	See p. 37		573,120		117,130	16,702	133,832
70 - 75	336,668	58,092	47,519	7.08	2.84	135,187	5.20	25,998	3,196	29,194
1975	2,464,993	542,000	443,339			708,307		143,128	19,898	163,026
75 - 80	392,610	64,000	52,352	7.50	3.26	170,638	5.10	33,458	3,978	37,436
1980	2,857,603	606,000	495,691			878,945		176,586	23,876	200,462
80 - 85	455,142	64,000	52,352	8.69	4.45	233,170	5.00	46,634	4,568	51,202
1985	3,312,745	670,000	548,045			1,112,115		223,220	28,444	251,664
YEARLY: 75 TO 85		12,800	10,470					22,322	2,844	25,166
YEARLY PER 1000 CAPITA 1975 - 1985	PART.	4.8	3.9					8.3		9.0
	TOTAL	4.8	3.9					13.1		13.5



Finally, the Palestinian refugees and the seasonal workers needs are taken into consideration (estimated before*). The total needs are expressed in the last column.

The upper series of rows indicate the evolution of the projected situation from 1970 to 1985. It is clear from the adjacent graph that the gap is quickly increasing due to the faster growth of the needs relatively to the supply. By 1985, the number of dwellings needed but not supplied by the market will reach 251,664 units if the conditions existing from 1960 to 75 will remain unchanged till 1985. (They were 117,130 in 1970.)

Long term policies should be developed to help diminish the increasing emergency of the uncovered housing needs. Until such policies prove effective, the intermediate row shows that each year during the 1975-85 period, 22,322 dwellings (25,166 including the Palestinians and foreign workers) should be built above the 10,470 principal dwellings produced by the existing private market.

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* *See page 21*

The lower two rows show the dwelling supply expressed yearly from 1975 to 1985 per 1,000 people. The private market produces 4.8 dwellings per 1,000 capita, only 3.9 dwellings are principal dwellings. To cover all the needs by 1985, an extra 8.3 dwellings should be produced yearly per 1,000 people, raising the total principal output to 13.1 dwellings per 1,000 capita (13.5, including Palestinians and foreign workers).

The United Nations scholars suggest that a target for Third World countries should be between 8 and 10 dwellings per year, per 1,000 capita*. Lebanon produces only 4.8 dwellings and especially only 3.9 principal dwellings per 1,000 capita, while 13.1 to 13.5 dwelings would be needed to cover all the needs of the country by 1985.

The next chapter will deal with the resources related to the problem of housing in Lebanon. The resources will be estimated, then optimized alternatives will be discussed and different strategies offered to cover as much of the defined housing needs as possible.

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* *Reference 25, page 6*

the financial resources

In the previous chapter the required improvements of the existing dwelling stock and the additional needed dwellings have been defined in detail.

The following chapters are devoted to the analysis of all the resources that are related to the problem of housing, to the definition of optimization criteria for the optimal use of the estimated resources to answer as much of the defined housing needs as possible.

These resources are essentially the following:

- Capital
- Labour
- Technology
- Building materials
- Land
- Environment

These resources will be individually estimated and their optimal use will be discussed in the following chapters dealing with the different issues relating to the problem of housing. These issues include:

- Financial considerations
- Environmental considerations
- Social considerations
- Urban considerations
- Design considerations
- Construction considerations

This chapter is devoted to the first of these considerations: The financial considerations.

The financial resources will be estimated at two different levels: the individual or private level and the governmental or public level.

THE PRIVATE FINANCIAL RESOURCES

incomes and rents

Households can usually afford only a certain segment of their incomes for housing as they have other necessary expenditures. Food, clothing, transportation, schooling and health are the vital ones that share the budget allocation of a family. It is commonly recognized that low- and medium-income families should not spend more than 20% of their income on housing. This figure is nothing but an empirical rule of thumb that gives an approximate idea of what a household can generally afford in housing, given its income level.

As in many Third-World countries, there is no detailed data about the income levels of the people in Lebanon. Fortunately, there is some information in Lebanon about the proportions of household consumption.

The adjacent table shows the limited information* available about the expenditures distribution of an "average" household (spending less than 6,000 L.L. annually).

The table shows both the increase in the cost of living and the proportion of the different categories of consumption from 1966 to 1973.

Consumption has been surveyed instead of income because people have a tendency to understate their incomes from fear of tax-oriented surveys.

It is interesting to note that although the cost of living has increased by almost 22% from 1966 to 1973, the relative cost of housing has decreased from 23.46 percent of the total housing consumption in 1966 to 20.25% in 1973.

These figures seem to indicate that the cost of housing is within acceptable limits for the average household. But the following factors alter somewhat this interpretation:

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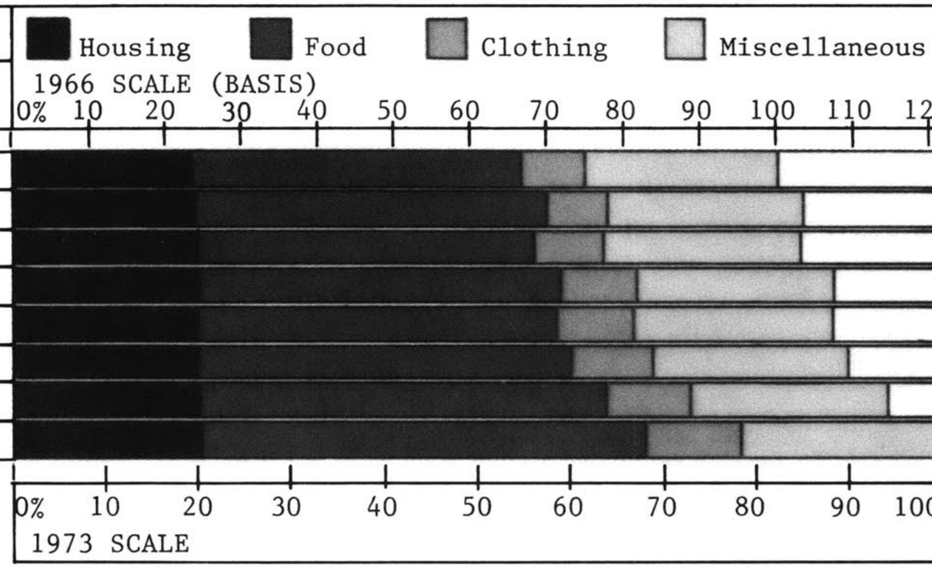
* *Reference 13, page 246*

HOUSEHOLD CONSUMPTION IN LEBANON FROM 1966 TO 1973

YEARS	CATEGORIES OF CONSUMPTION					YEARLY INCREASE (BASIS 1966)
	HOUSING	FOOD	CLOTHING	MISCEL-LANEOUS	TOTAL	
1966	23.46	42.80	8.55	25.20	100.00	100.00
1967	22.82	44.50	7.99	24.69	100.00	103.68
1968	23.24	42.99	8.64	25.19	100.00	103.13
1969	22.35	44.30	8.97	24.39	100.00	107.64
1970	22.47	44.11	9.13	24.31	100.00	107.70
1971	22.20	44.55	9.72	23.53	100.00	109.43
1972	21.33	46.21	9.85	22.61	100.00	114.68
1973	20.25	47.76	10.21	21.82	100.00	121.70



1. A family spending 6,000 L.L. per year in 1970 is a medium low-income family. An important proportion of households are quite below this level. For these people, the proportion of their income that they have to devote for housing is probably quite higher. Unfortunately, there is no detailed data that would show the ratios for detailed groups of population.

2. From the study of the existing stock in 1970 (first chapter) it is evident that what the average household gets with the 20.25% of its budget is often an acutely overcrowded dwelling (56.1% of the households) or a dwelling without basic utilities (running water: 17.1% of the households) or basic equipments (bathroom: 31.1% of the households).

Therefore, rather than showing a reassuring figure, the table shows quite a grim picture. It indicates that more than half the households have to pay up to 25% of their budget to get small dwellings (relative to their needs) lacking utilities and equipment where they have to live in overcrowded conditions because they cannot afford larger dwellings.

The apparently optimistic trend between 1966 and 1973, showing a decrease in the housing expenditure from 25.20% to 20.25% of the total expenditure, indicates the worsening of other categories of consumption, mainly the food consumption due to the specially high level of inflation in food products.

Moreover, due to the increasing number of luxury dwellings, built to avoid the rent control applied to the non-luxury dwellings, the rents will increase more quickly than every before and affect a very large proportion of the newly-built dwellings.

As a matter of fact, it is known that from 1970 to 1975 the low-income rents went up 100%, the medium and upper-income rents went up 125% and the offices 300%. Their impact is still low on the table of averages because they are still a small part of the total number of dwellings. But very quickly, in the next decade, the increase will be apparent even on average tables.

The adjacent table shows the rental distribution in Lebanon for 1970.* Rents have been chosen as a common indicator for comparison purposes. In the cases of ownership, the equivalent rent value has been therefore indicated.

The columns show the different regions considered (Beirut, the other cities and the rural areas), and the rows indicate the number of people in each region following their category of rent.

The flat curve, suddenly rising sharply, shows that the majority of households (84% for Lebanon in general) have relatively low rents (less than 3,000 L.L. per year) while a minority (7%) have to cope with higher rents (going up to more than 10,000 L.L/ year sometimes).

This would be an acceptable distribution of rents if the majority of the low rents were equivalent to fair housing conditions. This is not the case as seen in the precedent paragraph. More than half the households are acutely overcrowded and about the third lack the most elementary utilities or equipments.

As a result, what the graph really shows is that a majority of the households can not afford high rents and are therefore badly-housed while a small minority can afford to be well-housed.

This is probably the case in many countries, industrialized or not, except that the present Lebanese curve is much too extreme. A flatter curve is much healthier.

Also typical of many Third-World countries is the strong inequity of wealth (rents) between the capital of the country (Beirut, in this case) and the rest of the country. Around 85 to 90% of the rents above 3,000 L.L. per year are in Beirut while 70% of the rents below 500 L.L. per year are located in the rural areas.

These proportions are again too extreme in Lebanon. A more balanced situation would have been much healthier for the general future development of the country.

However, in the rural areas land is less scarce and speculation much less important. As a result, land is much cheaper and the subsequent housing rents much lower compared to Beirut's prices. As a result, a direct rent comparison between Beirut and the rural areas looks worst than it is in reality.

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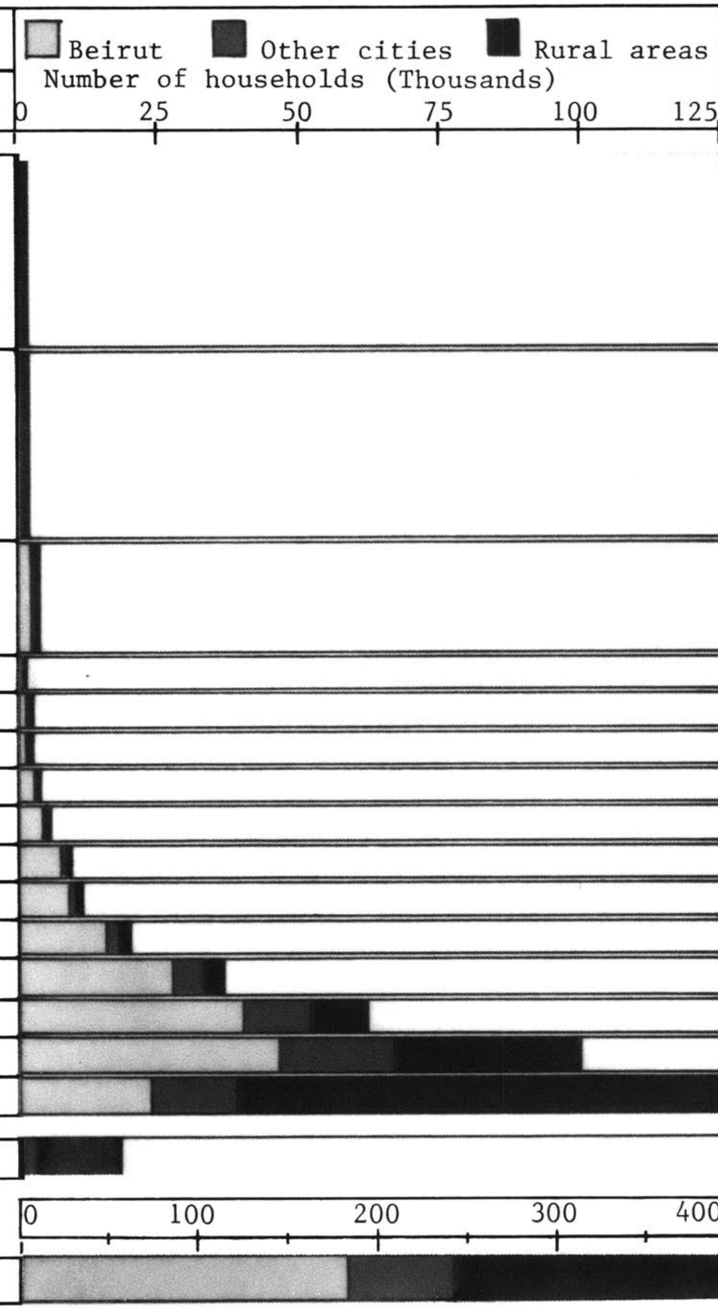
* *Reference 12, page 36*

DISTRIBUTION OF RENTS IN THE DIFFERENT ZONES OF LEBANON IN 1970

RENTS L.L./YEAR	BEIRUT		OTHER CITIES		RURAL AREAS		TOTAL LEBANON	
	Number	%	Number	%	Number	%	Number	% Total
Above 10,000	870	85.3	45	4.4	105	10.3	1,020	0.3
10,000-7,500	1,095	97.3	15	1.3	15	1.3	1,125	0.3
7,500-6,000	2,700	93.7	105	3.6	75	2.6	2,880	0.7
6,000-5,500	690	97.9	15	2.1	0	0.0	705	0.2
5,500-5,000	1,605	89.9	60	3.4	120	6.7	1,785	0.5
5,000-4,500	1,650	92.4	90	5.0	45	2.5	1,785	0.5
4,500-4,000	2,850	88.8	135	4.2	225	7.0	3,210	0.8
4,000-3,500	4,305	90.5	285	6.0	165	3.5	4,755	1.2
3,500-3,000	7,125	84.5	810	9.6	495	5.9	8,430	2.1
3,000-2,500	8,745	82.9	855	8.1	945	9.0	10,545	2.7
2,500-2,000	15,225	79.6	2,190	11.5	1,695	8.9	19,110	4.8
2,000-1,500	27,030	74.6	5,500	15.2	3,630	10.0	36,210	9.1
1,500-1,000	39,450	64.0	12,090	19.6	10,125	16.4	61,665	15.6
1,000-500	45,825	46.2	20,505	20.7	32,910	33.2	99,240	25.1
Below 500	23,115	18.4	15,390	12.3	87,000	69.3	125,505	31.7
Undefined	585	3.3	2,190	12.3	15,075	84.5	17,850	4.5
Total	182,865	46.2	60,330	15.2	152,625	38.6	395,820	100.0



the households requiring a subsidy

The question that can not be answered precisely here is the income levels and locations of the people that will not be able to solve their housing needs through the existing market supply mechanisms.

The only possible estimation from the available data shown in the two last tables can only be very approximate. The "guesses" are based on the fact that the 25,000 households estimated in the last chapter are probably part of the 60% of the households that can not afford large enough or well-equipped dwellings.

In the last chapter* the number of households that would have to be provided with help from the government to get a dwelling was estimated to be around 25,000 households per year, from 1975 to 1985, to cover all past and present needs in 1985.

The adjacent table shows a detailed description of incomes. These details have been approximated as precisely as possible based on the few data gathered above and on personal observations. They are very rough and serve here mainly as illustrations of the methodology. In real cases, however, similar data should be obtained from precise surveys.

Also, for illustration purposes, approximately 60% of the households have been assumed to be in rural areas and the rest in urban areas. This ratio corresponds to the ratio of the total population in Lebanon.

For reasons of simplicity, the lower-income groups have been assumed to be all located in rural areas while the upper groups are assumed to be in urban areas.

This simplistic representation is enough for the present illustrative purposes of the case. It shows the general trends, but does not represent the possible cases of very poor urban population, especially among the new migrants to the big city.

In real cases, the representation should be more accurate to be practical. Very detailed surveys and representations could be possible with the use of computer-aided techniques.

These 25,000 households, as seen in the last chapter, are below the market's supply level. The right column shows the subsequent 20% housing monthly budget limit to be afforded by the hypothetical households.

The next section will deal with the government participation in completing the individual efforts of the households to get their housing needs fulfilled.

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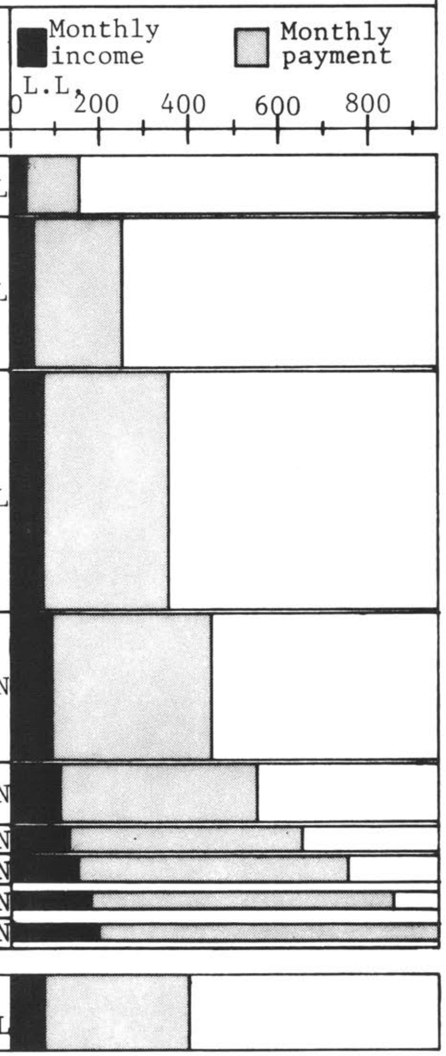
* *See page 50*

ESTIMATED YEARLY HOUSEHOLDS TO GET GOVERNMENTAL HELP

NUMBER OF HOUSE-HOLDS	AVERAGE MONTHLY INCOME (L.L.)	AVERAGE MONTHLY PAYMENT (L.L.)	ZONE
2,000	150	30	RURAL
5,000	250	50	RURAL
8,000	350	70	RURAL
5,000	450	90	URBAN
2,000	550	110	URBAN
1,000	650	130	URBAN
1,000	750	150	URBAN
500	850	170	URBAN
500	950	190	URBAN
25,000	400	80	60 % RURAL



THE PUBLIC FINANCIAL RESOURCES

the present situation

It is quite difficult, in a limited study like this one, to estimate meaningfully what the government of a country can or should devote for its housing purposes.

General models are difficult to apply, because they are often more academic than practical. They rarely take into consideration the real political problems of a country, especially in politically troubled areas like most of the Third World countries, including Lebanon. In these areas, emergency budgets, like war budgets, alter the priorities unexpectedly.

Nevertheless, for comparison purposes, it is interesting to note that most models* suggest that around 4 to 6% of the Gross National Budget or around 20% of the current gross fixed investment per year should be allocated annually for housing.

They also suggest that from the allocated whole budget a fourth to a half of the amount should go to utilities and community facilities, a fourth for the poorer countries and a half for the richer countries whose people become more demanding of services.

The adjacent table shows the evolution of the Gross National Production in Lebanon from 1965 to 1972. The G.N.P. per capita is around 1,900 to 2,300 L.L. (around 700 to 850 U.S. $). This puts the country in a medium-low level, compared to other countries.

The table shows that since 1970, around 8.5 to 9% of the G.N.P. was devoted to housing production. This percentage is even higher than the U.N. target proposals.

The fact is that in Lebanon, construction which includes housing and offices is an important part of the Lebanese investments. It is even preferred by many to other types of investments like industry and agriculture.

Among the many reasons for that preference is the quick return of capital and the low risk involved in housing as well as the fact of dealing with a relatively familiar subject.

But as seen in last chapter, this is far from being a real solution for Lebanon, due to the speculative orientation of the Lebanese market which leads the supply in other directions than the real needs.

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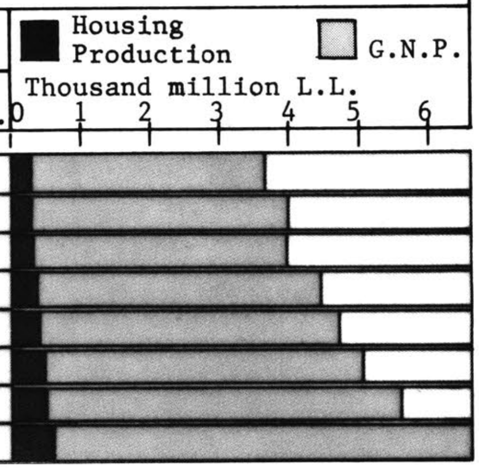
* *Reference 25, page 6*

G.N.P. & HOUSING PRODUCTION FROM 1965 TO 1972

YEARS	G.N.P. Million L.L.	HOUSING PRODUCTION Million L.L.	HOUSING PRODUCTION % of G.N.P.
1965	3,639	269	7.4
1966	3,995	284	7.1
1967	3,962	300	7.6
1968	4,429	335	7.6
1969	4,724	385	8.2
1970	5,031	430	8.6
1971	5,595	495	8.9
1972	6,595	558	8.5



But at least this shows that the housing construction industry is quite dynamic in Lebanon and that the investors do not need, as in other countries, to be proven that it is worth investing in housing construction.

The need in Lebanon is really to direct the housing supply to lower-income markets with the help of laws and other incentives.

The distortion between the supply and demand of housing in Lebanon is due to many reasons. Some of it is specific to Lebanon, some is present in most housing markets.

Among the factors affecting usually all housing markets, the following ones should be mentioned:

1. The immobility of the dwelling, fixed to its piece of land, is an imperfection of the housing market because the supply can not always follow the demand.

2. The lack of clear information is generally inherent to most housing markets due to the complexity, immobility and specificity of each dwelling in a wide spread and amorphous total dwelling stock. This is an important imperfection of housing markets in general.

And among the factors specific to Lebanon, the following ones play a major role in the housing problem:

1. The quick urbanization (discussed in the introduction), has been historically responsible for the chaotic supply of housing with a quickly-increasing demand.

2. The recent troubles in the south of Lebanon have accentuated an exodus to the capital. This has increased the housing pressure on the capital from people often below the market supply levels.

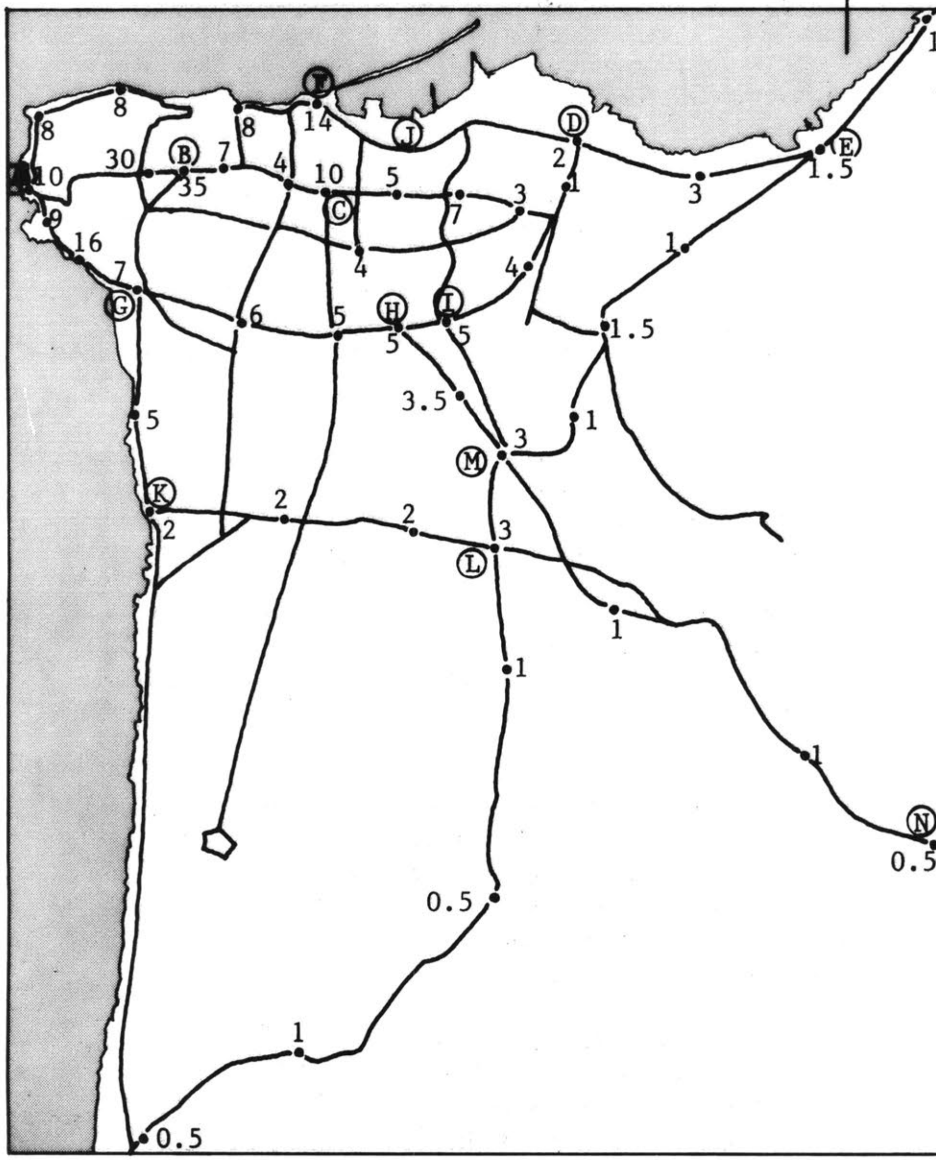
3. The amount of Arab oil money pouring into the area has accelerated the inflation due to an artificially rich "island community" of foreigners and Lebanese that can afford a higher scale of expenses than the rest of the population.

4. The concentration in Beirut of most of the industrial, commercial and administrative sectors of the country, has constantly increased the constrast between Beirut and the rest of the country. This has accelerated the internal migrations to Beirut and the subsequent inflation.

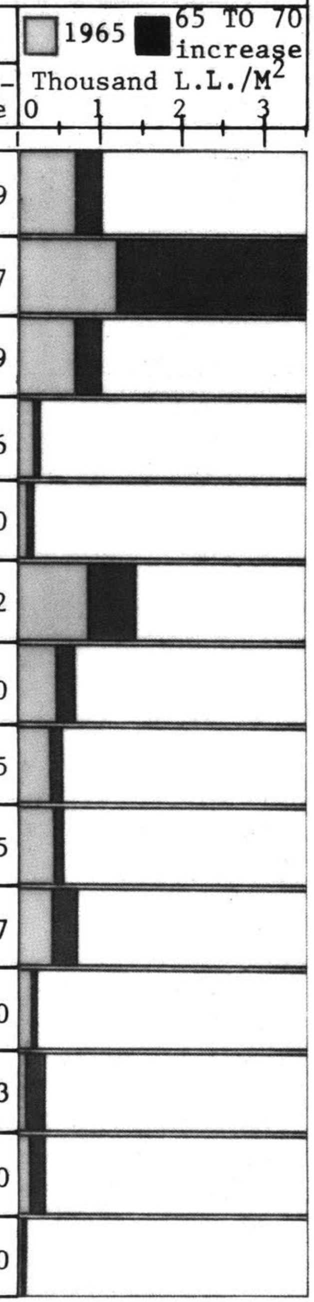
5. The rent law, fixing the rents of the non-luxury dwellings has conversely produced an ever-increasing proportion of luxury dwellings. This decreases the availability of non-luxury dwellings and raises the price of all new dwellings.

LAND PRICES IN BEIRUT AND SUBURBS IN 1965 AND 1970

CITY OF BEIRUT AND SUBURBS
1970 LAND PRICES (HUNDRED L.L.) ALONG MAIN STREETS



	LOCALITIES	PRICES (L.L./M²) 1965	1970	% increase
A	BAIN MILITAIRE	700	1,000	42.9
B	HAMRA	1,200	3,500	191.7
C	BECHARA EL KHOURY ST	700	1,000	42.9
D	NAHR	190	250	31.6
E	NAHR EL MOTT ROUNDABOUT	100	150	50.0
F	ZEITOUNE	850	1,430	68.2
G	CHOURAN	500	700	40.0
H	MAKASSED	400	530	32.5
I	MUSEE	440	530	20.5
J	PORT	420	700	66.7
K	OUZAI	160	200	25.0
L	CHIAH	90	300	233.3
M	HADETH	150	300	100.0
N	KAHALE	25	50	100.0



As a result, inflation has increased tremendously during the last years, especially in Beirut, as can be seen in the adjacent table*.

From 1965 to 1970, costs have gone up from 25% to 230% in different areas of the city, reaching maximums of 3500 L.L./M^2 in the new Beirut Central Business District: Hamra. Since then, the prices have nearly doubled due to the rising inflation and Arab money pouring into Beirut.

Facing such savage higher price jumps in the cities, the lower income groups find themselves more and more cut from the market supplies of housing and have to resort to squatting procedures in unhealthly social and physical conditions.

On the other hand, the rural poors, more and more abandoned, leave their rural areas for the apparently better city conditions. The vicious circle continues.

* *Reference 6, page 55*

the long term policies

Facing such problems, the government has an important role to play. A laisser-faire position quickly leads to the exacerbation of the already acute crisis and to a potential chaos.

The government's actions could be divided into a set of three categories:

- voting anti-speculation laws
- giving incentives to encourage the private market to supply at least the medium income people
- giving direct help to the lower-income groups that can not meet the profit-oriented market levels.

1. Anti-speculation laws refer generally to a series of actions. The most important of them are mentioned in the following lines:

a. progressive taxation to eliminate the underutilization of profitable land,
b. taxation on speculative profit,
c. taxation on the full market value of land as declared by the owners for both taxation and public purchase,
d. expansion of the supply of urban land by compulsory public purchase,
e. giving advantages to community purchases of land to have a community rather than an individual control of land,
f. control of land use,
g. planning integrated decentralization in suburbs and to satellite towns.

2. The government should provide incentives to help the market supply to at least the level of the medium income households, and keep its direct resources and investment for the lower-income groups. Such incentives would be:

a. organizing information centers to better inform both the supply and the demand of the real housing situation (and especially to show that on the supply end the luxury dwellings are being left empty while there is an ever-increasing demand from medium and low-income groups),
b. making compulsory the investment in housing of a part of the benefits made by corporations,
c. making compulsory the investment in national housing of part of the foreign firms benefits in the country, especially insurance companies,
d. allowing tax reductions to people involved in lower-income dwellings,
e. allowing special subsidies to organizations promoting medium and low-income housing,
f. providing long-term. low-interest loans to construction firms and/or medium and low-income people through the development of mortgage insurances that could attract market money at longer-term and lower rates, such as: guaranteed mortgage bonds, cash flow insurance, second market agencies.

3. Unfortunately, such incentives, although positive, are not enough to the lower-income households, because these are far from able to get any loan from banks, and they are much below any possibility of paying back the loan in a lifetime. For this category, a direct help is necessary from the government, while market action is still recommended when possible.

Direct governmental action would include subsidies to people following their income level and family size; it would also include building dwellings with optimized methods to reduce their costs.

At the same time, the concept at this level is to develop habits of thrift to tap all small resources that lead eventually to sizable resources. For these and many other reasons, the key issue is to group people instead of dealing with them separately into non-profit organizations, called here cooperatives.

The cooperative can take the scale of an existing village needing remodeling or extra units, or a decaying city neighborhood, to revitalize it or a new housing neighborhood could be formed by the chosen new dwellers. The advantages of the cooperatives are the following:

1. Bureaucracy and decision making are decentralized from a major super-center to the different cooperatives. The advantages are:

a. Economy is achieved through the diminution of a central huge and consuming bureaucracy,

b. freedom and responsibility are shared by the people; this is a more and more recognized vital fact for social cohesion.

c. more adaptability is possible to social, geographical and cultural differences. This would certainly produce more human environments than those produced by central large planning offices that have to resort to sterotyped solutions to make their huge bureaucracies efficient.

2. A cooperative system attracts more loans for longer terms and at lower interest rates because the loans are not made to one person who may not be commercially dependable. A cooperative (village or neighborhood) can force one of its members to pay on due time, or agree to pay in his place if he has momentary difficulties. And if the collectivity as a whole refuses to pay, then legal action can better be taken against it rather than against a "fluid" individual.

3. A cooperative, being a non-profit organization, minimizes the costs on its people by definition.

4. The cooperative, because it is a community action, minimizes speculation.

5. Economies of scale can be made by the cooperative due to bulk purchases and direct negotiations with suppliers and contractors, eliminating middle-men.

6. The individual household, instead of buying and storing its building materials until it has enough, could rather put the money in the cooperative, turning its savings into benefits, and get from the cooperative the construction material when it is ready, without much extra expense (as it is a non-profit organization).

7. This should enhance a habit of thrift to the household that would produce benefits which could be further used to maintain and repair its dwelling.

The benefits of the cooperatives are therefore enormous, but cooperatives do not flourish spontaneously, they should be encouraged by the government on many levels such as:

1. propaganda or education
2. technical assistance
3. land subsidies
4. capital subsidies
5. legal and other services.

Such help or subsidies would be relative to the income level of the cooperative, and would be reduced as the cooperative develops more of its own resources.

The government should also promote, supervise and coordinate the financial institutions related to housing, such as:*

* *References 20, 25, 31*

- building societies
- savings and loan associations
- mutual savings banks
- credit unions
- non-profit housing associations
- public savings institutions
  - national savings institutions
  - postal savings systems
- commercial banks.

A central bank should be established for these institutions to:

- supervise the institutions
- provide seed capital
- provide short term loans to meet periodic liquidity needs, mortgages, and deposit insurance.

Only such a financial structure would allow the small resources of the low-income people to be put to profit and especially to provide them, through their cooperatives, with loans (for longer terms and at lower interest rates than those available otherwise), thus leading to more favorable housing conditions.

Only a simplified and general framework has been described above. A detailed study of long-term housing policies is beyond the limits of this study.

The framework was nevertheless mentioned to reassert the fact that such long term policies (details remaining to be solved) are a prerequisite for any realistic attempt to provide low-income housing.

Without such a political-social and economical structure, the only possible action would be to construct a few "model" housing schemes that would serve a very few "lucky" people or an "elite" among the most deprived, and remain insignificant, isolated cases, while the real general problem would remain unsolved. This framework should therefore be urgently studied in detail for a quick implementation.

the immediate government participation

On the other hand, these long term policies, if politically accepted, would require many years to be implemented and even more time to prove effective.

In the mean time, something has to be done for the people who lack the most elementary decent shelter, or its basic utilities and equipments like running water and bathroom.

Immediate action is therefore imperative which will relieve the immediate needs until long term policies prove to be effective, and thus restore the ability of the deprived people to take care of themselves.

Such actions could be taken through a governmental housing agency, which would coordinate the immediate required efforts. This includes assessing precisely the housing needs and resources and directing the planning and building of the new dwelling stock and improving the existing stock.

Unfortunately, such a housing agency does not practically exist in Lebanon. Only in 1974, a "Ministery of Housing and Cooperatives" was formed with a symbolical budget of 200,000 L.L. only.*

As for the most related ministery, the "Ministery of Labour and Social Affairs," it is only very indirectly related to housing and has no practical impact. Its budget is larger than the previous one but still quite limited (around 20 million L.L. yearly from 1972 to 1974).

In 1956, however, an agency has been formed to provide help to the victims of the h956 major earthquake and the Abou Ali river flooding.

The agency, called "National Office for Recontruction," drew its resources from different origins, including taxes, loans and donations.

As can be seen on the adjacent upper table, the budget of this agency is around 23 million L.L. annually

Again this budget is quite limited, especially if the real allocations of the budget are considered (lower adjacent table). In fact, out of the 23 million L.L. budget for 1969,** only 6.6 million L.L. are directly used for the housing production, more than 6 million L.L. are used for administrative and miscellaneous expenses and the rest is directed to other ministries.

Such an inefficient use of this limited budget explains the small impact of the agency. But if structured and made efficient, this agency could become a National Housing Agency in the framework of the immediate needs for action in housing.

Its responsibilities would include providing the administrative, financial and technical help to the yearly 25,000 households which will be below market level from 1975 to 1985 as well as improve the utilities and equipment of the existing dwellings.***

This latter part could be the responsibility of the Ministry of Public Works through its different offices (electricity, water...), although the objectives should preferably be coordinated by the housing agency.

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* *Reference 13, page 320*
** *Reference 25, page 214*
*** *See page 37*

NATIONAL OFFICE FOR RECONSTRUCTION BUDGET (1964-69)	
YEARS	BUDGET Million L.L.
1964	23.032
1965	25.635
1966	25.429
1967	22.175
1968	24.395
1969	23.000

Budget Million L.L. 0 5 10 15 20 25

1969 BUDGET ALLOCATIONS OF THE NATIONAL OFFICE FOR RECONSTRUCTION		
BUDGET ALLOCATIONS		MILLION L.L.
HOUSES		6.63
ADMINISTRATION		2.00
MISCELLANEOUS		4.42
MINISTRIES	EDUCATION	3.00
	ELECTRICITY AND HYDRAULIC RESOURCES	0.50
	PUBLIC WORKS AND TRANSPORTATION	4.05
	INTERIOR	2.00
	TOURISM	0.40
TOTAL BUDGET		23.00

Budget 0 5 10 15 20

But for the sake of simplification of this illustration, in the framework of this study, only the new dwellings required will be considered as covered by the budget of the National Housing Agency.

Furthermore, as there is no practical way of estimating precisely the eventual budget of the agency between 1975 and 1985, it will be assumed that the budget could be raised at least to 50 million L.L. annually for that period. This budget is double the one of 1969, but given the steady rise of the G.N.P. and the increase in the social pressures, 50 million L.L. is a fair estimate of the potential yearly average budget from 1975 to 1985.

This value, with the household income and locations estimations will be the basis of the housing formulation. Again the values are just rough estimations to be checked thoroughly in case of the implementation of the methodology described and illustrated here.

Unfortunately, 50 million L.L. are still quite limited for 25,000 households. If distributed equally, the subsidy per household would amount to 2,000 L.L., while a piece of land of ten meters by ten in the suburbs of Beirut (where cheap lands cost 100 L.L./M^2) would cost 10,000 L.L. and a simple dwelling would range between 10,000 and 20,000 L.L.

Naturally, the subsidies will not cover the expenses, and a part of them will be covered by the budgets of the households themselves.

Moreover, the subsidies would be granted depending on the income levels, the family sizes, and the location of the people, thus increasing the possible help to the neediest.

On the other hand, a certain minimum amount should be provided, below which the subsidy is meaningless.

This amount depends on the "level of housing" that it can provide, and therefore on the costs of the housing products which have to be defined before the evaluation of the subsidies.

Due to the evident scarcity of resources, their use should be optimized, and the cost analysis be made on optimized alternatives.

The term "optimization" is here used in a broad sense, and as said in the introduction of the chapter, it is not an aim by itself, but a quality: the efficient use of the available resources to cover as much and as well as possible the needs of the people.

The needs have already been quantitatively defined in the first chapter; they will be qualitatively covered in a later section dealing with the socio-historical aspects of the housing problem.

Unfortunately, even with optimized resources (as will be seen later) the income levels of the people added to the estimated housing agency budget are not enough to cover decently the needs of all the households.

The usual alternatives are either to provide the households with "matchboxes" or "chickenboxes" (extremely small dwellings, as in the Post-war Europe), or providing larger dwellings to a small number of households, while the rest remain unhoused.

Given the unacceptability of these alternatives, on human as well as political grounds, the alternative proposed here is to provide the households with incomplete but improvable dwellings. The concept is to provide a potential, long-term solution with the immediate means. This concept relies on the notion of "self-help" or "do-it-your-self" system and incremental development.

This seems socially and economically quite appealing. A basic minimum would be given to the households that could not get anything otherwise. These could develop their own basic unit with the help of their cooperative as their needs and resources increase. A "bank" of materials would be available in the cooperative to furnish the required materials and advise or help at reduced prices.

There are many different self-help alternatives, ranging from "sites and services" (sites and services only are provided to the household which has the responsibility to build its dwelling by itself), to self-help cooperatives (the dwellings are built by the households under the supervision of the cooperative. The units are delivered to the households once completed.). In this latter case it has been proven through case studies that for the cost of one room two rooms can be built.

The ratio of self-help can be measured by the following formula:*

$$K = \frac{L}{L + E} \times 100$$

where E is the cost of hired labour and bought materials, L is the equivalent cost of the self-help labour (man-hours) and the materials obtained freely, and K, the ratio of self-help. The nearer K is to 100, the less costly is the solution to the government.

The ratio of self-help depends on the interrelation between the needs, the resources and the costs of the products. It will therefore be defined once the rest of the resources have been defined and their use optimized and cost estimated.

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* *Reference 7, page 221*

environmental considerations

climatic indicators

Happy and healthy human life is possible only as long as the temperature inside the human body is kept constant within fairly narrow limits.

CLAUDE BERNARD, 1865

In order for a man to work efficiently, sleep soundly so that his body can recover fully from the fatigue caused by the exertion of the previous day, certain specific climatic variables should be met.

Unfortunately, in most Third-World countries, the climatic conditions are too harsh, generally too hot, for a harmonious development of man. Using heaters and air conditioners is the industrialized world's way of overriding extreme climatic conditions. These solutions are generally very expensive and cannot be afforded by most Third-World, low-income people, or, at most, limited heating could be available at great relative expense.

It is therefore imperative to devise design solutions that fit best the existing climatic conditions to require the minimum running cost of cooling/heating and provide the maximum comfort for the people.

The dwelling is a special area where the effort should be made because the family spends a very large part of its day in the dwelling.

There are four main variables that determine climate:*

1. Temperature.
2. Radiation.
3. Air movement.
4. Humidity.

Most of the Third-World countries have climates ranging from "hot dry" to hot humid (normally called "warm humid") climates. Some countries have both characteristic depending on each season.

1. HOT DRY CLIMATE

1. Temperature: has large variations:
   - seasonal: the winter is cold, while the summer is hot
   - diurnal: difference between day and night: the day is hot while the night is fresh or cold.

2. Radiation: very strong during daytime, especially due to a very clear sky and a very reflective arid earth surface.

3. Air movement: little, except for local wind and sand storms.

4. Humidity: very low, with low rainfall.

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* *Reference 22*

2. WARM HUMID CLIMATE

1. Temperature: generally hot with little seasonal and diurnal variation.

2. Radiation: strong, but not as much as for dry climates, the sky being less transparent and the earth less reflective because of the extra growing vegetation.

3. Air movement: slight, generally still air.

4. Humidity: high, with high and even rainfall.

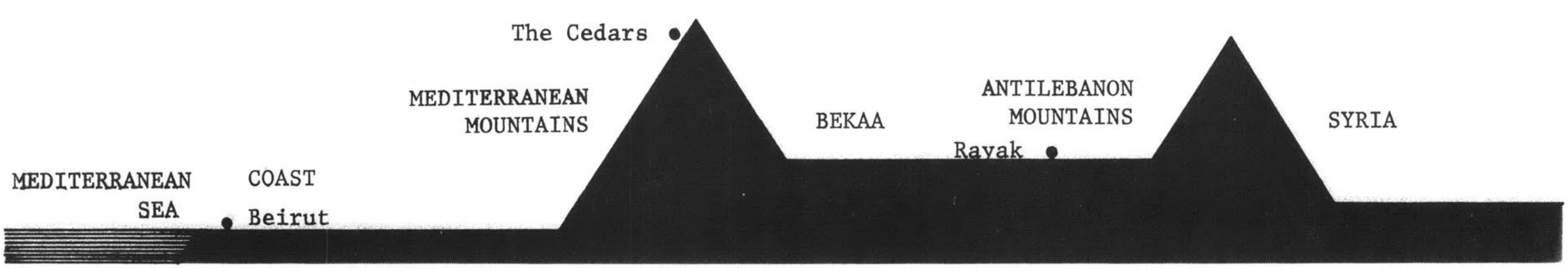
The climate of Lebanon is quite far from the extreme climates described in the last section. Nowhere in its territory does Lebanon have the heat or the dryness of the Arabic deserts nor on its shore does it have the humidity and rain of the tropical warm humid climates. In fact, it has quite a favorable climate for human life, much less favorable for vegetation, however, hue to the summer dryness. This could be improved, though, by a continuous irrigation effort.

Although the Lebanese climate is relatively temperate, it has characteristics of warm humid and hot dry climates in different parts of its territory, depending on the season.

Its territory is quite small: 10,400 square kilometers stretching along a 210 km coast on the west. Its width has an average of 50 km with quite a diversified cross section as can be seen in the (exaggerated) sketch below:

Generally speaking, the coast can be considered as having a warm-humid climate while the Bekaa plateau is rather hot and dry. The western mountains, in between, have quite a temperate climate.

The following sections show the characteristics of each region in detail, from data published by three local observations stations: Beirut, The Cedars and Rayak.



the mediterranean coast

The coast, and the west side of the western mountain (maximum height 3,083 m), has a Mediterranean humid influence due to the west winds blowing from the sea which carry humidity and rain. But as the geographical position of the country is above the tropics (between 33° and 34°0' latitude North), there are still seasonal differences and the climate is not an extreme warm humid climate at all.

The data in the table below have been issued from a station in Beirut and they represent the approximate conditions of most of the coast*.

The coast has quite a mild temperature, with an average of 20.7°C (13.4°C for January, the coldest month, and 27.8°C for August, the hottest month). These temperatures, although not extreme, show some appreciable seasonal difference.

During six months (May to October, inclusive) the average temperature is above 21.8°C. If April and November are also included, 8 months then have a temperature above 18.5°C, which allows outdoor life.

Also, during 4 months (June to September) there is practically no rain: 2.6 days in 4 months. And if May and October are included, there still is only 10.3 days of rain in six months, which further strengthens the possibilities for outdoor life.

* *Reference 13, pages 34-38*

CLIMATIC VARIABLES FOR BEIRUT (ALTITUDE 33 m) FROM 1876 TO 1973

MONTHS	AVERAGE TEMPERATURES (°C)				AVERAGE PRECIPITATIONS				AVERAGE RELATIVE HUMIDITY	
	Minimal	Maximal	-10 0 20 40	Average	mm.	0 100 200	Days	0 8 16	%	0 50 100
January	10.5	16.4		13.4	191.3		15.8		71	
February	10.8	17.2		14.0	157.7		14.0		72	
March	12.2	19.3		15.7	96.1		11.2		72	
April	14.7	22.4		18.5	51.1		6.0		72	
May	17.8	25.8		21.8	17.3		2.8		71	
June	20.8	29.0		24.9	3.3		0.6		69	
July	23.0	31.3		27.1	0.5		0.1		67	
August	23.7	31.8		27.8	0.4		0.1		66	
September	22.7	30.2		26.4	6.7		1.8		64	
October	20.4	27.2		23.8	47.2		4.9		66	
November	16.4	22.6		19.5	133.4		8.5		68	
December	12.8	18.5		15.6	188.0		14.2		70	
Total	17.2	24.3		20.7	893.0		80.0		69	

The diurnal average temperature differences are quite low: 7.16°C between average minimal and maximal with little variation in the different months (shaded area in left graph).
The relative humidity is quite high; its yearly average is 69% and ranges from 64% in September to 72% in February. Rain, though, is concentrated in the 4 months from December to March. But even then, it rains relatively few days: 80 days a year with 55 days in the 4 winter months, totalling an average rainfall of 893 mm, which is quite high but concentrated in few days (around 1 day out of 5, yearly).

As a summary, the coast is hot and humit in summer with average temperatures around 27°C and relative humidity around 66%, but no rain. As a result, outdoor life is enhanced, provided wind brieze is favored and there is shelter against sun.

These shelters may be used against rain in spring and autumn when the coastal climate still permits outdoor life. If good ventilation is provided, North and (sunshades) South orientations are therefore best.

Mild and temperate winters require well-insulated dwellings against rain and cold temperatures, to minimize heating requirements.

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* *Reference 13, pages 40-43*

the western mountains

The influence of altitude seems quite important on the Mediterranean climate. At the extreme case * (Cedars) displayed on the right page, the temperature becomes much colder, with an average of 9.1°C, ranging from 0.2°C in January to 17.9°C in August, with average minimals around -10°C in January and average maximals around +27°C in August.

But the Cedars' station, being at an altitude of 1925 m, has extreme data compared to those of the majority of the mountain. The intermediate data are somewhere in between the data of Beirut and those of The Cedars, depending on the specific altitudes considered .

The monthly temperature changes become more important: an average of 20.8°C, approximately three times more than on the coast.

The relative humidity is smaller than on the coast, due to the lower temperatures. The average at the Cedars is 61%, ranging from 48% in August to 73% in January.

However, the amount of precipitation is higher than on the coast, because the mountains act as a barrier to the humidity; as a result 977 mm of precipitation (rain and snow) are the yearly average with only 79.7 days, (as in Beirut (80 days)).

As one goes up the mountain, therefore, the climate becomes less and less "warm humid" and more and more temperate.

Summers still have no rain, and as on the coast (same number of rain days) they can get quite hot with highs up to 27°C in August (during daytime), while cold in the evenings (around 8°C). The real problem,

CLIMATIC VARIABLES FOR THE CEDARS (ALTITUDE 1925 m) FROM 1937 TO 1973

MONTHS	AVERAGE TEMPERATURES (C) Minimal	Maximal	Average	AVERAGE PRECIPITATIONS mm	Days	AVERAGE RELATIVE HUMIDITY %
January	-10.1	10.0	0.2	220.0	14.0	73
February	-10.4	10.0	0.2	187.0	13.0	70
March	- 9.2	13.5	2.6	145.0	12.0	67
April	- 4.4	19.0	6.7	69.0	8.0	60
May	0.4	23.1	12.1	31.0	4.0	59
June	4.8	24.4	15.0	5.0	0.5	55
July	7.1	26.9	17.2	0.5	0.1	51
August	7.9	27.3	17.9	0.5	0.1	48
September	5.5	24.9	15.5	5.0	1.0	55
October	1.6	22.2	11.7	44.0	5.0	58
November	- 3.1	17.5	7.1	103.0	8.0	67
December	- 6.9	13.4	3.0	167.0	13.0	69
Total	- 1.4	19.4	9.1	977.0	79.7	61

though, is in winter, especially as one approaches the extremes like the Cedars.

In these cases, protection against cold and snow are necessary; good insulation becomes imperative.

Except for insulation, the general "hot climates" optimizing patterns discussed are often the same ones for cold climates because in both cases the objective is to minimize the harsh outside climatic impact on the dwelling.

Details, however, will not be discussed, but should be studied when applications in such extremely cold regions are considered.

* *Reference 13, pages 48-51*

the bekaa & eastern mountains

This area receives few of the Mediterranean winds, and when it does, these have been emptied of rain and humidity by the western mountains. Rather, Siberian and desertic dry winds blow more often, making it rather a dry hot climate type.

The data (table on the next page) come from the Rayak station in the plateau located at an altitude of 900m approximately. These data represent the climatical situation in most of the flat plateau.

CLIMATIC VARIABLES FOR RAYAK, BEKAA (ALTITUDE 920 m) FROM 1930 TO 1973

MONTHS	AVERAGE TEMPERATURES (C)			AVERAGE PRECIPITATIONS		AVERAGE RELATIVE HUMIDITY
	Minimal	Maximal	Average	mm	Days	%
January	-5.5	16.8	5.3	158.3	13.0	79
February	-4.2	18.8	6.1	122.5	12.0	77
March	-2.8	23.6	8.8	82.7	9.0	70
April	-0.3	28.1	12.8	37.0	6.0	62
May	2.9	32.5	17.3	16.2	3.0	57
June	6.4	35.9	21.3	0.9	0.5	49
July	9.6	36.7	23.7	0.2	0.1	46
August	10.0	37.3	23.9	0.2	0.1	48
September	7.7	35.9	21.3	0.9	0.9	53
October	4.0	31.4	17.2	21.4	3.0	56
November	-0.3	25.3	12.0	65.1	7.0	66
December	-3.6	19.8	6.7	122.2	11.0	78
Total	1.2	28.5	14.7	627.4	65.6	62

The temperatures in this case are much more extreme. The average temperature is relatively low, 14.7°C, and from June to September, the four months have average temperatures above 21°C, with only 2.2 days of rain in four months, and with monthly average highs up to 37.3°C in summer. Relative humidity is also lower than in Beirut, 46-53% during these 4 months, while in Beirut the humidity is around 66%. Evenings are quite cool, with average monthly differences in temperature of 28.5°C. Also, the winters are very cold compared to the hot summer days: 5.3°C average in January with lows down to -5.5°C.

Here also, therefore, outdoor life is climatically favored during 4 to 6 months a year, but as humidity is lower, radiation is much stronger and shading devices are necessary. In winter, snow, and especially rainfall, are quite frequent but less than on the coast or the western mountains. It rains only 65.6 days (i.e., 1 day out of 6), producing 627.4 mm of precipitation against 893 mm in Beirut.

Next section will deal with the impact of these climates on the design of the urban and indoor spaces.

the design implications

To conclude, therefore, from last section, the climate in Lebanon is moderate-to-hot. The summers are warm-humid on the coast, temperate and humid on the western side of the western mountains and dry on the continental plateau and the eastern mountains. The radiation is important in all areas in summer.

The winters are mild on the coast and except for much rain there is no real problem. In the mountains and the Bekaa mountains, the temperature is much lower with snow and freezing temperatures sometimes.

Despite its relative mildness, the Lebanese climate still has warm features that have to be taken into consideration for the design of the spaces, to make them as healthy as possible and minimize the heating or cooling expenses.

Diminishing radiation by shading devices and maximizing air movement are necessary because of the consequent drop in temperature and the cooling evaporation of perspiration. Extra protection against radiation is needed for the very arid areas while protection from heavy rain is required only in warm humid areas.

OUTDOOR SPACES

hot dry climates

In hot dry climates, as water is very scarce, vegetation grows with difficulty and the non-built areas are generally dusty and ugly. In order to plan them and make them appealing, these outdoor areas should:

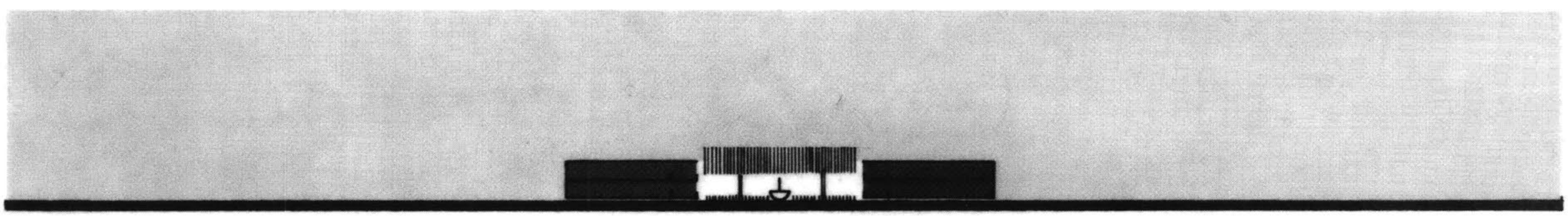
1. Be limited in size, as the possibility of action is limited.

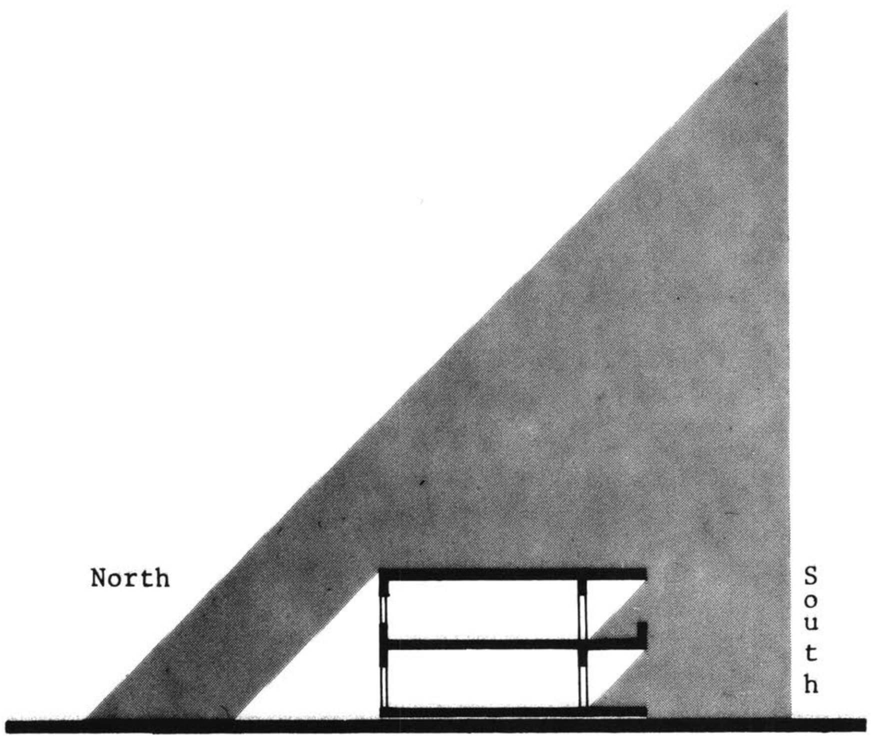
2. Be enclosed, to overlook as little of the non-controllable areas as possible.

This concept has been much used in the Arab North African cities or "Medina," where the cities are compact agglomerations, within walls, with introverted courts that only could be landscaped, closed to the sunny, dusty outside world.

3. Include a fountain in the court or square, if water is available, to provide evaporation and coolness.

4. Provide shaded pathways, if not too expensive. Th These can be associated with the house structure to b be more economical, or if climate permits, shade trees may be used.





warm humid climates

1. In the warm humid climates, vegetation is much more developed and the dwellings may be more open to the nice green view, especially because of its lesser degree of radiation. Courts may be optimal, though, for social reasons (see next section).

2. Fountains are climatically less necessary than in arid climates.

3. Protection against the sun is necessary, even with the lesser radiation than in the arid climates; moreover, protection against heavy rain is also necessary when there is no radiation but heavy rain. Protection against sun and rain could take the same patterns as for dry hot areas.

INDOOR SPACES

In both climates, the degree of radiation is quite important, and the following implications are valid for the two cases:

1. Shading devices should be applied to diminish the direct sun heating impact on the structures.

2. North and south walls are best for the valuable facade, as north does not get sun, while south sun can be stopped by a horizontal sunbreaker in cloth or any material, or, more usefully, by a balcony.

3. The areas of the walls and roof exposed to the outdoor unfavorable conditions should be minimized. As a result, the following patterns should be recognized.

a. Dwellings adjacent to each other diminish the wall area exposed to the solar radiation (provided they have a good ventilation plan).

b. Having the exposed wall smaller, significantly reduces the areas exposed to sun.

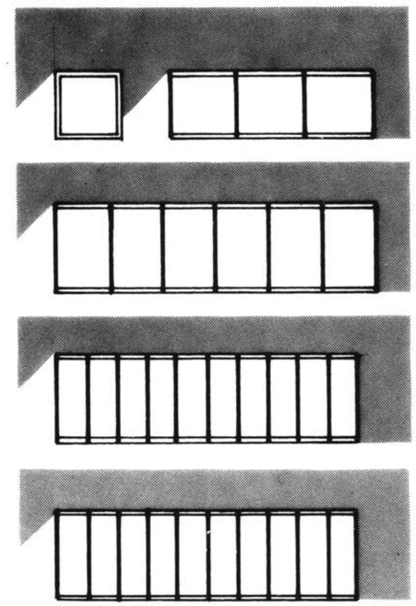
c. Having two floors rather than 1 floor, for the same total area of the dwelling, reduces by nearly half the roof area, while the wall area remains the same (twice higher but half the width).

d. Ceiling and roof: the lower the ceiling, the less the area of the wall exposed to sun radiation, provided the ceiling is well ventilated and insulated. A 2.50 meter ceiling height is quite enough although sometimes 2.75 m is preferred on the grounds that hot air which goes up remains above the human level. But good ventilation and insulation do a better job than a ceiling height with no air movement.

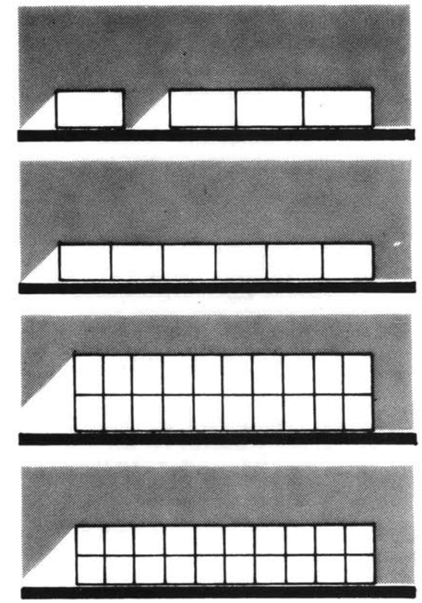
A pointed roof offers the advantage of better waterproofing due to the quick flow of rain water in winter and an upper ceiling in summer where the hot air would be above the human level. A pointed roof, however, offers more exposed area to the outdoor environment.

On the other hand, flat roofs have traditionally had many uses. They serve as a drying area for linen, vegetable and fruits (sundried) during the daytime, as a fresh living area in the long warm evenings and as a sleeping area during the hot nights. Flat roofs therefore seem to have more advantages if well ventilated than pointed roofs in the Lebanese context.

4. Ventilation: Natural ventilation is an essential asset in both climates: in the dry climates to refresh quickly the dwelling once the (colder) night air arrives, and in warm humid climates to remove humidity and produce a refreshing perspiration evaporation effect.



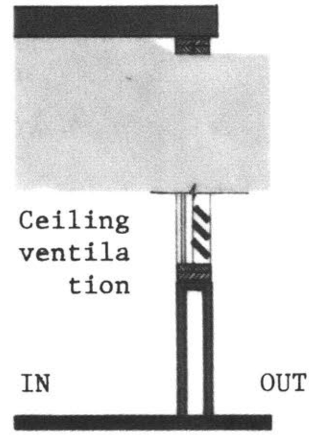
PLANS

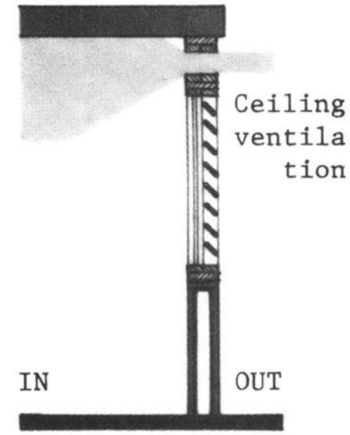


SECTIONS

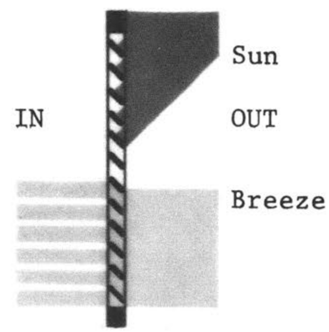
As a result, cross ventilation through openings on each of the 2 opposite walls of the dwelling is necessary.

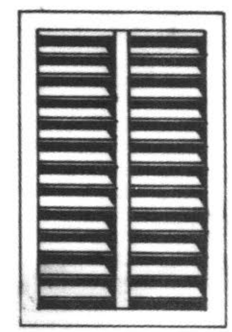
For direct ceiling ventilation, windows should be as high as the ceiling, to circulate the air and cool it quickly and continuously, and to allow the hot air to move out as it goes up. A small window could permanently be left open above to ventilate the roof and room while the rest of the window is closed, especially in hot dry climates, during the day (because the main window is too close to the ground radiation). Small windows in hot dry climates are therefore usually preferred to large windows because radiation and heat are transmitted through the glass much more than through the concrete walls. Window bays in such cases are the least efficient climatically.



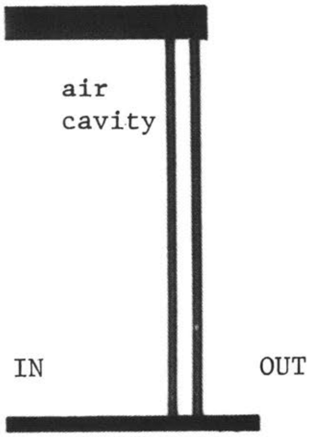


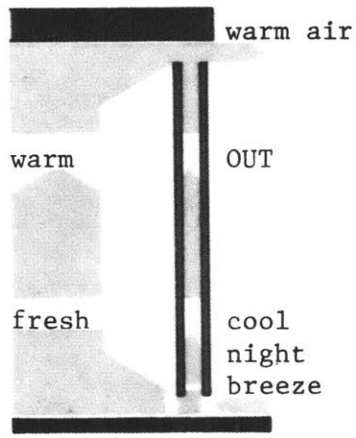
An extremely important device is the wooden sunbreakers for the windows. They have been slowly forgotten due to Western influence, but they are perfectly adapted to low income (naturally ventilated) dwellings in the hot areas. They provide shade, privacy and security, while permitting the breeze to enter the dwelling. They usually open to the outside (or roll in boxes for richer dwellings) while the glass panels open to the inside.





Finally, in order for the envelope (walls and roof) to be best insulated against the outside radiation and temperature, cavities seem to be most efficient because they provide good insulation due to the large width and air gap in the middle, they also cool down faster due to the relatively small quantity of material and the inner movement of air.





Openings in the bottom and top of the walls could improve the cooling process when the day becomes fresher. But somebody would have to open or close the openings following the time of the day. This is probably too complicated for most households, and it is therefore not worth the cost. Cavity walls however could still be retained. They are cheap and have a series of other advantages (discussed in the construction section), and the ventilation could be left to the ceiling flush windows described above.

As a general summary, Lebanon has a moderate-to-hot climate, with warm humid summers on the coast, temperate humid summers on the western mountains, and hot dry summers on the continental plateau and mountains. Radiation in all areas in summer is important and should be minimized by compact planning, shading and good ventilation.

Shade trees should be developed as water and rain permit on the coast and western mountains, while irrigation from the Litani on the Bekaa plateau could be more efficiently utilized.

The winters on the coast are mild and do not have serious problems except to need a good protection against heavy rain. In the mountains, and the Bekaa, the temperature is much lower, with snow and freezing temperatures. As a result, compact planning is also favorable to protect against the cold winter nature and minimize the heating requirements.

Therefore, although the climate is not extreme, the dwellings still have to minimize the climatic impact in order to provide the most suitable living conditions with as limited resources as possible (especially the livings costs of the dwellings). The use of the patterns described above is therefore strongly recommended.

social considerations

historical influences

In this section, the social characteristics of the people of Lebanon will be briefly described, then the implications on the design of the spaces will be deduced.

For the sake of clarity, this will be done in two steps. The first will deal with the social patterns and characteristics at the collectivity or urban level. The second step will be restricted to the level of the dwelling itself.

There are many influences that have shaped the social behavior of the people living in Lebanon. Very schematically, this is the chronology of the most important factors in the history of the country.*

- The appearance of architecture and organized life seems to have crystallized in Lebanon around the 5th millenium before Christ. The people were the Phoenicians, the businessmen of the epoch who traded between Mesopotamia and Eqypt. Sidon, Byblos, Tyre, Beirut, Tripoli and Baalbek were created.

- In the middle of the first millenium before Christ, Carthage was formed by the Phoenicians. This opened the commerce between Africa and Europe.

- In 330 B.C., Alexander the Great brought the Hellenistic influence to Lebanon.

- From 63 B.C., the Roman influence overlapped the Hellenistic influence.

- Then Christianity developed in the country.

- From 395 A.D., the Neo-Hellistic Byzantine influence developed.

- From 637 A.D., the Islamic influence reached Lebanon with the Omayads and the Abbassides.

- During the 12th and 13 centuries, the Crusaders dominated the country.

- Then the Mamelouks, from 1289 stopped the European influence for a while. What followed was a confessional equilibrium between Christians and Druses.

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* *Reference 10*

- From the 16th to the 18th century, under an ottoman ruling, the feudality was structuring the country with 2 influences: a strong European influence on one side, especially Italy, and an increasing nationalism tying together the different races and religions.

- After the First World War, Lebanon was occupied and under the influence of the French; it was "a republic under the French mandate."

- Independence of Lebanon occurred in 1943. But the country remains a ground permeable to all commercial and cultural influences from both western and Arab cultures.

It is much beyond the scope of this study to detail the impacts of all these numerous influences. However, one can recognize two generally opposite trends that have constantly shared the impact on the culture and behaviors of the Lebanese people.

A Mediterranean influence from Lebanon itself and from the western Mediterranean, Greece, Rome, Italy, and France, on one hand, and on the other, Oriental influences, mainly Islamic, with the Omayads, the Abbassides and the Persians. These two influences are different, but complement each other to make today's social patterns.

The Mediterranean influence, along with the geography and climate of the area, has promoted an extroverted social pattern. In fact, on the Lebanese coast where most cities are and where between one half to one third of the population lives, outdoor life is possible from May to November (i.e., nearly six months per year). As a result, people like to socialize and need outdoor areas linked to their dwellings where then can see other people and be seen. The layout of the dwelling must take these outdoor needs into consideration.

2. On the other hand, the Islamic influence has come with more introverted patterns, partially due to socio-religious habits and partially due to the harsher climatic conditions where they originated, that led them to look inward rather than outward.

As a result, they brought, in their architecture, a delicately balanced succession of spaces, from the public to the private spaces. The sequence starts with the public piazza, at the center of the agglomeration (having all the community facilities--civil and religious--and the marketplace). The piazza is then linked through the principal pathways to a secondary pathway network, to a series of semi-private courts around which the dwellings would be distributed.

The semi-private courts create a great sense of neighborhood, favoring mutual help, common life, and strong ties against the sense of solitude (the sense of solitude is very usual in modern industrial housing compounds).

These courts also favor security and maintenance. Maintenance, because these courts being semi-private, people that live around them have less tendency to dirty them than the passers-by in a completely public area. Security because any foreigner is recognized as such by a natural surveillance possible due to the scale of the court which holds a limited number of families who know each other. These courts have also been traditionally safe as the entrances to them could easily be blocked during attacks by armed groups.

The old Arab dwellings themselves were also introverted towards an inner court, because of the harsh climatic conditions of their region and the secrecy of family life that was prevalent. These factors do not exist in Lebanon because of its much more enjoyable climate and the natural Mediterranean extroverted mentality.

Because of that, when dwellings have inner courts (in Lebanon), they still have windows opening to the outside world and gardens in front of the dwellings where the family gathers in the afternoon and weekends, have dinner, call their friends passing in the street to join them for a drink or a backgammon game.

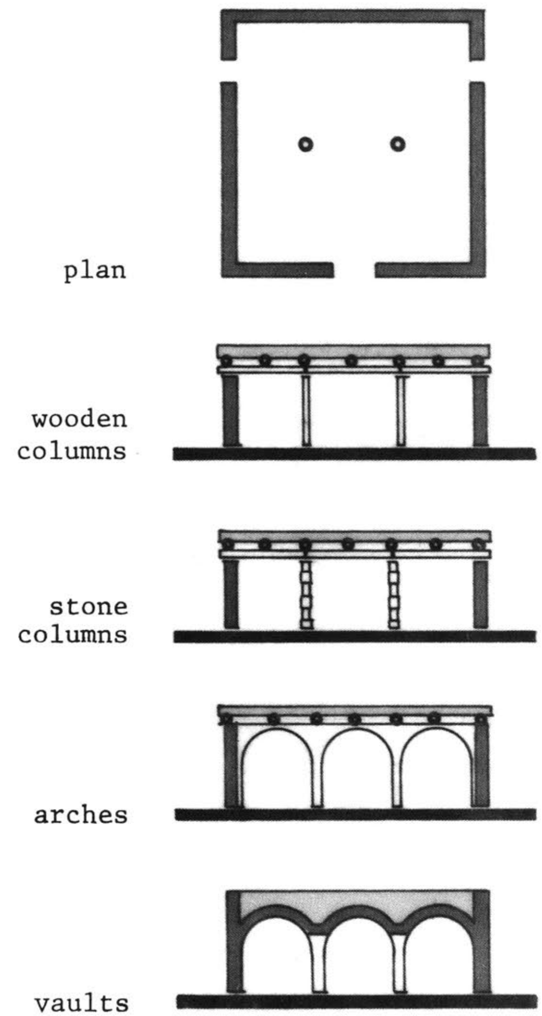
The following lines show how the dwellings have evolved as the different influences have shaped the country.*

the phoenicians

Some remains from the first Phoenician dwellings have survived. They are as early as the 5th millenium B.C. These remains, surveyed by archeological teams, indicate during the 3rd millenium B.C., a rectangular single room. The dwelling, is made of thick rubble stone, covered by an earth-and-straw roof held up by wooden beams and a couple of wooden columns (that rest on a piece of stone for waterproofing). The thick walls and roof did keep the inside warm in winter and fresh in the hot Lebanese summers.

The concept has persisted in town villages up to today with some changes, though: the wooden columns have been replaced by stone columns, the arches, to carry the wooden-straw-earth roof. The earth roof had to be sporadically compressed by stone rollers to cover the earth breaks.

Later, and for richer households, the vault appeared but was covered by earth to make a horizontal upper plane for insulation and waterproofing (rolling) reasons.



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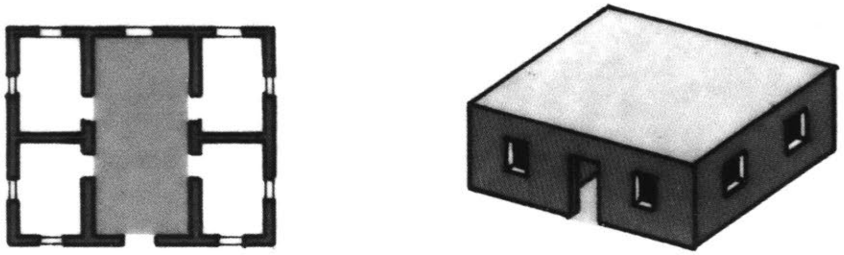
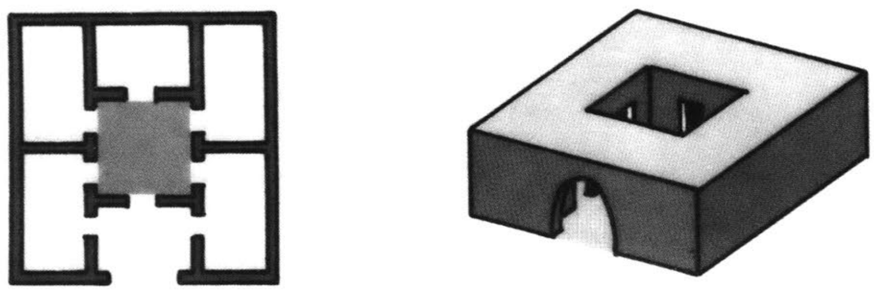
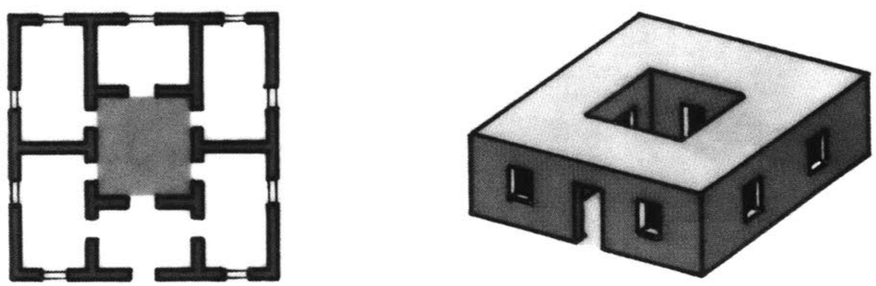
* *Reference 10*







Parallel to that development, for the larger and richer households, a pattern has developed with a central hall surrounded by rooms. This pattern of distribution remained until the 19th century A.D., adapting itself but surviving all influences.

This pattern corresponded to a strong sense of family that overrode (and still overrides today to a certain extent) a sense of individuality. The family used to gather around the paterfamilias in the central space, which was the family and reception area. The other rooms were reserved for sleeping or cooking.

the romans

With the Romans appeared the "atrium" concept: an open court to which the rooms would open. The concept of atrium is in a way similar to the central hall concept in the fact both are family central reception spaces.

There is, nevertheless, a big difference between the two. The atrium court is uncovered and the house is introverted around it with no exterior openings, while the central Lebanese hall is covered but has openings to the exterior as well as the rest of the house.

Very quickly, in Lebanon, the introverted Roman atrium scheme became extroverted with openings pierced through the outside walls.

byzance

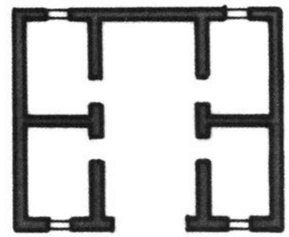
The Byzantian neo-hellenism did not make a strong impact on the Lebanese dwelling.

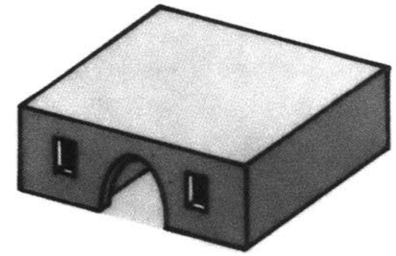
the omayades

With the Omayades, the antique atrium concept came again with their stone cutters.

the abbassides

The Abbassides imported an old Persion tradition: the liwan. The liwan is an open room with an arched bay with 2 rooms on each side. Due to its similarity with the naturally developed central plan it was very quickly accepted and popular.



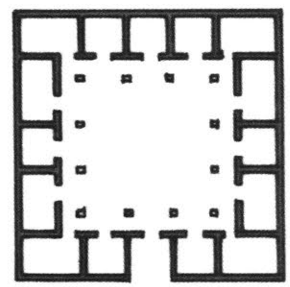


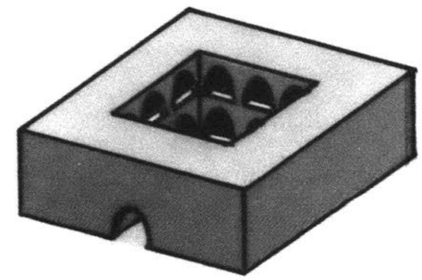
the crusades

The Crusades left little impact on the domestic architecture; their impact was more on church and castle architecture.

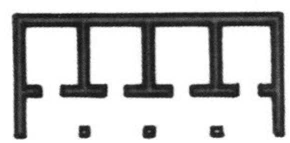
the mamelouks

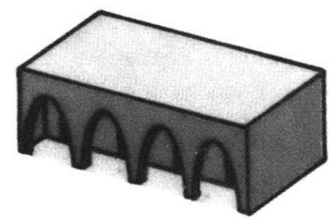
The Mamelouks brought (feudality and) the Khan, a Persian influence. The Khan is a communal dwelling space where families have cells, above their shops, distributed around a public atrium. The formula was quite adapted to the caravans of commercial travellers that would sell their products in the ground arched floor and live in the second floor. (The sketches are not to scale.)





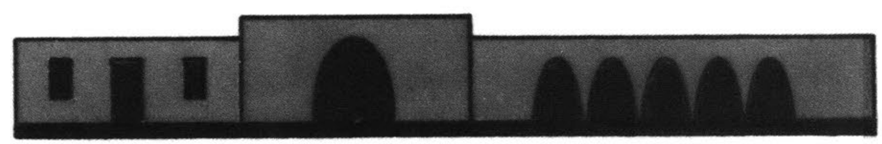
Another pattern appeared around the same period: the arched gallery type. It consists of a series of adjacent rooms linked by a front covered arcaded gallery. This was maybe inspired by the Khan; it developed, however, on its own, opening itself to the outside, especially in the mountains where the narrow strip adapted well to the steep mountains, limiting the excavation requirements.





the 16, 17, 18th centuries

In the feudal Lebanese period, all these patterns were aggregated and assembled following the different functions required in the palaces. Beit ed Dine is



the most fulfilled example. But no new types were created in the change of scale. The only specific innovations were ornamentations, often from Italian influence; they reached the most humble dwellings.

the 19th and early 20th centuries

After the feudality culmination, the domestic dwellings did not change. All the patterns continued to be built, separately or combined.

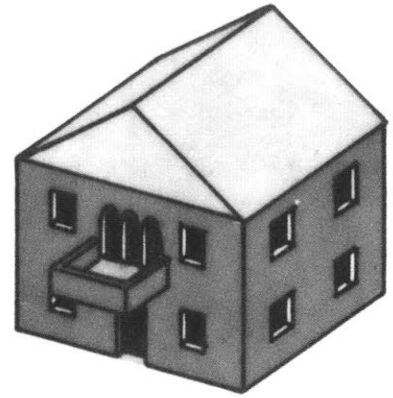
But the most commonly built dwellings were central hall houses with some specific new details:

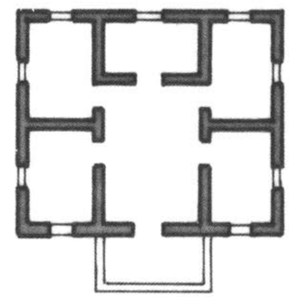
- The central hall was ended by a triple arcade, on one side and by an extra room on the back. The arcades were glazed, especially in cities to gain one room, but the glazing fitted the columns badly. A balcony often appeared, extending the central hall.
- Two floors became common, for more room and more view, especially in the cities.
- Openings were pierced on both floors, looking at a garden in the cities or at nature in the mountains.
- Red tiles from Marseilles (France) covered pitched roofs, replacing the wood and earth, previously flat roofs.

the 20th century

After the Marseilles tiles and the Italian marbles, concrete came and completely destroyed the tradition, first trying to imitate it and then adopting Western patterns, whether they fit or not the cultural patterns or climatic-geographic realities of the country.

Craftsmen disappeared to be replaced by quicker, cheaper methods, favored by quick urbanization. Eight

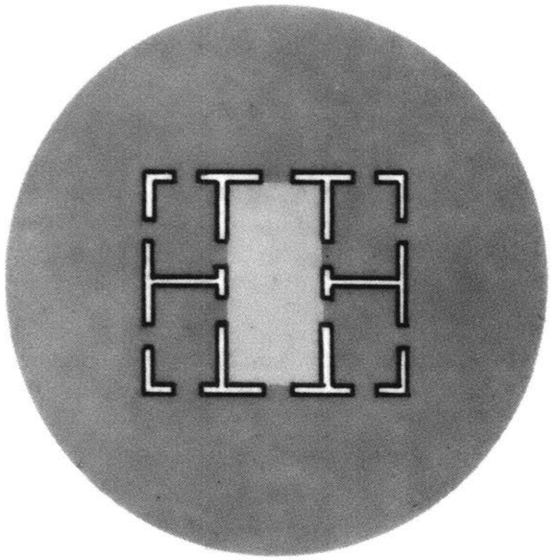




to twelve high rise apartment buildings appeared in Beirut. The central hall pattern was abandoned for the western differentiation between the reception, sleeping and services areas.

Concrete also invated the rural areas. But as it was not yet comprehended, the new houses were completely cut from the social historical and cultural existing expressions of the region. The new expression was poorly brutal and intruded awkwardly in the delicately balanced rural towns and villages.

Facing the chaotic situation of today: how to build? It seems that the "Lebanese" architecture has,



throughout its changes and developments, been a true product of the climatic, geographic, social and cultural forces.

The 20th century domestic architecture chaos itself, is a result of the cultural, social and technological chaos and as such it is a true and real product.

An effort is needed, though, to distinguish, after the storm, the real trends from the artificial ones, the deeply rooted patterns from the superficial ones and the continuous influences from the transient ones.

central space and extroversion

Two major patterns seem present in all dwelling forms that were surveyed above:

1. A central hall or family space around which 2 or more rooms gravitate.

2. An extroversion tendency of the rooms and especially of the central hall to the exterior (near exterior: garden or balcony, and far exterior: view of the valleys in the mountains).

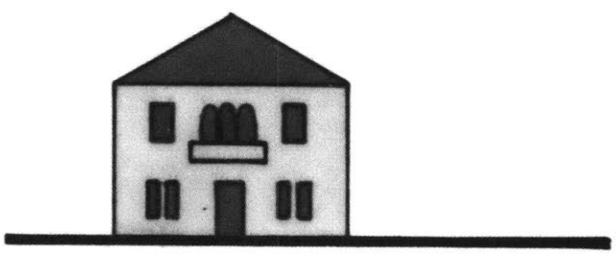
These two phenomena seem very much related to the Mediterranean extroverted temperament and to the temperate climate and inviting nature of Lebanon, especially on the coast and the western mountains, which house most of the population.

And, generally speaking, the veranda, or front garden, is a very well-used place, as for six months a year, eating and socializing outside is possible.

The central hall, before being glazed, had two purposes: it was a shaded breezy area for living from spring to autumn, while it served as a protected circulation for winter, between the 2 or more rooms around the hall.

The plan centrality was therefore used as a convenient circulation, protected from rain and sun, and as a social family focus for family life and in receiving friends. This family focus has decreased, though, especially during the last 50 years as urbanization has broken the extended families into smaller groups, and is placing more and more importance to the individual, young members. As such, a central space becomes less symbolically necessary to stress the paterfamilias importance.

But as family life and social life are still important, especially as leisure time has a tendency to increase, a family space is still necessary, related to the exterior (a front porch or garden--protected if possible, or a balcony on the street if it is an apartment). Apartments did not exist before urbanization pressures started, except in the form of the Khan but they were mainly for the travellers. And even for these, the relation to the community was especially emphasized through the public courtyard, for social and commercial reasons.



individualism and «personalization»

Another important factor that has always been present throughout the Lebanese history is the isolate form of the dwellings. This is the case either for the 17th-18th century dwellings in the mountains like the Lebanese villages of Deir el Kamar, or especially with the 19th century individual squarish 2 floor dwelling that developed everywhere, and especially in Beirut.

This is a close expression of the Mediterranean (except North Africa) Lebanese individualist character. The dwellings, even if densely packed, like in Deir el Kamar or in the coastal towns, still express their individuality. This individualistic tendency is quite responsible for the extreme diversity in the vernacular traditional housing architecture.

This character should be preserved, if possible, because it reflects the people's mentality and also because the individual and personal character of a dwelling creates a special relationship with its owner, a sense of belonging and pride. This favors a careful attitude and desire for improvement by the owner of "his" house and neighborhood.

But one has to recognize that such an individualist approach is much less possible since the 19th century. Before that, the pace of construction (and life) was relatively much slower. It could take a whole lifetime of a household to build incrementally a custom-made dwelling to fit its increased needs and resources.

But today, due to the much quicker urbanization and important scarcity of resources, the problems can not be left anymore to the individual households because these do not have a whole lifetime to adapt gradually to the historical and social patterns.

Facing the chaotic present urbanization and the relatively scarce resources, action is needed at the public level to organize the urbanization and optimize the scarce existing resources in order to avoid chaos and anarchy.

Unfortunately, public or collective action has the inherent risk of destroying the individuality and

personality of the different dwellings. Their action comes from a central agency that resorts to stereotyped solutions based on the concept of "average households" to achieve economies of scale in all phases of the process: the planning phase, the construction phase and the distribution phase.

But there are very few "average households," as far as character and personality is concerned. Public housing unfortunately seldom recognizes these household dimensions and the industrialized housing shemes very quickly become industrial "slums" because they do not correspond to the real expectations of the people.

A very interesting survey* made in Colombia (see adjacent graph) on a self-help project with a standard "Western" plan a few years after the occupation of the dwellings has shown that, out of the 2,218 dwellings of the project, 23.3% were unchanged, 43.0% were improved and 33.7% were extended.

Besides a large proportion of the rooms were used in "abnormal" ways, i.e., not as intended by the designer, or as the designer thought they would be used.

This example illustrates how much decision-making should be left to the people, and how much it is an illusion to believe that a professional can forsee the priorities and desires of the people that will use "his" dwelling.

NORMAL V/S ABNORMAL USE OF DWELLING SPACES

SPACES	NORMAL USE (%)	Normal / Abnormal (0% 25 50 75 100)	AB-NORMAL USE
LIVING-DINING	56.4		43.6
BEDROOM	67.0		33.0
KITCHEN	50.5		49.5
PATIO	58.0		42.0
BATHROOM	54.4		45.6

* *Reference 34, page 8*

infrastructure & suprastructure

A possible way of combining the needed collective urban organization and resource optimization with a users' decision-making process could be through the dual process of "infrastructure and suprastructure."

This concept is clarified by the prefixed of the two words. From latin, "infra" means under while "supra" means above. The dwelling infrastructure would be therefore a basic (optimized) part of a dwelling, that would be provided to a certain category of people, while the suprastructure would be the part that the user would add himself.

The concept is to provide an infrastructure that insures an optimized use of the resources and an organizational pattern for the future urban development, while enough is left for the individual households to express their choices and personalities in a direct action through the suprastructure.

The left sketch below is one of the possible illustrations of this concept. In the right representation, the dwellings are completely built by the (public) agency. As a result they are (except for a few variations) similar to each other and there can not be a personal identification of the household with its house. The stygma of "public housing" is stamped on the "project."

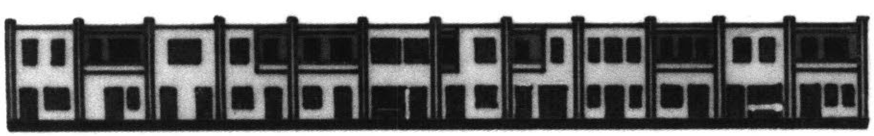
In the left representation however, the public agency only builds an infrastructure. In this particular example the infrastructure consists in the utilities, the bearing walls and some of the slabs. Only these elements are similar to each other, they indicate the limits of the individual (two floor) units and provide the basic structure of the dwelling and the organizational pattern of the urban layout. And each household uses the space in between the bearing walls following its means and needs, thus expressing itself through this suprastructure.

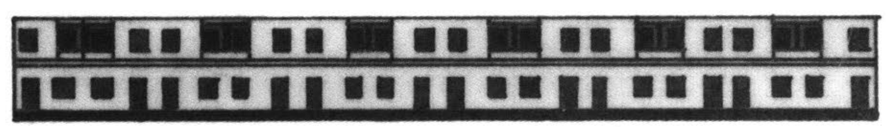
Thus, decision-making is at least partially restored to the household, while the infrastructure takes care of the urban collective constraints.

It is also worth noting that the concept of the infra-supra-structure complements directly the self-help concept often needed to decrease the financial dependency on the scarce resources of the public housing agency.

And it seems that only once the decision process has been given back to the user that the housing architecture will join its popular traditional and cultural roots, becoming what it was once, the expression of the people.

Incidentally, the product will not probably consist of arcades, cut stone or tiled roofs. These expressions (although beautiful) belong to the past. The contemporary realities have changed and such, trying to make obsolete patterns revive (as advocated by some), would not restore the Lebanese tradition, which should remain a "live" tradition.





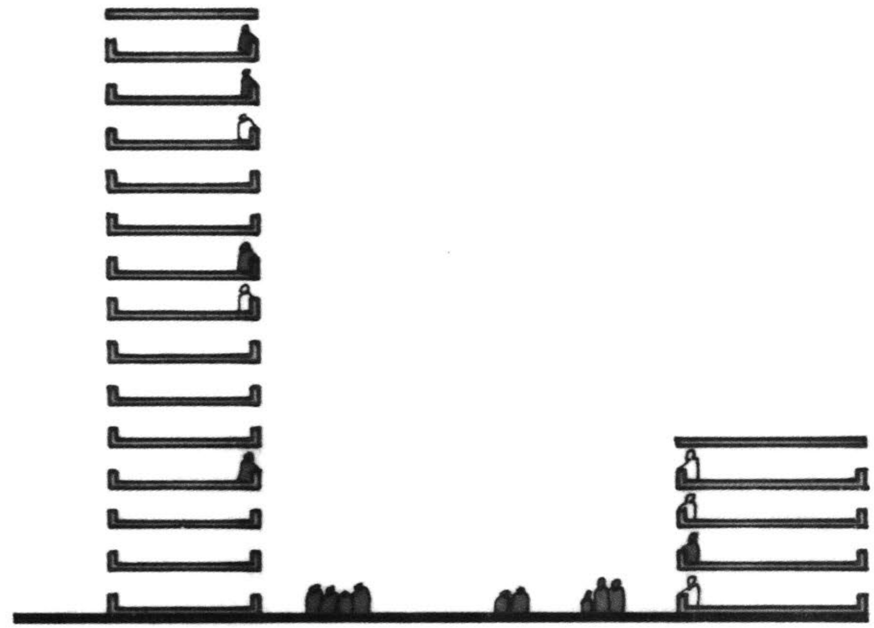
high-rise versus density

Traditionally, the dwelling buildings in Lebanon do not usually exceed two to three floors, thus allowing a human scale relation between the man and the street or the courtyard. But during the last fifty years, the trend has been towards much higher buildings, especially in the cities. In Beirut, most of the apartment buildings have between eight to ten floors, sometimes up to twenty to thirty floors.

The usual incentives for such high-rise apartments have been discussed above, they are related with speculation on land, maximization of profit through the maximum use of the scarce land available around the cities and the production centers*.

Recent studies recognize more and more that such dwelling environments are "inhuman" and favor nervous disorder, social problems, vandalism, and unsafety.

Many reasons for the origin of these illnesses are described; they all gravitate around the depersonalization of space, lack of human scale surveillance, and lack of identification with the dwelling environment.



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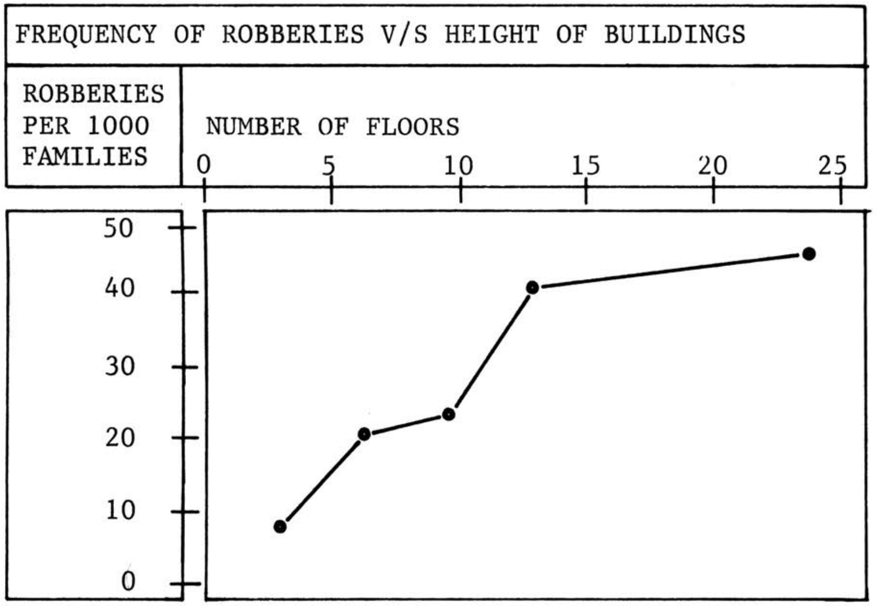
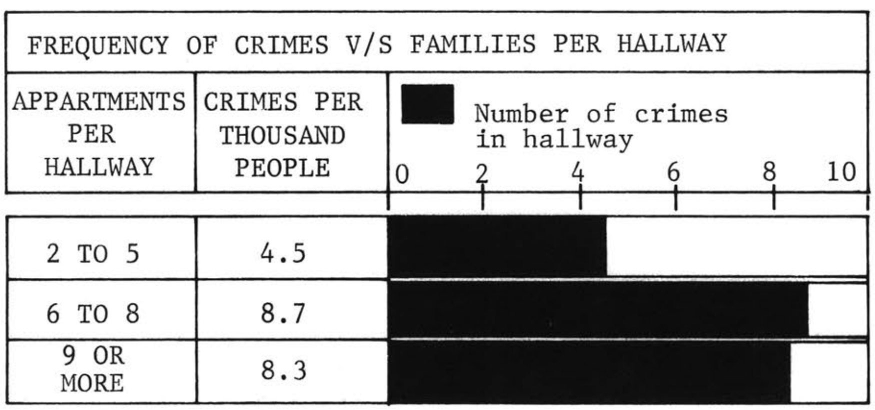
* *See pages 62-63*





The adjacent graphs* show how the frequency of robberies varie with the height of buildings and with the number of dwellings per hallway. These police figures are for New York City, but they show how, within one city, social disorder increases sharply with the increase of the number of floors per apartment building. These social "costs" often reverse the extra profit obtained from the high rise schemes, making them less attractive and often vandalized and abandoned.

The most evident reason is that, as the number of floors or households per hallway increase, the "natural" surveillance is harder to work. Natural surveillance can only work when every household knows more or less it neighbors or at least could detect an intruder that does not seem related to any of the people around.

Therefore, in order to minimize the social disorder resulting in social (and economical) costs, a minimum number of floors and households per hallway should be provided, to optimize natural surveillance and social cohesion.

The usual criticism against low-rise dwellings is the resulting low densities that imply an uneconomical use of the scarce land and a low efficiency in the use of the infrastructure.

There is no real ideal unique density that works best for housing. Density depends on too many intricate factors like topography, climate and utility patterns to have a unique value. But through observation of case studies, it seems that densities below 300 people per hectare would imply a too-low use of valuable land and infrastructure cost while a density of higher than 600 people per hectare would be too high to allow for adaptability and change, and at the same time would

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* *Reference 14, pages 29, 69*

complicate the utility network patterns up to diminishing returns.

Oscar Newman in his book "Defensible Space"* reverses the problem stating that high density of dwellings should not be accepted: because it is socially too dangerous. And modern anti-crime gadgetry or special design criteria to cope with the high densities would be too expensive in most cases.

It is also suggested that above densities of 50 dwellings per acre or 500 people per hectare (assuming an average of 4 people per household), most planners resort to the use of high-rise buildings. And that above densities of 80 dwellings per acre or 800 people per hectare it seems impossible to build other than double-loaded high rise towers, the most dangerous form of housing.

Due to the special conditions in New York City, a compromise solution could be to mix high-rise with low-rise buildings. (In the lower dwellings the larger families would be located.) But in most of the other cases, low-rise buildings, up to a maximum of four or five floors should be enough to obtain the highest acceptable densities (around 600 people per hectare).

Incidentally, five floors are the maximum before the use of elevators becomes necessary. And as elevators increase noticeably the cost of the dwellings, they should be avoided in case of tight budgets as those considered in this study.

Finally, to permit natural surveillance, to help social cohesion and to remain in the historical tradition, the concept of clusters should be adopted as a planning principle.

The concepts of clusters and "urban units" will be described in the following section.

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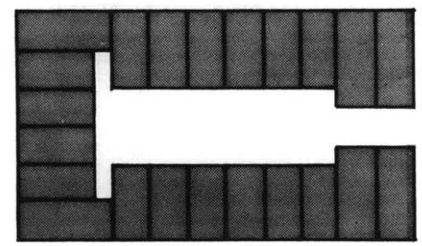
* *Reference 14, pages 195-198*

the urban unit

the cooperative urban unit



As just concluded, the concept of cluster is an interesting concept, given the social and cultural patterns of Lebanon.

The concept of clusters consists in the distribution of a few dwellings (the private spaces) around a court yard (a semi-private space), shared by all the people of the cluster.

The cluster is therefore the smaller collective or social entity, as opposed to the dwelling which is the smaller individual entity.

But this organization is not enough by itself, because it does not include services and community facilities which are also absolute necessities.

This section will describe an urban design framework that takes into consideration the planning criteria described above as well as the construction criteria discussed in one of the next sections.*

But the real problem is that it is quite uncomfortable to define an urban framework without a specific case study, because the model is either too general and its real applicability becomes quite limited, or it is more precise, given it often becomes too specific to have a generalized use.

The model that will be described here will therefore represent a pattern rather than a real urban design model, and its purpose is, at most, to serve as an illustration of a set of criteria and a reference for comparison.

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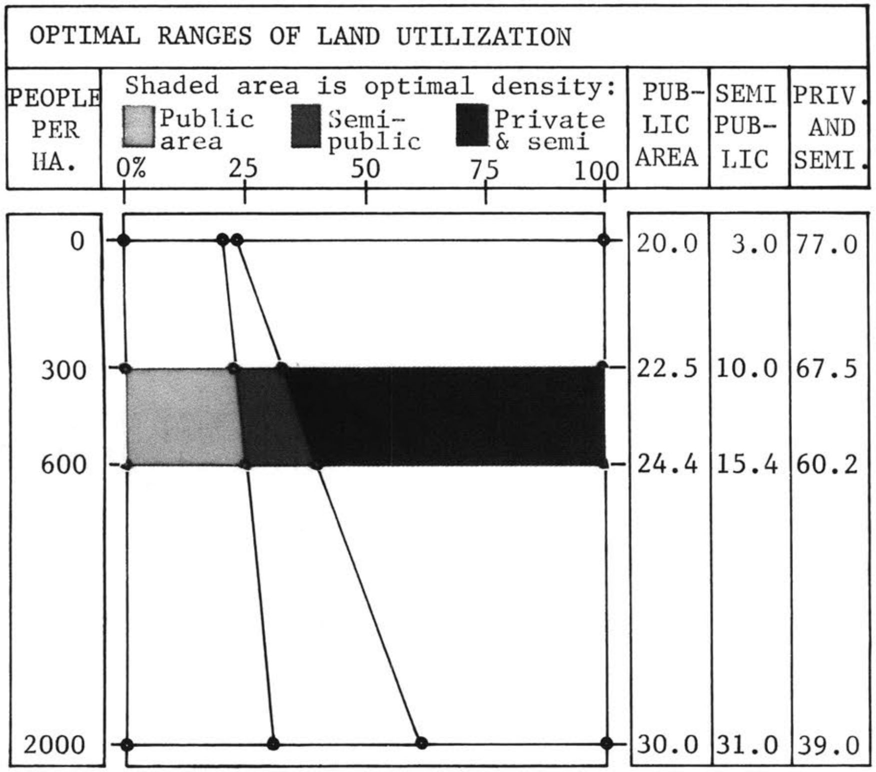
* *See pages 143-190*



actions that are less thrifty because more related to the needs than a central governmental bureaucracy.

The government (or the housing agency) will still have to help the cooperatives financially and technically to make sure that the vital needs of the people are covered. This action would decrease as the co-operative becomes able to take care of itself. The details are described in the section dealing with the concept of cooperatives.*

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* *See pages 63-65*

** *Urban Settlement Design in Developing Countries, Massachusetts Institute of Technology*

optimal ranges of land utilization

To maximize the natural maintenance, surveillance and policing of the urban unit, the proportion of the different spaces ranging from public to private areas should be carefully chosen.

The U.S.D.P. at M.I.T.** has formulated some guidelines based on case studies in the U.S. and in Latin America. These guidelines should only be understood as reference points for comparison purposes and not as rigid limits.

The adjacent graph summarizes the optimal proportions of the different areas following the different possible densities.

As stated before, the suggested densities range between 300 and 600 people per hectare (the shaded area). At lower densities the utility networks become unefficiently used while densities superior to 600 people per hectare imply a complex and costly adaptation of the utility networks and community facilities to the potential changes, and they also have a negative effect on the social life of the communities.

It is interesting to note that the public areas increase the least as the density rises, while the semi-public areas increase substantially to cover the needs of an increasing density that has to accomodate itself with less semi-private and private space. proportionally.

1. The Public spaces (streets, walkways, and open public spaces) are minimized because they rely on public maintenance and security. The longer the streets are, the longer the utilities networks. These naturally increase as the density increases because street and open space have to become wider to accept more people.

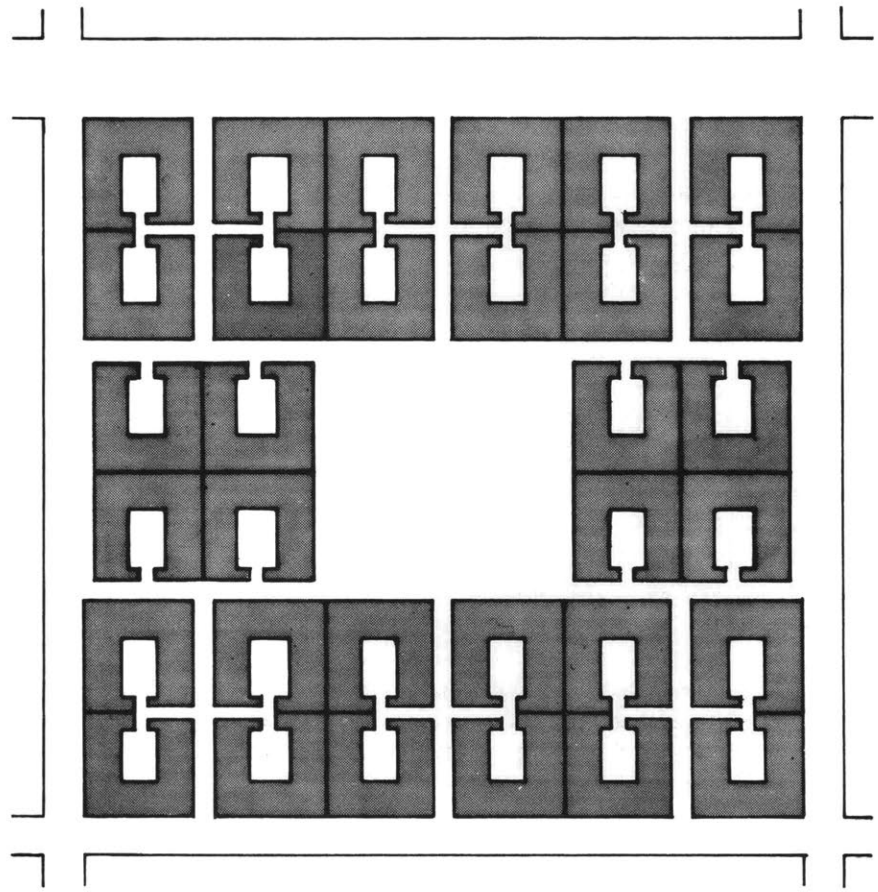
A few of these clusters should therefore be organized around a semi-public space (the central space in the adjacent drawing) to acommodate the community facilities and serve as a forum for the group of clusters around it. This semi-public space should therefore have an urban scale to contrast the domestic scale of the cluster courts, and also to contain playgrounds, a social center, religious centers and probably a primary school.

These elements will form an urban residential unit including the above defined private, semi-private, and semi-public areas. All these spaces could be taken care of by a cooperative which organizes the urban unit.

The notion of "cooperative urban unit" is not the only alternative. The urban unit can be only the juxtaposition of the few clusters that share the same community facilities. But it seems that having a cooperative urban unit with a partially independent, self-managed and responsible administration resulting from a direct participation of the people of the urban unit has many advantages. (Most of the advantages are described in the section dealing with the cooperative system.*)

These urban unit cooperatives could be formed at different stages of the development, including the construction time, in self-help schemes. Such frameworks are the best pre-requisites for self-help action in order to decentralize the responsibility of the government and attract long-term, low-interest loans from the loaning institutions, to the lower income groups.

If this notion is politically accepted (which is assumed here for the sake of the illustration) the cooperative would be formed by one or two representatives o of each cluster who will be responsible for the maintenance of their respective clusters as well as the maintenance (as a group) of the semi-public central areas.



The government will only be left with the public areas of the urban units which are the streets around the urban units (technically to the center lines of these streets), because these streets will be accessible to everybody.

Again, the purpose here is not to remove the burden from the government to place it on the lower-income groups, but given the scarcity of resources and the importance of the needs, the aim is to favor community

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* *See pages 63-65*

The optimal range seems to be between 20% for the low densities, and 30% for the high densities (2000 people/hectare). As for the optimal densities (300 to 600 people/hectare), the proportion is therefore between 22.5 to 24.4% of the land.

This increase is relatively smaller than the others because the streets to accept vehicular circulation require minimum dimensions even at low densities. The increase is therefore less sharp than the other areas as the density rises.

2. In the context of a residential unit, the area allocated to the semi-public use is relatively limited. It is only 3% of the total area at the low densities but rises fast to 31% at the excessive density of 2,000 people per hectare. And between 300 and 600 people per hectare, the proportion of semi-public space is between 10 and 15.4% of the total area of the urban unit.

This rise is sharper than the one of the public areas because the community space is more directly affected by the rise in density than the width of the streets because of the reasons mentioned above.

This area* should be narrow enough on one side to be physically watchable (safer) by the houses around it. The higher dwellings could also be placed around this area to have a better view of the park and, at the same time, have a horizontal scale corresponding to their higher vertical scale.

For the same reasons, the higher dwellings should also be palced along the edge streets of the urban unit.

3. The clusters, including the private lots and the semi-private courts, would therefore be the remainder, that is, 77% for the low density and 39% for 2000 people/hectare; ranging from 67.5% to 60.2% for the optimal density range 300 to 600 people/hectare.

Within the cluster, the proportion of lot to semi-private court will be detailed later, but in general, the court proportion will be around the third to the fourth of the total cluster area, depending on the age of the households, the height of buildings and the number of dwellings.

The unit should be large enough to be able to support community facilities like a primary school and the cost of an urban space or piazza and be small enough to be within a social scale where social patterns can occur and bureaucratic bottlenecks be avoided in the cooperative work. Finally, a geographical scale is also necessary from dwelling to school, to the market, or to the playgrounds.

If a population of 5,000 people is necessary to support a primary school** then this corresponds to an area of 16.7 hectares with a density of 300 people/hectare and 8.3 hectare, with a density of 600 people/hectare.

These areas correspond to squares of 280 to 400 meters of side length.

On the other hand, 400 meters is already a large block size beyond which the walking distances from the main streets becomes too large.

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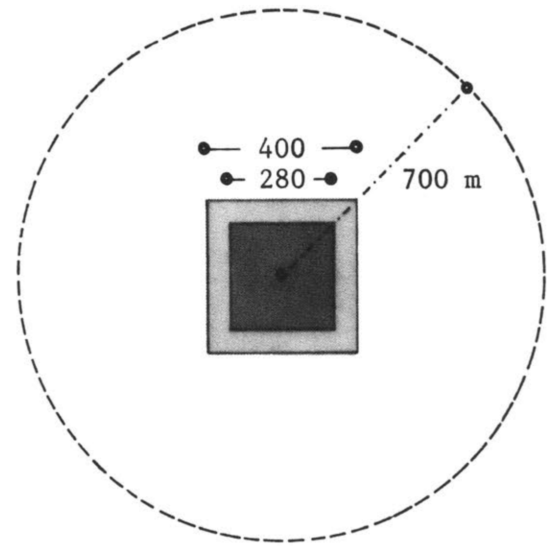
* *Reference 14, pages 114-115*

** *Urban Settlement Design in Developing Countries, Massachusetts Institute of Technology*

And as far as the walking distance to a primary school is concerned, 15 minutes walk to the school is regarded as a maximum. This corresponds to a total distance of 1000 meters or a radius of 1000 $\sqrt{2}$ = 700 meters, a far longer distance than the urban units dimensions.



As a result, for the lower density cases, the primary schools could be scattered, until the density rise, to diminish the initial costs of the urban units.

A population of 5,000 people would correspond to approximately thirty clusters with thirty families each; if the average household size is the one of Lebanon: 5.3 people per household. This implies an urban unit of 400 x 400 meters approximately.*

If the cooperative representation is held by one person per cluster, that would make a body of 30 people that would get both feedback from the cooperative to the families and vice versa with more chances for real popular participation in self-management.

Again these figures are approximate, and they should be regarded more as references for comparisons than precise limitations.

All these figures depend on the specific local conditions, topography, culture, income levels; they also depend on the capacity of the social workers to form more or less large cooperatives and run them until they can be self-managed. The degree to which the government could/should interfere in such cooperatives would depend, as described, upon its administrative and financial possibilities and the political structure of the population in each particular case.

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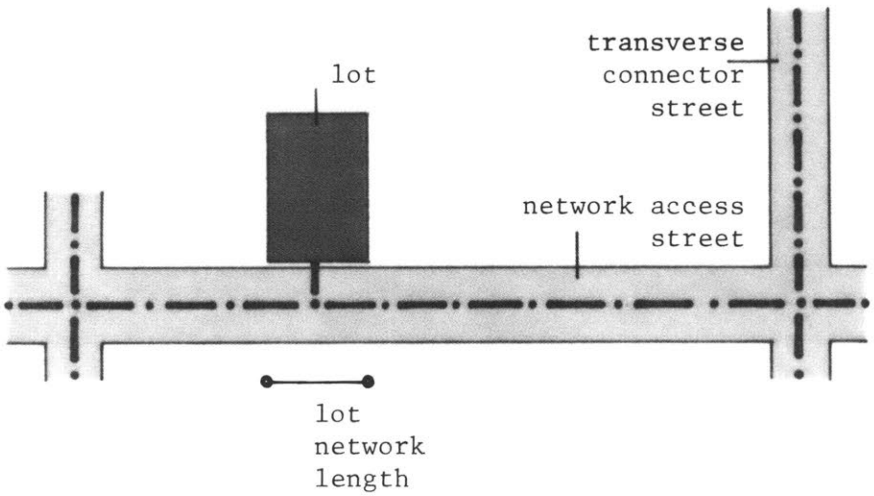
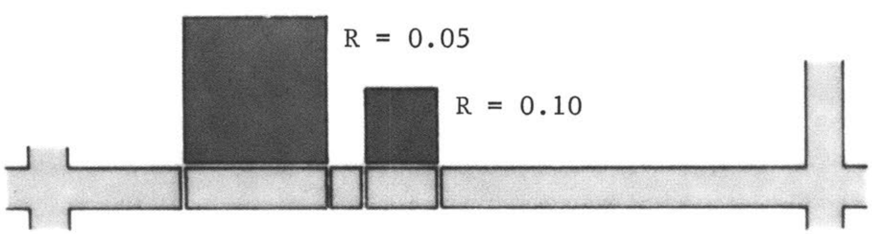
* *See page 111*

the individual lots





In a framework of incremental individual construction combined with a land and infrastructure organization, the dimensions of the individual lots take an unusual importance because they have a direct bearing on the length of utilities, land use and construction.

Utilities are generally associated physically with the street because streets are public properties where it is easier to make repairs or enlarge obsolete networks.

It is difficult to generalize an optimum system for all cases. Topography, different costs of labor and materials, equipment and technology could imply different systems. These factors can only be studied given a piece of land in its physical context.

There are, nevertheless, some criteria that are general, and that have some impact on the layout of the dwellings and on the dimensions of the lots.*

The efficiency of a network can be expressed as:

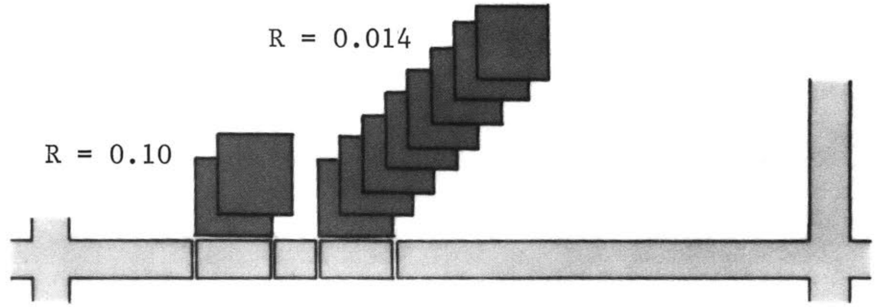
$$R = \frac{\text{network length}}{\text{area served by network}}$$

The smaller the ratio the more efficient the network. The ratio varies greatly following the geometric configurations:

1. The larger the area of the lot, the more area is served per unit length, because the area increases faster than its relative side length.

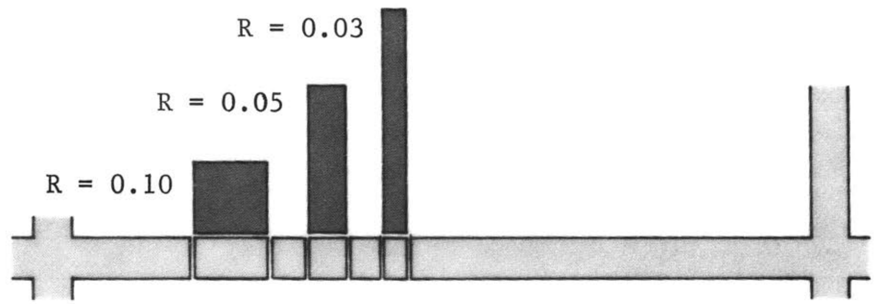
For instance, a square of $100\,m^2$ has a utility length of 10 m, that is, a ratio of 10/100 = 0.10, while a 400 m^2 square has a utility length of 20 m, that is, a ratio of 20/400 = 0.05.

2. The more floors on the lot, the more vertical area is served per unit network length. The cost of vertical piping is not considered here. Usually the horizontal networks are a public expenditure while the building pipes expenses belong to the building owner.



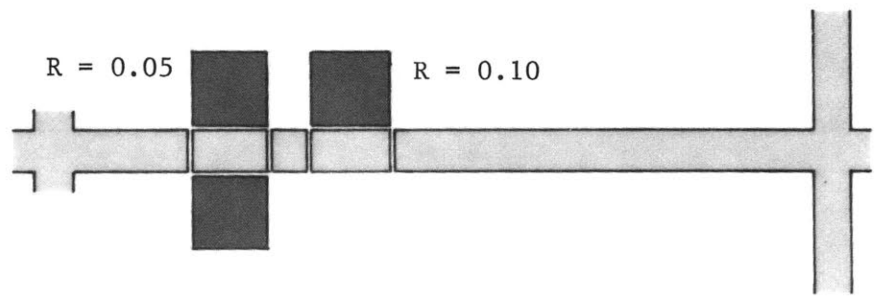
For instance, a squarrish dwelling of 100 m^2 has a front side of 10 m. Its R ratio is therefore 10/100 = 0.1. If the building has 7 floors instead of 1, its ratio becomes 10/700 = 0.014.

3. A rectangular lot is more efficient than a squarish lot if it is connected to the utilities by one side only, the narrow side. And in this case, the smaller the width of the lot, the more efficient the network layout.



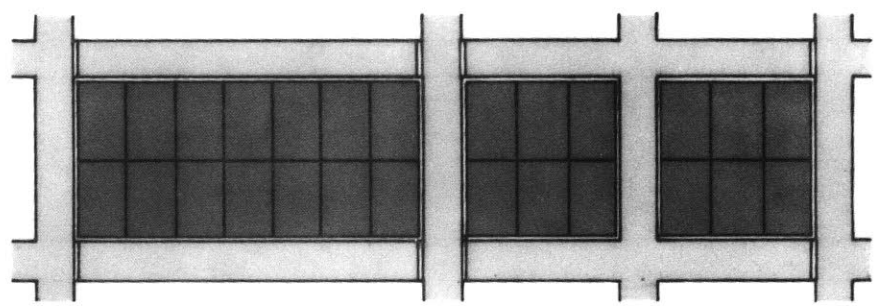
For a 10x10 m lot, R = 10/100 = 0.10.
For a 5x20 m lot, R = 5/100 = 0.05.
For a 3x33 m lot, R = 3/100 = 0.03.

4. Double loaded network lines are more efficient than single loaded lines.



For 10x10 m lots:
in the single loaded network, R = 10/100 = 0.10;
in the double loaded network, $R = \frac{10}{100 + 100} = 0.05$.

5. The less frequent the transverses (to the lot accesses) are, the shorter the overall utility length, the more efficient the network.



This is clear from the adjacent diagram. Its left part uses less network length than its right part, for the same number of lots served.

These geometric considerations have been described here very schematically. This is just a first step towards a rational approach for the lots distribution.

* *Reference 4*

Other numerous criteria (like the different pipes sections, the mechanization of the excavations, etc.) should be taken into consideration in more detailed studies. But this simplified framework is still valid at this stage of general design, because it indicates the general guidelines of the layout system.

From the discussion above, narrow rectangular individual lots on the two sides of a street (or court) permit a more efficient use of the land and the utility networks.

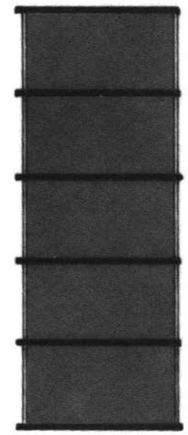
Moreover, for climatic reasons,* in order to minimize the impact of the hostile weather, individual dwellings should be adjacent to each other. For construction reasons,** in order to minimize the structural elements (foundations and bearing walls), the dwellings should have these elements shared as much as possible.

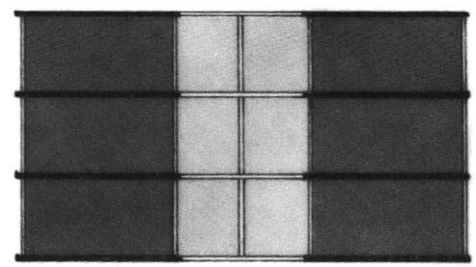
As a result, two of the facades are blocked by the adjacent dwellings and the remaining two facades should be left open for ventilation and lighting reasons.

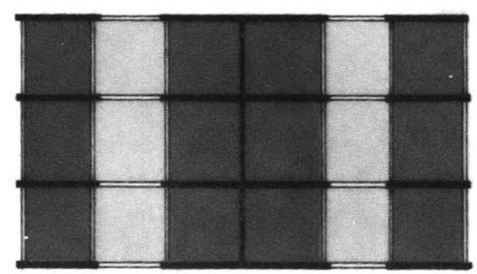
As the clusters are adjacent to each other, the dwellings should be separated to allow the access to light and ventilation for the back walls facades.

The separating zone naturally becomes two backyards: one for each dwelling of the adjacent clusters.

An alternative could have been to open a court in the middle of the dwelling, and therefore stick the two dwellings and clusters to each other. But given the scale of the dwellings, the court would divide the home into two separate blocks, which is not acceptable in the Lebanese weather as it still rains heavily at least three months a year.







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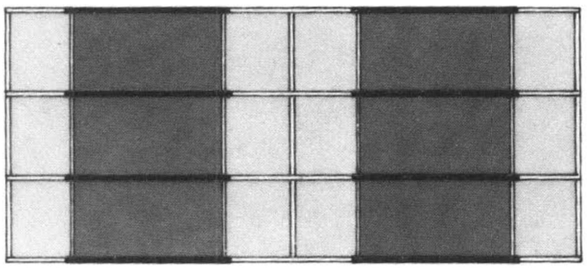
* *See pages 77-81*

** *See pages 162-174*



Bridges or covers would reduce the narrow court and be too expensive for the advantage they bring: more privacy in the backyard, but lack of cross ventilation to the back part of the dwelling.

Finally, given the Mediterranean extroversion of people and their desire to sit, gather and watch the street or court, a front yard is very much part of the social requirements of the people. Both courts increase tremendously the living space of the house in more than six months of excellent outdoor climate, these areas are in no way a wast of precious land--they are part of the very important physical and psychological needs of the people.

The individual lot is therefore formed of a median built area with two yards at both its two free extremities: a frontyard and a backyard.

The dimensions of this individual lot are defined in the section dealing with the design of the dwelling.* This zoning system allows different residential and residential-related functions to take place in optimal conditions.

The lot thus defined is therefore the basis of the spatial organization of the urban unit, and one can define an urban grid, or joining system to limit the constructed zones from the non-constructed zones, based on the defined dimensions, and taking into consideration the different recognized requirements discussed in the financial, land, climate and dwelling sections.

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* *See pages 119-141*

layout and density alternatives

In the adjacent drawing, the lots (20 m x 5.4 m) give a sense of scale, and they define the built strips as opposed to the private gardens, the semi-private cluster-courts, the semi-public urban court and the public streets.

This model shows how an urban unit can be organized, given real dimensions, densities and a hierarchy of spaces.

But this model is still only an abstract model that does not take into consideration different existing topographical or existing layout conditions.

The model does not profess that whole cities should be made of adjacent duplications of itself. The model is only an illustration to show how the described urban model is physically realizable, and not just an intellectual fantasy.

The conceptual framework of the urban unit can take other physical forms, following the cases, or no physical form at all. For example, in rural areas, financing help with a village cooperative could be enough, as land, time and self-help labor are naturally available. But in larger cities like Beirut, a direct involvement in the design of an urban grid and a utility and perhaps a structural infrastructure are necessary because of tighter conditions.

The "physical" model can also adapt to different density requirements. These, as discussed earlier, change according to the scarcity or the cost of land.

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* *See page 102*
** *See pages 102-104*

Densities of from 300 to 600 people/hectare were described as the parameters within which many requirements can be met.* As seen above, the relative proportions between public, semi-public and private spaces should vary with different densities.** The variation is minimal for the public areas, while it is more substantial for both semi-public and private areas.

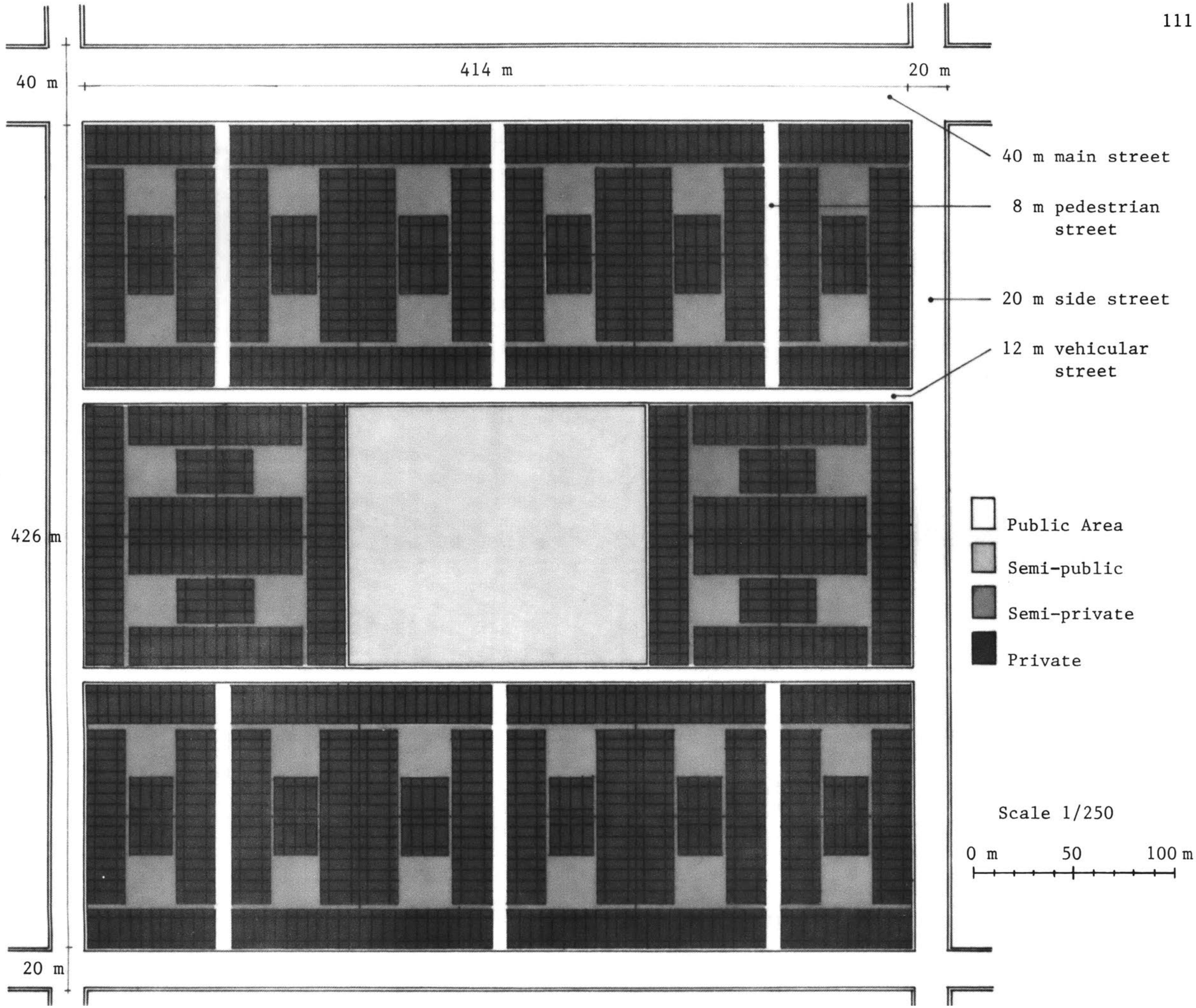
In the present model the public area consists of both pedestrian and vehicular streets, around and in the urban unit. This area is 19.45% of the total gross area and is kept constant as densities vary from 300 to 600 people/hectare. It is incidentally lower than the suggested percentage of 22.5 to 24.4%.

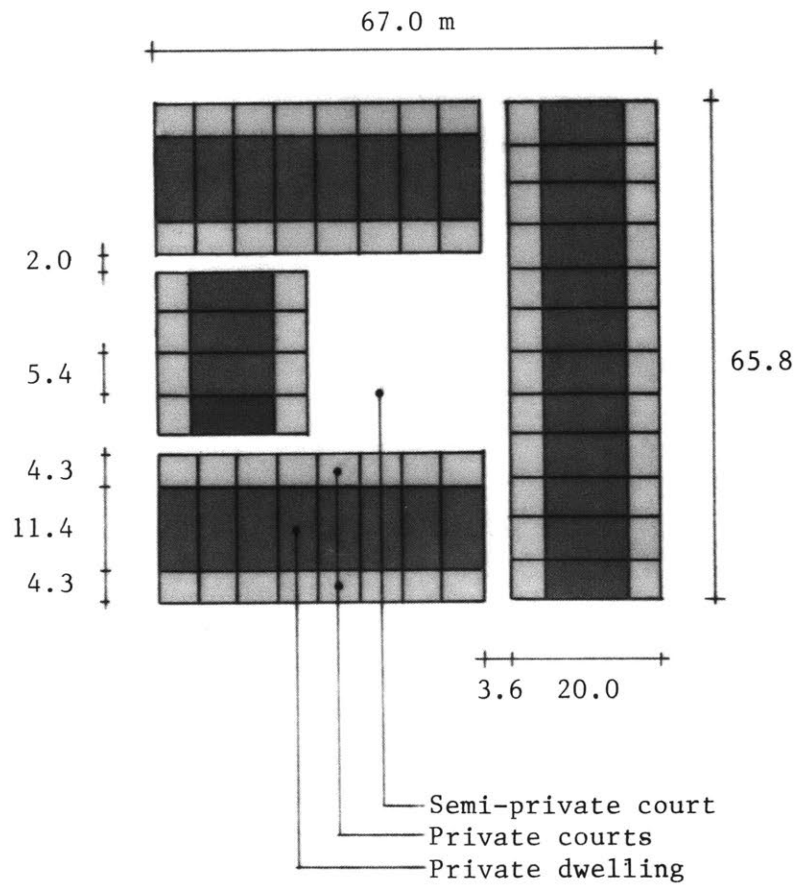
But public area, more than the other areas, depends very much on the main streets pattern. They are exterior to the urban unit and depend on the planning system of the city in general.

As an illustration here, bordering on the 414x426 m urban unit are 3 twenty-meter wide streets and one main 40 m wide street.

The 2 inner streets of 12 m each are for vehicular crossing. They are placed parallel to the main streets to have their entrances away from the main traffic and avoid all sorts of hazards. In the center is the main central semi-public area that varies between 10.39% to 14.83% following the different densities required. The variation could be done (see next page) either by remodeling the whole unit organization or, more simply as shown here for illustration purposes, by reducing the two lateral sets of clusters.

The semi-public area will house the primary school, a social unit and the cooperative headquarters. They will be (with the clusters representatives) responsible for the maintenance of the open playing area.


414 m
20 m
40 m
40 m main street
8 m pedestrian street
20 m side street
12 m vehicular street
426 m
Public Area
Semi-public
Semi-private
Private
Scale 1/250
0 m
50
100 m
20 m



Along these lateral clusters and across the vehicular streets would be situated (if any) the shopping street, where the urban unit people and eventual foreigners would be able to shop. Another shopping area could be along the main street to attract passers-by, but it would be a traffic hindrance, and should therefore be controlled, and determined by the size of the main street. The other (vertical) street will be 8 meters wide and only for pedestrian use. Emergency vehicles have enough access through the lateral streets. The streets define groups of 66 m side clusters, but entrances to these clusters are at 20 m from vehicular access.

The left diagram shows an urban cluster. It includes 32 lots and a common (semi-private) central court.

Only one of the possible entrances should be left open: the one facing the pedestrian street. The reason is to avoid the use of the cluster as a transit zone and enhance the privacy of the cluster and therefore its "natural" surveillance and protection.

The other entrances serve as emergency exits and to allow an access to the side lots of the clusters. They also enhance the breeze effects that are highly appreciated in Lebanon.

The individual dwellings are planned to have two floors, either immediately or incrementally, and the density depends on the number of people per household.*

But in the lower-income groups, the household size is often higher. If it reaches eight people per household, the density would reach 400 people per hectare.

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* *See pages 115-117*

If the household size is the same as the average Lebanese household size (5.5 people per household), the density of the urban unit is around 300 people per hectare.

In expensive lands however, higher densities are often required, and additional dwellings have therefore to be added to the clusters. This can be built vertically but should be done carefully as noise and anonymity increase quickly as the number of dwellings rise significantly above 30 to 40 dwellings per cluster.

As the density rises, the proportion of the different areas change also. And as mentioned above,* the most important change occurs in the semi-public central area of the urban unit. The diagrams below illustrate graphically the relative increase in semi-public space as the density increases from 300 (case A) to 600 (case B) people per hectare, approximately.

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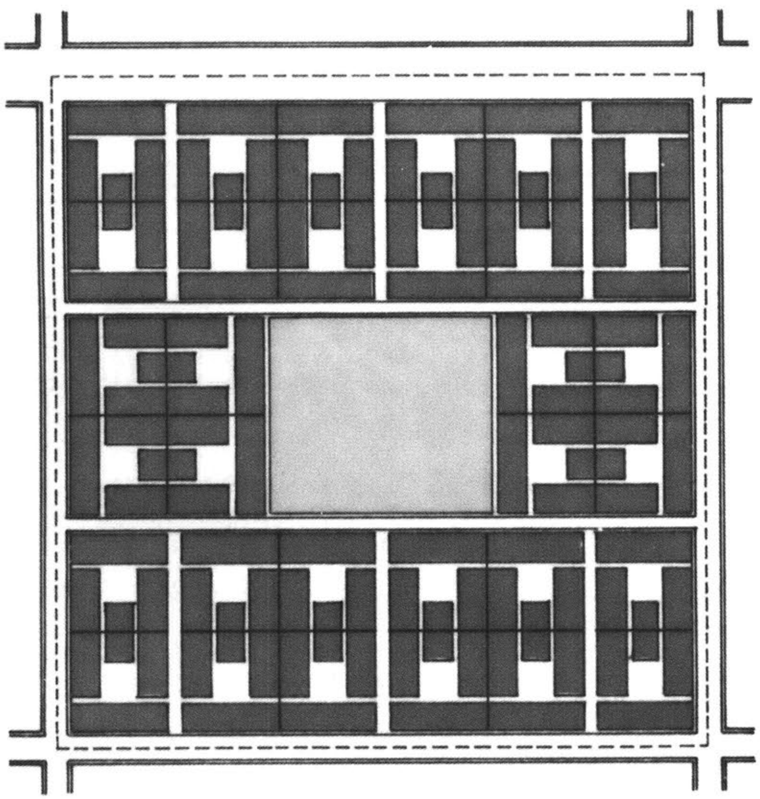
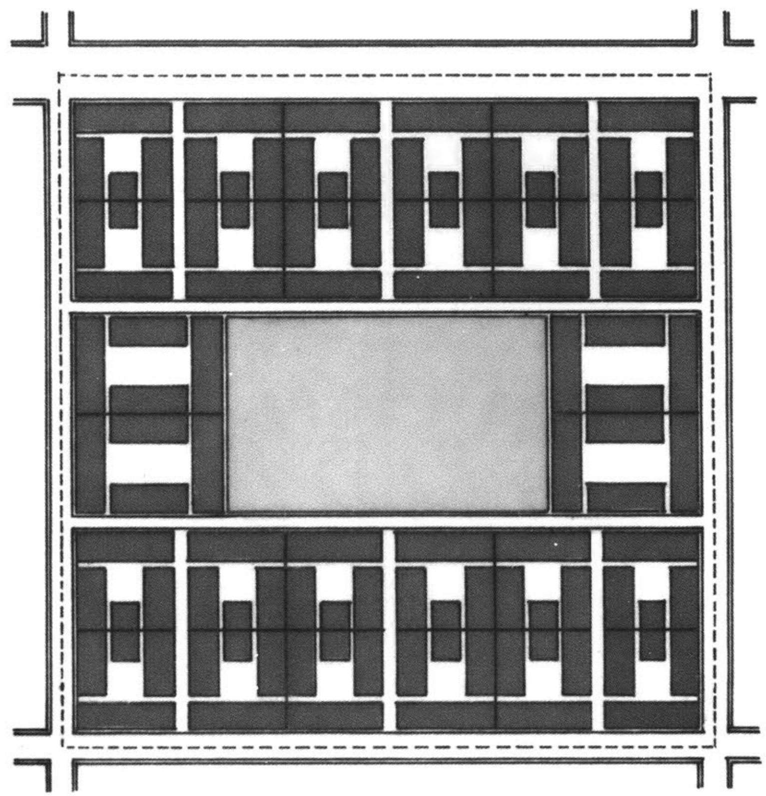
* *See page 104*





If the estimated potential density is low (300 to 450 people per hectare), layout A should be adopted, while in cases of densities higher than 450 people per hectare, type B layout should be chosen.

These differentiations are just illustrative of the concept and are no more than reference points.

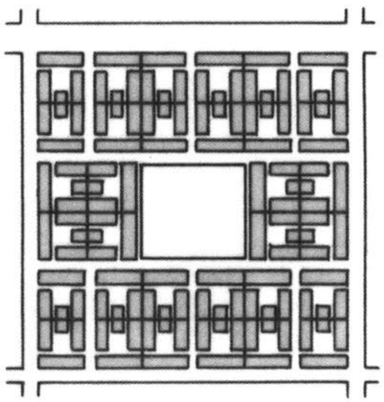
If dwellings have to be added to the cluster to raise its density, a row of one- or two-floor dwellings (or both combined) can be added vertically to the ground two-floor dwellings, making structures of three, four or even five floors high.

The added floors should be minimized, as said above, to avoid social problems. And when added, they should be distributed as much as possible to the open sides of the clusters to face more open areas that are better related to their scale.

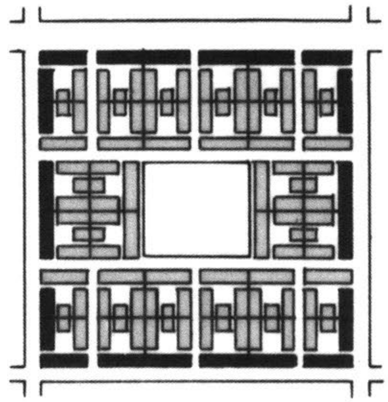
The adjacent diagrams illustrate the increase of dwellings from 32 to 64 dwellings per cluster. The last case is beyond social advantages but it is shown for comparison purposes.

The layouts represented are all of type A for this illustration purpose. But the same variations are obviously possible in the type B layouts. The choice between the two is made, as said above, following the density projected.

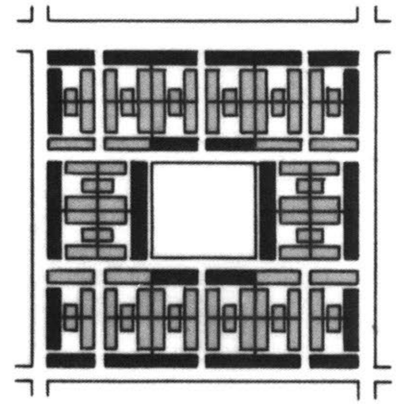
The number of dwelling rises from 1024 in the first case to 2048 in the 6th case, and from densities of 281.6 to 563.3 people per hectare at the household size of 5.3 people and from 425.1 to 850.3 people per hectare, at the household size of 8 people per hectare. In the case of the B layout (to be used for the higher densities) the number of dwellings varies from 944 to 1888. The gross density varies from 259.6 to 519.3 people per hectare with families of 5.3 people and from 391.9 to 783.8 people per hectare with families of 8 people.



Alternative 1

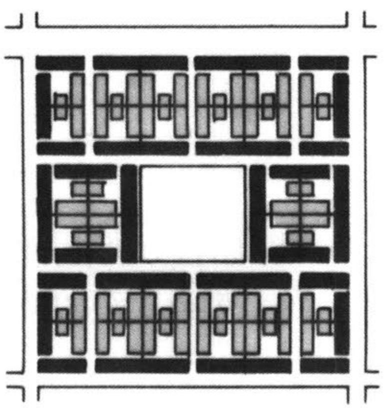


Alternative 2

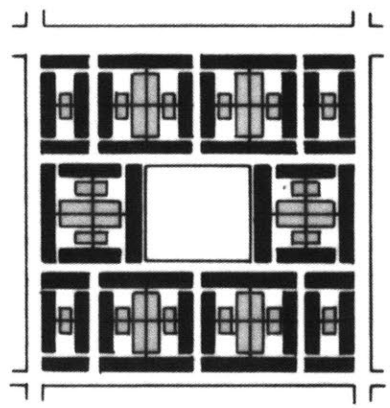


Alternative 3

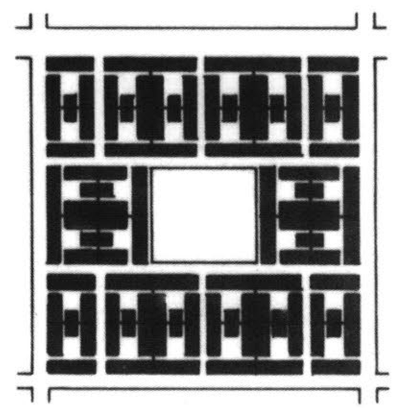
Alternative 4



Alternative 5



Alternative 6



DWELLING DISTRIBUTION ALTERNATIVES (FOR LAYOUT A)

1 dwelling per lot

2 dwellings per lot

The following chart and graph summarize all details of the 6 cases, and show some of the implications when certain variables are chosen.

The first column represents the different possible number of people in the urban unit, the second column represents the consequent density of the urban unit (with the focus--shadowed area--on the 300 to 600 densities). The horizontal scale of the graph represents the possible family sizes from 0 to 10 people per household.

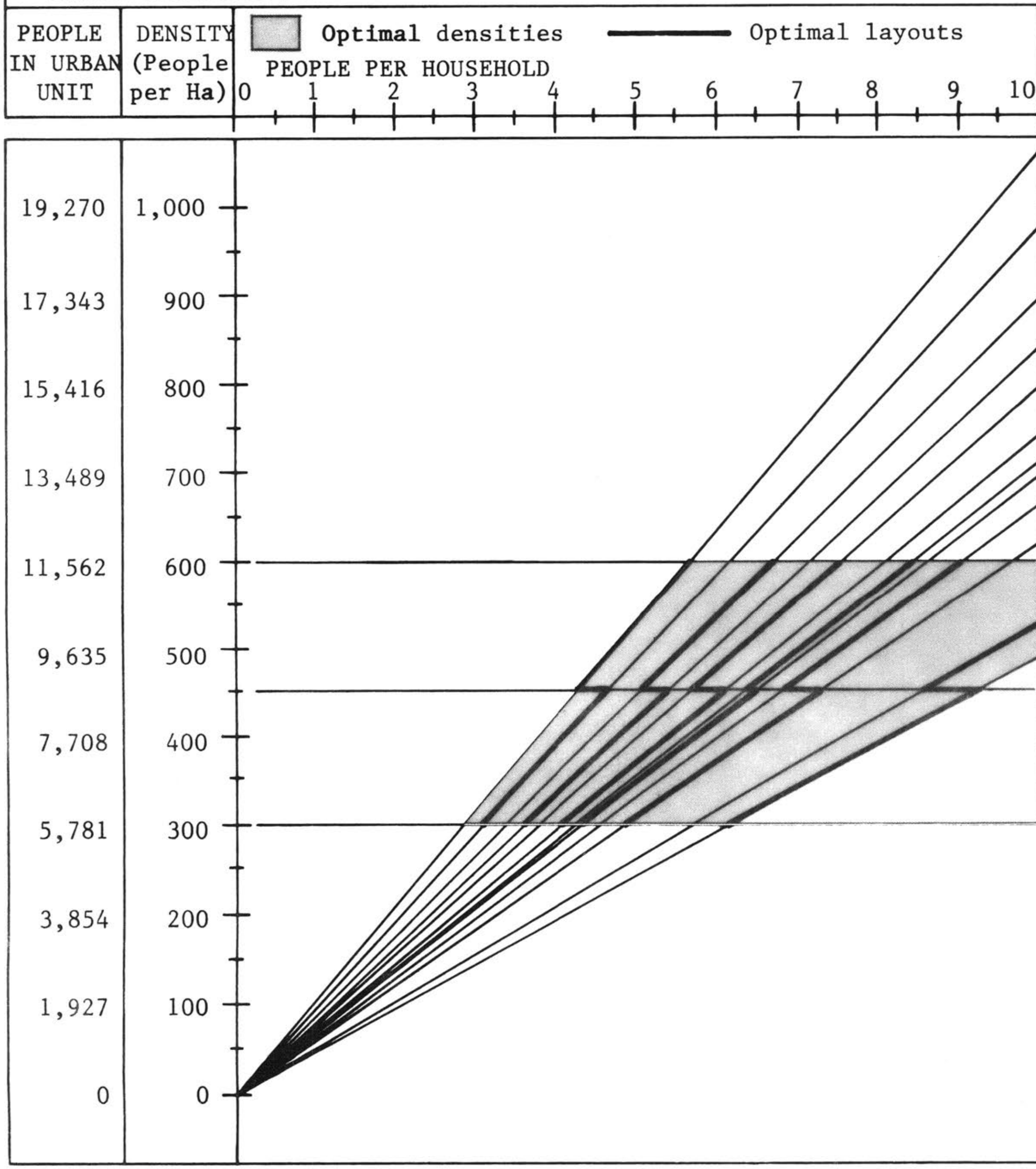
The oblique lines obtained are related to the first right column, indicating the illustration number, with the relative number of dwellings in the next columns and the proportion of the dwelling on the ground floor in the last column.

A break in all oblique lines at a 450 density indicates the use of the second layout scheme with densities above 450 people per hectare. So if a certain density is required due to the cost of land, and the family size of a segment of population is estimated, then the type of layout and its construction saturation are directly obtained from the graph.

Conversely, if the number of needed dwellings is known, then one could directly see the implied density and the type of layout and construction heights required.

This graph is essentially no more than a summary to show how middle and high densities can be gradually obtained to fit different family sizes within low-rise buildings from two to four floors.

LAYOUT ALTERNATIVES & NUMBER OF DWELLINGS V/S URBAN UNIT DENSITIES & HOUSEHOLD SIZES



LAYOUT ALTERNATIVES	NUMBER OF DWELLINGS			RATIO OF UPPER TO TOTAL
	TOTAL	GROUND	UPPER	
6 A	2,048	1,024	1,024	50.0
6 B	1,888	944	944	50.0
5 A	1,728	1,024	704	40.7
5 B	1,624	944	680	41.9
4 A	1,536	1,024	512	33.3
4 B	1,432	944	488	34.1
3 A	1,376	1,024	352	25.6
3 B	1,344	944	400	29.8
2 A	1,280	1,024	256	20.0
2 B	1,200	944	256	21.3
1 A	1,024	1,024	0	0.0
1 B	944	944	0	0.0

the dwelling unit

GENERAL CONCEPTS

The major problem when freedom of choice has to be restored to the user of a dwelling is to understand the limits of his possible choices, related to his priorities as well as the collectivity's general needs.

Numerous case studies of completely spontaneous urban settlements show that the utilities and equipments are never properly planned. And as it is very costly and difficult to install these networks, a posteriori (due to the lack of basic organization) the quality of environment and life is lowered, and the levels of hygiene very dangerous.

On the other hand, the precious urban lands are often misused in the chaotic and haphazard settlement process.

It seems therefore, that in the contemporaneous quick urbanization process, a complete freedom left to the user has important disadvantages. A basic urban organization is necessary to allow the different individual liberties to coexist harmoniously.

sites and services

The "sites and services" schemes acknowledge the problem. They provide to the low-income household a lot where it can build its own house. The lots are organized in as optimal layouts as possible, given the state of the art and the skills of the planners.

This strategy provides a maximum apparent freedom to the family, as they can build the dwelling structure they desire. The only infrastructure given in these schemes is the land, with the water, sewage and, if possible, the electrical connections.

This solution, however, puts a great burden on the family, burden that it often can not carry given its lack of resources, time and skills.

As a result, the dwellings built are hardly better than the usual shacks in the spontaneous squatter settlements.

They sometimes improve with time, but the process is generally slow, uncertain, tough for the users and not highly desired by the public authorities who are afraid of getting involved in building probable future slums.

This solution is therefore only temporarily tolerable in very extreme cases when the people have no job or no resources whatever, and when the government cannot afford to help more than with just a piece of serviced land. Such a serviced land at least provides an organized and optimized network and a space organization.

But besides the momentary situations, intermediate solutions seem preferable as they lighten the household burden, thus allowing it to take real advantage of its freedom.

The more intermediate alternatives can take place, as described above,* through the dual process of infrastructure and suprastructure.

infrastructure and suprastructure

The concept is to give a minimum livable unit, corresponding to at least the combined available resources of the country and the family. This minimum unit should then have the possibility of growing gradually to meet bigger needs or incremental resources of the family. The purpose is to promote long-term solutions with the short-term available means.

This apparent contradiction can be best resolved within the concept of an infrastructure versus a suprastructure.

The design of the dwellings should be aimed at providing an optimized infrastructure to give the maximum at the beginning within a limited cost, and provide the maximum possibilities and freedom for the suprastructure (or users'-built party) that will be added by self-help incremental work.

The first package, or infrastructure, should:

1. Correspond to the available resources of the household (or group of households) and the available government housing budget.

Resources here, are understood in their broad sense meaning all capital, administration power, technology, labor, etc.

2. Correspond to the priorities of the people, in decreasing order, proportional to the available resources.

The priorities are defined by observation. They depend on the climate, the social patterns, and the income levels of the considered groups of people.**

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* *See page 94*
** *See page 59*

3. Enable, within the range of the possible priorities, real suprastructure choices, as opposed to superficial choices that do not mean much to the user.

4. Correspond to the ability of the generally unskilled self-helper to complete the infrastructure to meet his long-term needs.

5. Be an optimized construction system both at the infrastructure level and the self-help suprastructure level, for incremental development.

6. Ensure the safety of the construction and the self-helper at all the incremental levels of the dwelling construction.

7. Give the ability to enforce the law related to the limits of the dwelling expansion for structural (safety), hygienic (lighting and ventilation of the major spaces) and legal (neighbors and collectivity) rights.

the dwelling zones

With the present strategy, the infrasturcture delivery of the first package has to take into consideration many potential planning choices, as discussed above.

The traditional dwelling construction does not have this difficulty, as, even in incremental strategies, one future solution is usually envisioned.

In order to deal with potential choices, the concept of zone should be introduced as an organizational factor in the design of the dwelling infrasturcture.

The concept of zones, here, is based on the observable fact that some zones (spaces or areas) of a dwelling structure have a significantly higher probability to be used for some specific functions.

Conversely, when certain behavioural patterns can be observed in a defined group of people, then functional zones could be defined.

Finally, the dwelling infrastructure can be designed to fit the defined zones.

The zones, by their physical locations and dimensions, would allow the defined potential functions to take place, when desired by the user.

The user adds his own suprastructure to transform a zone into the precise functional space he desires, provided his choice is not completely incompatible with the possibilities offered by the zone considered.

Different users would transform the same zone into different functional spaces (i.e., rooms), following their own needs by adding to the infrastructure their own suprastructure.

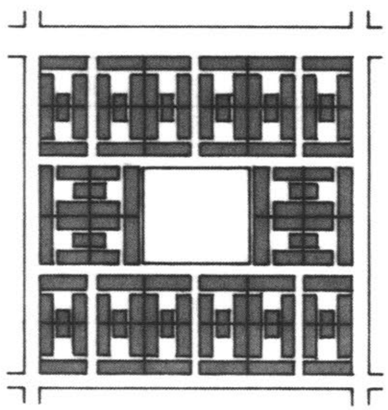
The amount of freedom depends on the choice of the zones and also on the amount of infrastructure delivered in the first package.

The general scheme concluded in the previous section* should serve as the first basis for the elaboration of the detailed system of zones and infrastructure.

In very brief terms, the concept is to cluster thirty to fifty double-story individual dwellings around semi-private courts and to organize the clusters around a semi-public area where social, educational and recreational facilities would be concentrated to serve directly the people of this small collectivity, the urban unit.

The scheme, as discussed above, would favorise the many aspects of social, family and personal life through the sharing of responsibilities and the decentralization of decision making.

At the urban scale, four zones have been defined above within each urban unit. The zones are:



a. the public areas: streets and walkways;

b. the semi-public areas: the central zone in the urban unit, holding the social, educational and recreational facilities;

c. the semi-private areas: the cluster courts, shared exclusively by a group of dwellings;

d. the private areas: the private lots containing the individual dwellings and their respective backyards or front gardens.

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* *See pages 110-117*

At the dwelling level, the starting point for the definition of the zones is the concept of the individual dwelling already introduced in the previous section.*

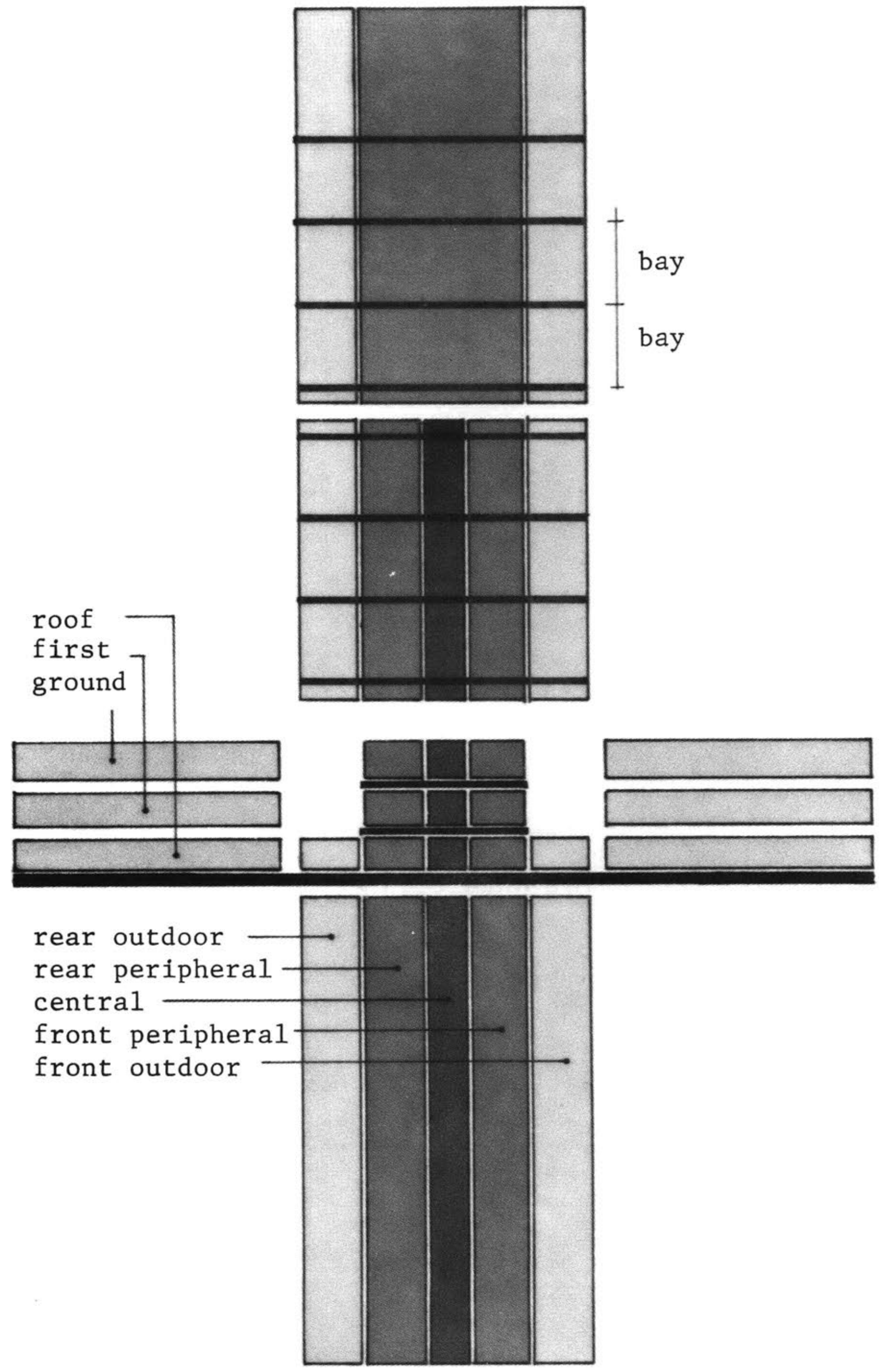
For the many reasons discussed above, mainly to enhance the need of a family to express itself as an individual entity, single dwellings were suggested as the basic unit (as opposed to a larger unit like an apartment building).

In the generally prevailing scarcity conditions, the dwelling had to take certain "optimal" dimensions to best use the land, minimize the utilities networks, minimize the construction materials and the environment impact, and result in reduced live and initial costs.

The consequent individual rectangular lots and dwellings defined above,* are further detailed into microzones (both vertical and horizontal zones) to define as precisely as possible the potential users' choices and the consequent optimal dimensions.

Horizontally, there are two peripheral zones and a central median zone separating the first two. The peripheral zones are exposed to the outdoor light air and view, back or front. The central zone is sandwiched between the two other zones and is therefore dark and badly ventilated, and has no exterior view. Vertically, there are also three zones: the ground floor, the first floor and the roof floor.

Under the present conditions or tightened resources, all functions can not always have their best position. A hierarchy of priorities should be settled to optimize the space or the zone uses.



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* *See page 109*

As a result, a first distinction could be between functions needing direct access to light and air, i.e., be in either one of the peripheral zones and, those functions not requiring this .

The stairs, closets, bathroom and corridors seem the only function in the Lebanese context that could be in the central zone, although ideally they should still have windows. These functions have in common the fact that people spend infinitesimal amounts of time associated with them, compared to other spaces. They are in fact transitional spaces rather than living spaces.

The bathroom should, more than the others, have a window to quickly remove humidity and odors, but as little time is spent in the bathroom, a link with the roof is an alternative to ventilating it properly. A simple duct could be a good enough substitute for a window.

For other functions, such as living, dining, sleeping, and cooking, a window to the air and light is necessary, and they should be in either one of the peripheral zones.

The cooking area or kitchen often does not have a window in contemporary Western architecture, and is put in a central zone. This is not acceptable in Lebanon as cooking is a long daily activity. This makes out of the kitchen a living space much more than a transitional space as in the Western world, which relies heavily on pre-cooked dishes. Also the extensive use of spicy, smelly ingredients makes imperative the proximity of a window, especially as artificial ventilation is above the means of the lower-income group.

categories of areas

A second useful distinction is between the different areas needed for the different activities.

It is understood that different people may need different areas for the same activities. For instance, some households may prefer large bedrooms while others would prefer smaller bedrooms for the sake of a larger living room.

As said above, the user should have the possibility of choosing his private spaces as he wants.

This section, therefore, only tries to define the domain of the probable as opposed to the non-probable, to define as precisely as possible the functional zones and the physical infrastructure, which allow the users' potential needs to be formulated within the zones defined by the infrastructure.

There seems to be three clear categories for the different functions considered:

1. The small areas (less than 5 m^2) include all central areas, i.e., those that do not necessarily need windows. In fact, only the bathroom has a well-defined shape and area. The others depend totally on the particular plan considered.

2. The medium areas (between 9 to 15 m^2) include individual bedrooms, kitchen (and dining room, if not part of living area).

3. The large area (around or above 25 m^2): the living area.

The next few pages will be devoted to defining as closely as possible the key dimensions of the different categories of areas.

THE SMALL AREAS

the bathroom

A smallest and yet large enough bathroom is usually around 1.30 m to 2.20 m, to include a bathtub, a lavatory and a toilet.

A shower area could replace the tub when hygiene habits are loose, as the tubs are more difficult to clean than the shower floor. Also a "turkish-toilet" flush with the floor could be an alternative to the toilet seat for people used to the Turkish toilet.

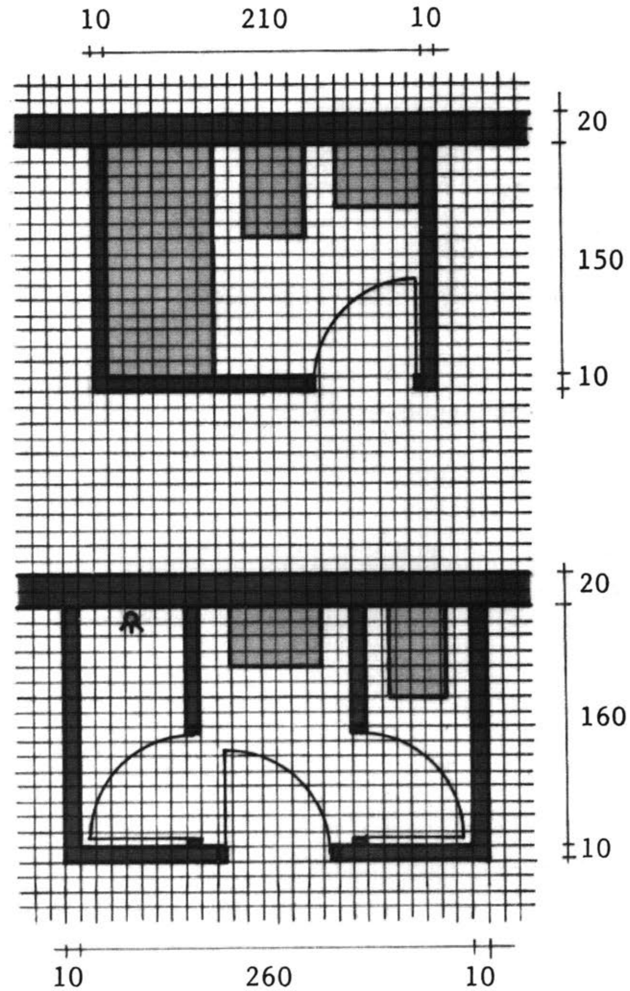
Both these alternatives require the same range of spaces (and should ideally be chosen by the users themselves).

Another alternative could make the bathroom more efficient. It consists in separating the three equipments of the bathroom by partition walls. This would allow more than one person to use the bathroom at the same time.

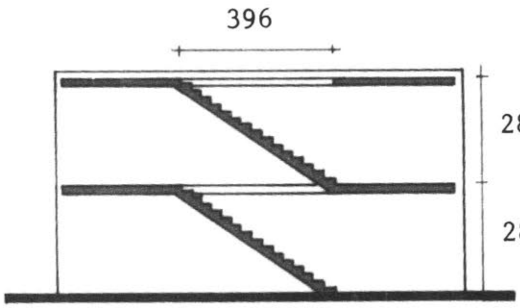
Different arrangements are possible, in order to fit different proportions requirements. But all have in common the lavatory in the central hall of the bathroom, distributing to the shower (or tub) room and to the toilet room.

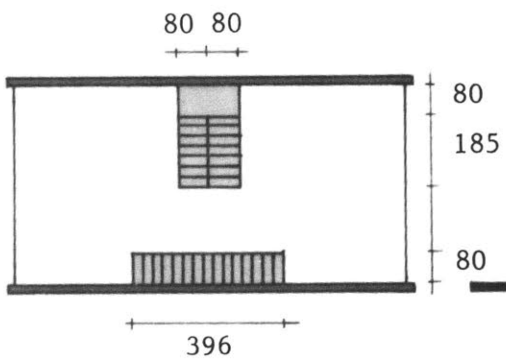
This is an interesting alternative for low budgets, as an extra bathroom can not be often afforded, the fixtures, pipes and connections being quite expensive.

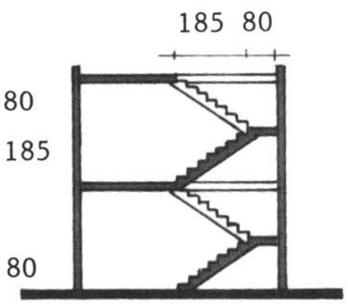
It is therefore suggested that this last alternative be chosen for instantaneous construction. And as for incremental schemes, where the bathroom is not built in the first package, an area of 3 to 5 m^2 should be accounted for in the infrastructure space.

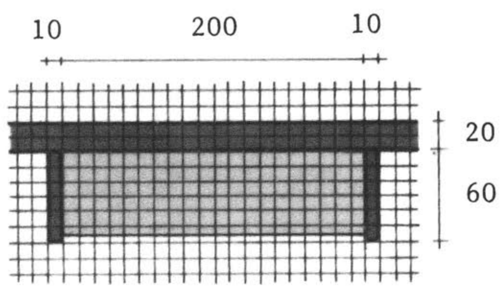


Although it is better to have a window in a bathroom, given the needed scarcity of facades, the bathroom could be placed in the central zone, to leave the facades for the more important bedrooms and living rooms. The bathroom could, however, be ventilated by a duct to the roof.









the stairs

The stairs are generally eigher double-run stairs, or one-flight stairs from floor to floor. Double-run stairs occupy more floor area (around 4 m^2) than the straight stairs (around 3.25 m^2). This is due to the fact of the double intermediate landing for the double-run stairs. (The areas have been calculated for a floor to floor height of 270 to 280 cm and a width of 80 cm for the stairs.)

But the double-run stairs can fit better in the central dark space, where they use the least valuable area.

They also relate better to the circulation of the dwelling because their landings (and the stairs) are in the center of gravity of the dwelling. Double-run stairs will therefore be adopted in all the illustrations.

the cupboards

Cupboards, whether built-in or bought in the market, have usually a width of around 60 cm. A length of 100 cm per person is considered to be the minimum dimension.

It is obvious that cupboards should be placed, if possible, in the central zone as they least require a window or a view to the outside.

the corridors

As they are purely transitional spaces, corridors should be minimized, and located in the central zone. Width of 80 to 90 cm are enough for the small distances.

THE MEDIUM AREAS

the bedrooms

There are two opposing bedroom concepts to deal with scarcity of space.

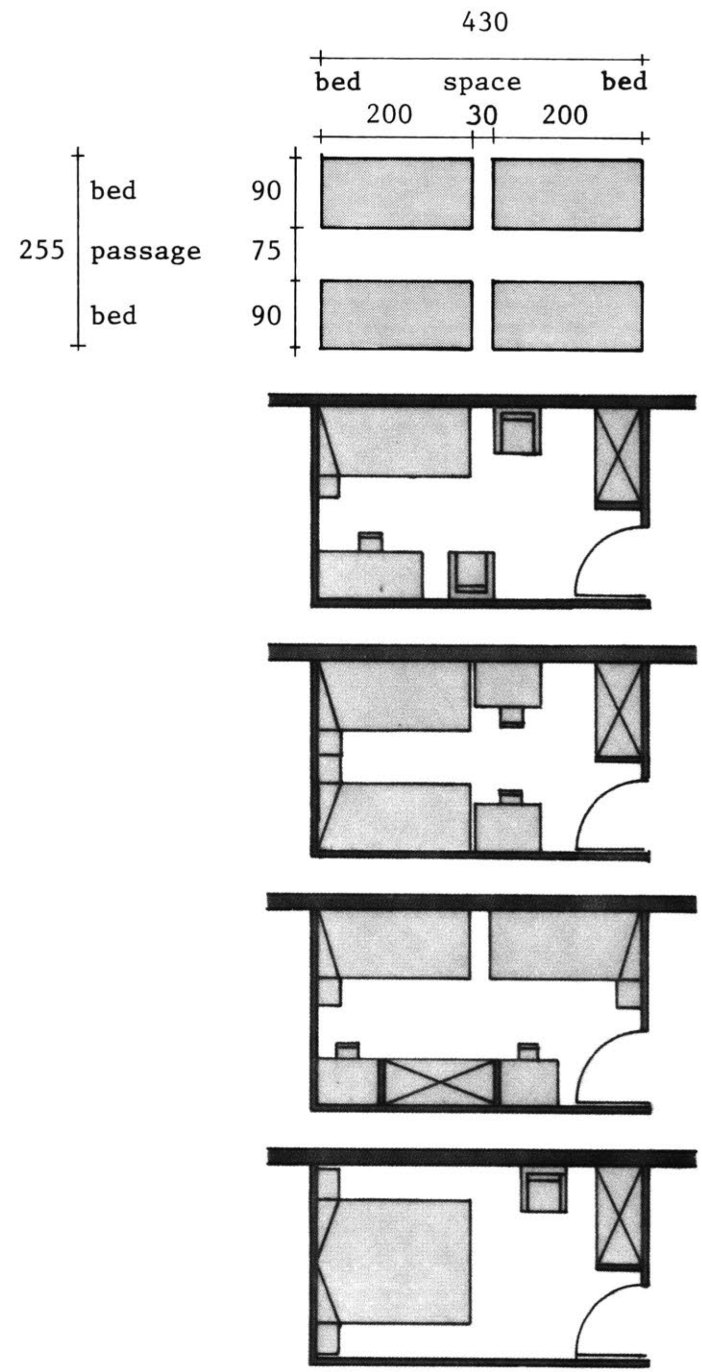
1. The first is to make them very small, just to contain one or two beds, a cupboard and a table. This theory considers the bedroom as only a sleeping room or perhaps a quiet studying place.

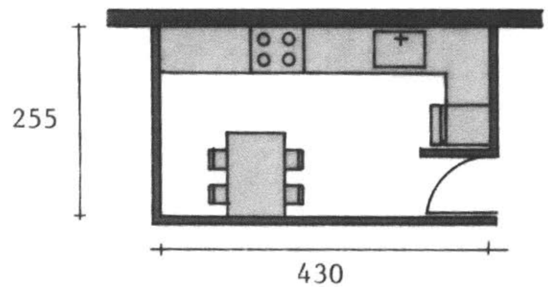
2. The second theory acknowledges the fact that the bedroom is more than a sleeping-studying area. It is also a relaxing place, the unique place an individual can shelter away from the family collectivity and enjoy privacy, have friends separate from the family. The bedroom becomes a multipurpose individual space where 1 to 3 people should be able to relax, talk, etc.

As a result, the bedrooms should be large enough to enable a multipurpose use of the spaces as well as avoid giving claustrophobia to the individual, alone or with his friends.

The minimum room width to allow the length of a bed and a passage or the width of a bed, a passage and a table or a closet is 255 cm net, or around 270 cm with the walls (the bed is generally 90x200 cm). A length of 320 cm could accomodate 1 person while if the length is 400 to 450 cm, two persons can be accomodated quite well, allowing different positions for the furniture. The difference in areas is from 8.16 m^2 for 320 cm to 10.97 m^2 for 430 cm. The 2.8 m^2 increase is worth the advantage of having two persons if needed instead of one, housed comfortably.

The final choice is of course to be left to the family, but it seems necessary to give the possibility of choice, as the price is only an extra of 13 m^2 for the four rooms.





It is obvious that the bedrooms, whatever dimensions they have, should be in either one of the two peripheral zones, to get sun and proper natural ventilation.

the kitchen

The kitchen, as described previously, is a place where the housewife spends a lot of her daily time, to prepare complex (time and space consuming) dishes. As a result, a relatively large kitchen is required to give room for circulation, for the traditional sink, oven and refrigerator. The two last items are more and more available to all income levels through credit systems and second hand markets. Also a large table where 2-3 persons (mother, 1-2 children) could work should also be included.

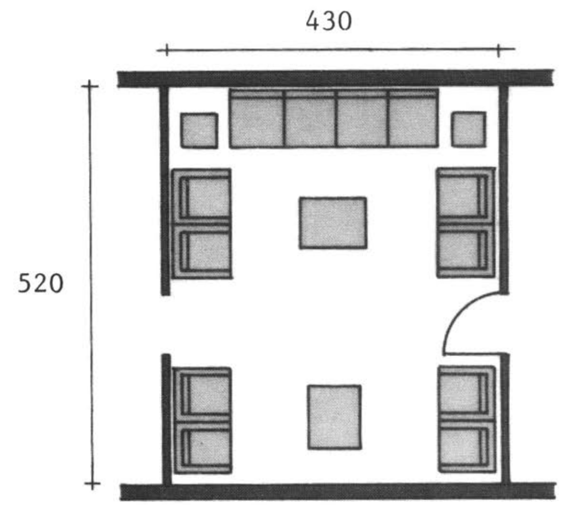
A room of at least 250 cm of width is required for passage, a desk (sink, cooker) and a table, and a length of 350 cm to 400 cm is minimum to store all items.

As cooking is a long daily activity in most of the Lebanese households, and as spicy and smelly ingredients are very much used, the kitchen should also be placed in one of the peripheral zones for good light and ventilation.

THE LARGE AREAS

The living area is the one large area in usual dwellings.

Traditionally in small Lebanese dwellings, the living room was a multipurpose, time-related space where cooking, eating, relaxing and sleeping would successively take place. White-washed built-in wood closets would store blankets and sheets during the day. This very efficient space use was necessary due to scarcity of resources, and possibly due to the common family life.

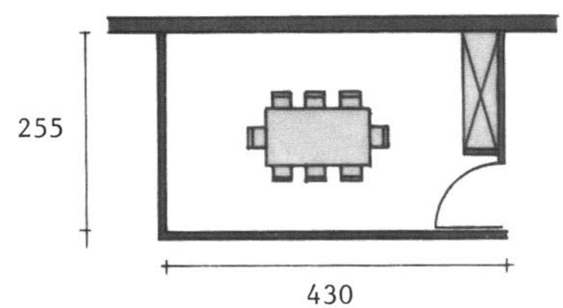


Now that a sense of individuality is developing along with an increase in expectation and resources, kitchen and bathroom become separate and specialized spaces, but the living room remains the focus for family life and social life.

But, even for those limited functions, the living room needs a larger space than the other spaces, as the whole family and their friends should be able to be seated, relax and eat (if the dining space is part of the dwelling).

The average family in Lebanon is 5.3 people, but familites up to 8 people can be easily found. If they have 5 guests, 10 to 13 people should be seated, needing at least sides of 450 to 550 cm and an area around 25 m^2.

More rectangular areas make it difficult for many people to gather around and talk together. If a separate dining room can be afforded , it will probably be chosen as it is a sign of status. In this case, the minimum area needed would also be around 250x400 cm as for the kitchen or bedroom to include a table to accomodate 6 to 8 people and a sideboard.



The living area should also be situated in one of the peripheral zones as it is a heavily used area.

the overall dimensions

There is an evident correlation between the three categories of spaces which are briefly summarized here.

1. The small areas are either part of a larger area (cupboard, corridor) or entities by themselves (stairs, bathroom), located in the central zone if possible.

2. The medium areas: bedrooms, kitchen and dining rooms require a minimum width of 250 or 270 cm including the walls, and an approximate length of 400 to 450 cm, located generally in the peripheral zone.

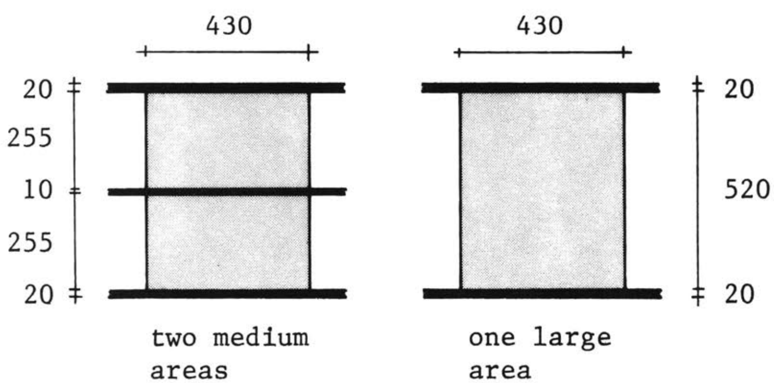
3. The large area requires the two dimensions between 400 and 500 cm and an approximate area of 25 m^2, also located in the peripheral zone.

The stairs width requires 180 cm including the side walls. The bathroom may be wider, up to 280 cm including the side walls, if special arrangements are required.

As a result, two medium spaces are approximately equal to one large area. And if the peripheral zone has a width of 540 cm (2x270 cm) and a length of 400 to 450 cm (at least 430 cm to fit two beds and the walls) then the peripheral zone can fit either one large area or two medium ones.

The two small areas, stairs and bathroom, would be left in the middle zone as they do not need light and can best serve all areas in that location.

A double-run staircase has the advantage of starting and arriving at the same place, and as it can fit within 270 cm, it can distribute to the peripheral zones with no loss of space, and a minimum corridor. The rest of the central zone could be either used as an extension of the peripheral zones, as a bathroom closet, or a corridor.



The central zone should therefore be 180 cm wide, with an intermediate 50 cm zone at each side that could be shared by either the central zone or the peripheral 430 cm zone following the particular design needs.

Thus the total indoor zone length amounts to 1140 cm, while the width of each dwelling, is 520 cm net, or 560 cm, including the bearing side walls.

A full bay is needed for each large area, while half a bay only is required for each medium area.

There are many advantages in this zoning approach. One of the major advantages is that the dimensions thus defined allow all desired combinations of the different areas: small, medium and large, in each floor, in an efficient way.

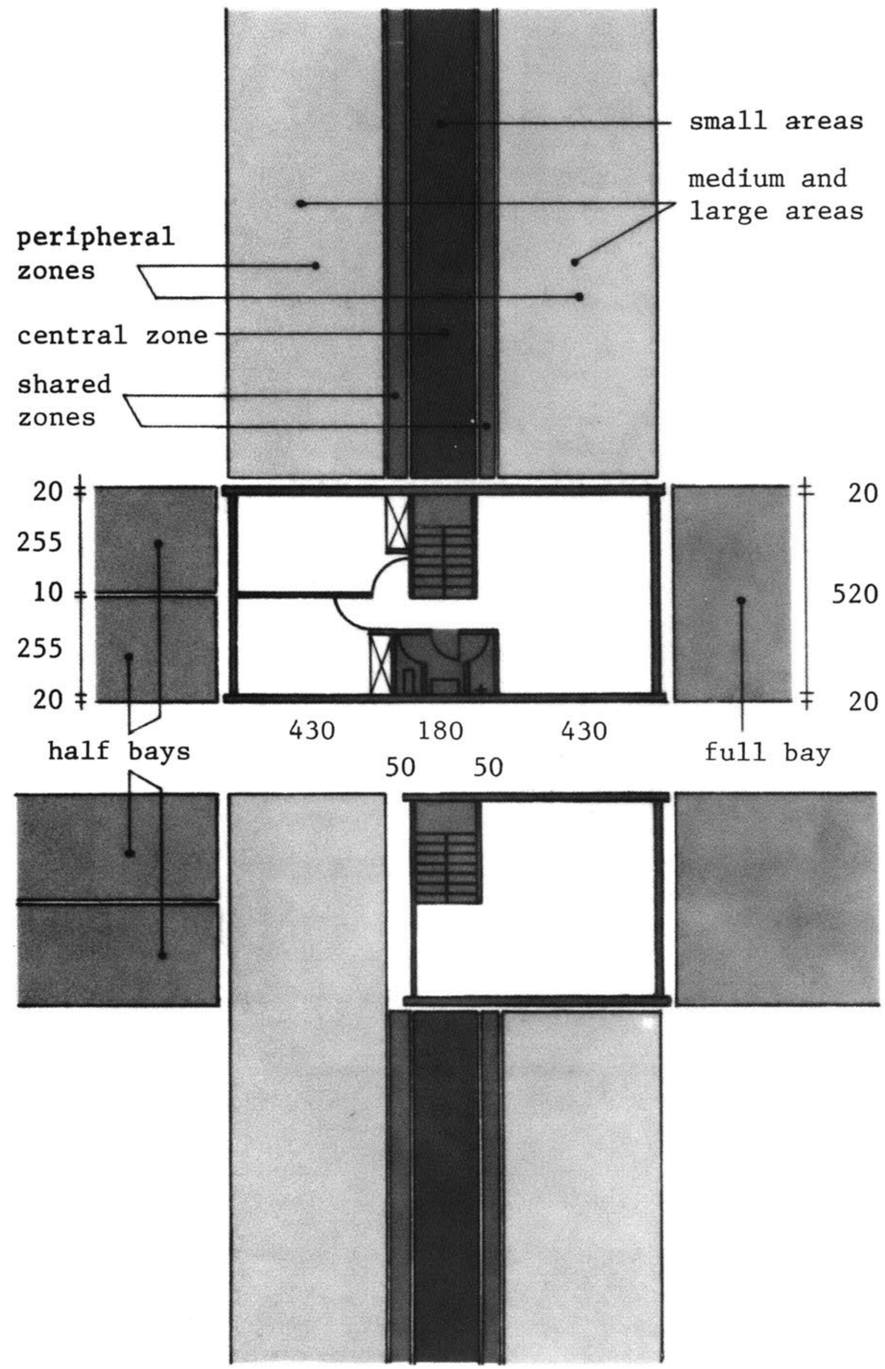
The other main advantage is that the system allows an incremental building approach, in increments of one peripheral zone at a time. This zone could fit either one large area or two medium areas, with an efficient circulation in the central zone.

Also the length of the peripheral zone (430 cm) is such that only one room can fit longitudinally, assuring light and ventilation to the whole dwelling.

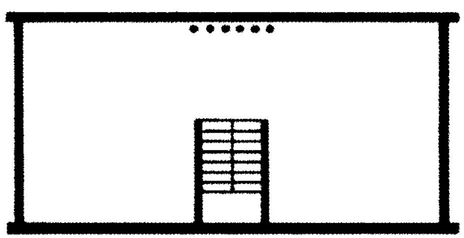
In incremental self-help schemes, a part of the bearing wall can be provided as part of the infrastructure. This physical dimension clearly shows the limits of extension for the self-helper and is therefore more easily enforceable.

The 540 cm span is the longest economical span possible in concrete technology that can be handled without extensive equipment.

Finally, the overall dimensions of the dwelling allow for an efficient and flexible system of piping. The details are described in the next section.



the location of the pipes



The only functions that usually require piping connections in a dwelling are the kitchen and the bathroom. The reason for the distinction is to choose the location of the pipes to allow all probable choices, without needing redundant expensive installations to be provided for improbable choices.

It is usually cheaper to place the pipes connection areas on the ground floor. But in Lebanon, this difference is less important as a water tank is usually placed on the roof of the house to store the irregular city supply, thus requiring vertical pipes to run at any rate from the bottom to the top, to the bottom of the dwelling again.

The choice could be left to the users, especially in incremental solutions to choose the location of their bathroom and kitchen, provided the vertical pipes are located somewhere and outlets are available on the two levels*.

As the bathroom should be in the central zone, and the kitchen in either of the two peripheral zones, on any of the two floors, it seems obvious to locate the vertical pipes in the dark central zone, least precious, and closest to all potentially required connections.

The pipes will be located along the party wall, to get the existing wall as a support, to be out of the way, and to be associated with the neighbor's pipes, on the other side of the party wall to share the same pipes connecting them to the urban main pipes in the front street.

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* *See illustrations on pages 196-215*

ILLUSTRATIONS

The examples in the following pages are only a few illustrations among the many possible ways of using the defined zoning and infrastructure.

The illustrations are meant to show the flexibility of the defined system to accomodate many different dwellings alternatives that are within the potential choices of the people considered in this study.

There are five sets of illustration in this section. The first shows a complete individual two-floor dwelling. The second illustrates the possibilities of higher structures, reaching four and five floors. The third and fourth cases illustrate single floor dwelling and individual room alternatives. And the last example illustrates the possibility of mixing commercial facilities with the residential units, a common practice in Lebanon.

individual double-floor dwelling

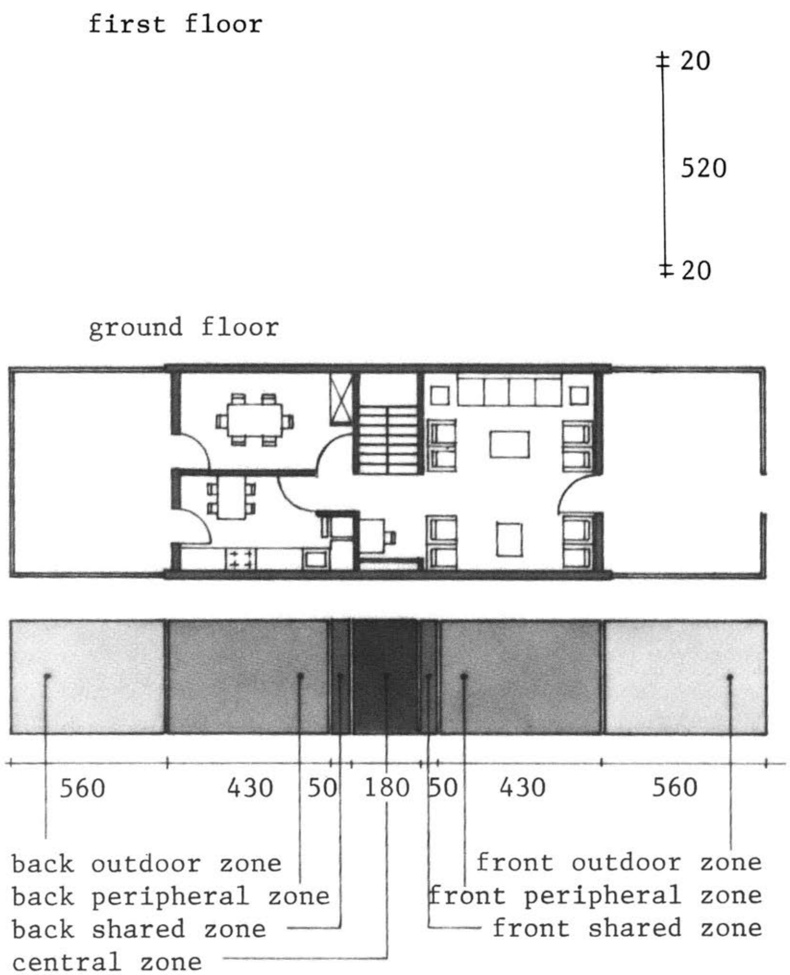
An infrastructure that would only shape the above defined zones would allow the user to transform, himself, the zones into a variety of possible definite a areas, corresponding to his definite needs.

The infrastructure does not only depend on the definition of the zones of potential choices. It also depends on economic and technical functions that will be discussed in the next sections.

But, as an immediate illustration, a finished package will be described here to illustrate one way of transforming the given zones into a complete dwelling.

The complete package is a very expensive first investment, and removes from the user the possibility for him to shape his own immediate and personal environment. As a result, a completed first package is not recommended.

The proposed illustration shows an arrangement for a family of six to eight people, thus using completely the two floors of the dwelling.



Given the limited area of each floor, the different functions will have to be distributed in the two floors of the dwelling.

It seems quite probable, in a two-floor dwelling context, that a night zone will be located in the second floor, while the day zone will be located in the ground floor. The reasons are multiple, and among them are the following ones:

Since the day zone is the area where the family gathers, where they entertain their common friends, this zone is a "social" zone that is naturally linked to the collective outdoor areas. Also the guests do not have to go through the sleeping area that is more private.

Also, the extroversion of the Mediterranean Lebanese people will naturally push them to sit in their front garden to see the neighbors and invite them in. And this zone should naturally be the extension of the living room. (Incidentally, it is also for this reason that the kitchen would face the backyard, a more remote area than the front one which has to be inviting and representative of the image of the dweller.)

Finally, the sleeping area requires more sound proofing, which is naturally more available in the second floor.

As a result, it seems quite natural to place the living, dining and cooking facilities in the ground floor, while the maximum of four bedrooms and the bathroom will be placed in the second, more secluded, floor.

This illustration shows a completed product. The incremental possibilities will be illustrated later* after the discussion of the construction system.

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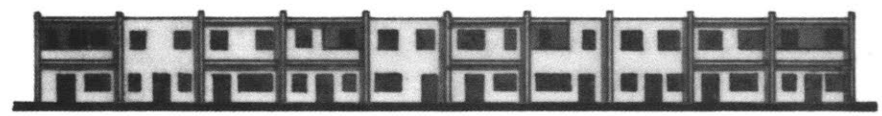
* *See pages 192-217*

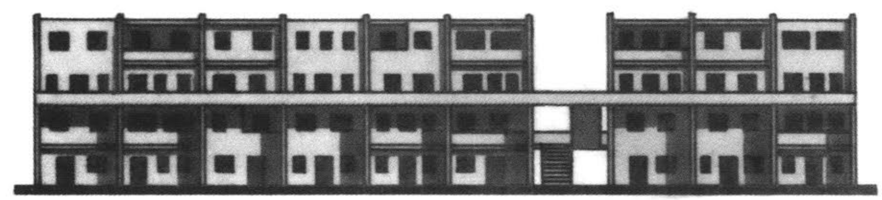
two and four-floor structures

The two floor dwellings, as discussed earlier in the chapter, are packed adjacent to each other, in rows, or preferably clusters, as illustrated on the adjacent drawing.



With such a scheme however, limited densities can be obtained. In order to increase the density, in urban conditions where land is relatively scarce and expensive, more floors, up to 4 to 5, could be required as described previously.

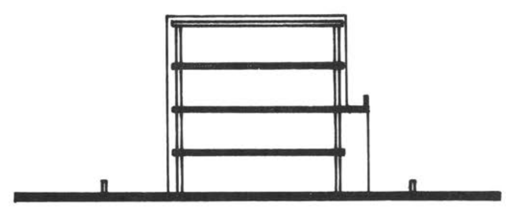
In order to avoid the anonymous apartment pattern and come as close as possible to an "urban house" and to the reduced cost of self-help schemes, two double floor dwellings, one above the other, seem a better alternative than 4 floors of apartments.



The lower dwelling would use the 2 yards (front and back) for outdoor life, while the top one would use the roof, thus avoiding the expense of balconies inherent with hot climate apartments.

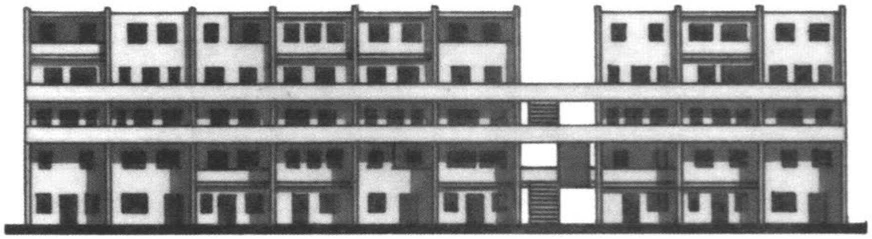
Exterior stairs would run to the 2-floor only, reaching the lower floor of the top house.

In order to minimize the staircases and the land, these exterior stairs would not be in between 2 houses, but at the end of a row of 8 to 12 houses, with an exterior open corridor.



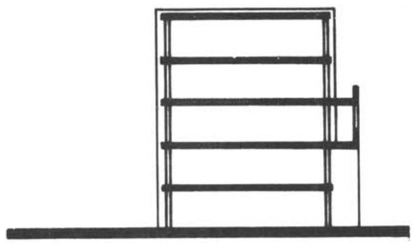
This corridor would have the role of a small mall to individualize psychologically and visually the upper from the lower dwellings.

single-floor dwelling in five-floor structures



In order to further increase the density in a highly urban region, with very costly land, an extra floor could be added to the two or four previous floors.

These one floor dwellings would therefore be smaller dwelling units, containing up to two bedrooms. They could be an interesting alternative for bachelors or young couples in a transitory situation, or older people wishing to have a certain independence from their families but yet live near them.



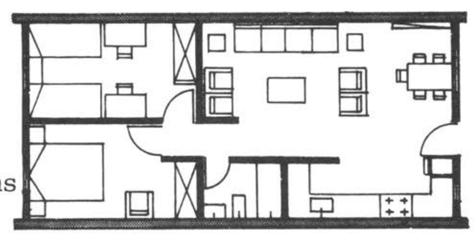
These apartments would be completed, except, if desired, the facades, inner partitions and finishes would be left to the user. The apartments could be either sold or rented, by individuals or by the cooperative.

In order to leave the roof to the top house, the apartment will be sandwiched between the 2 dwellings, enhancing the individuality of the 3 layers of dwelling.

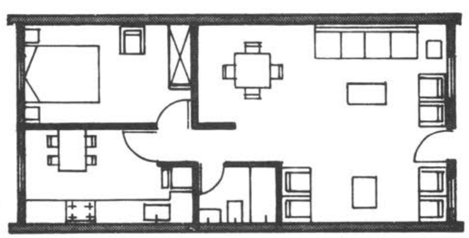
Incidentally, the four- and five-floor buildings will only be located in peripheral zones of the urban units in order to ensure wider open spaces in front of both sides of the building, the cluster courts being on one side and the streets on the other.

Due to the key dimensions adopted above, different kinds of arrangements are possible within the same general dimensions. 2 bedrooms in these small areas are however the upper limit, although the living room can house also 2 people in case of "emergency."

The adjacent drawings illustrate two of the many potential alternatives. The first is a one-bedroom dwelling, the second a two-bedroom dwelling. Variants are possible, as for the rest of the dwelling packages



Two bedrooms



One bedroom

individual rooms

Showing the flexibility of the defined zoning system, individual rooms could be accomodated in the defined zones.

The previous one floor individual dwelling area would be replaced by four individual rooms, connected by a corridor in the central dark zone, thus obtaining an efficient double loaded corridor with individual rooms and common bathroom facilities in one of the units.

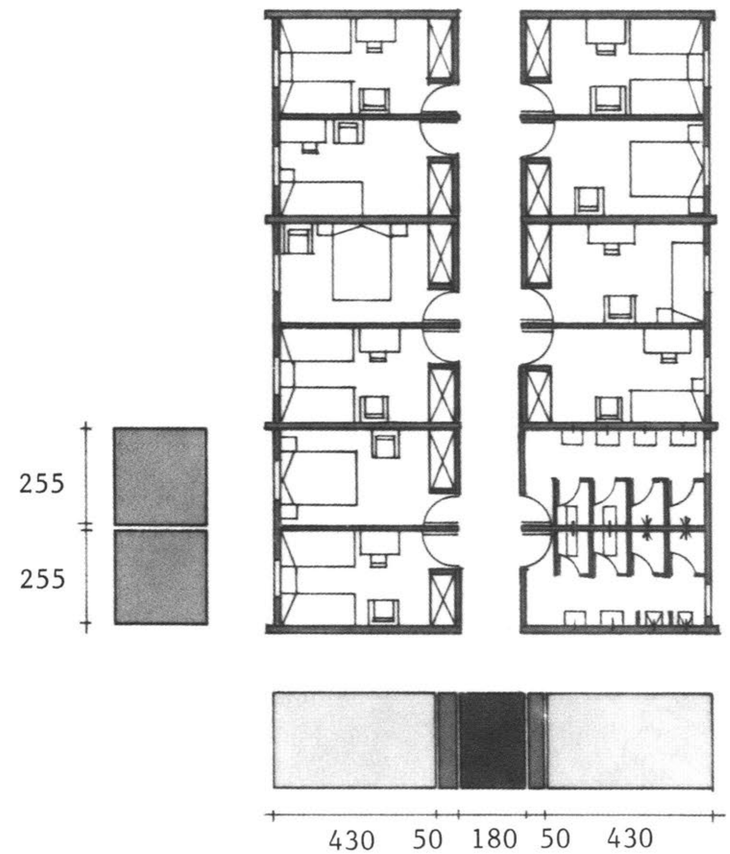
These rooms could be used for different purposes, to enrich the life possibilities of the urban units, using the defined zoning system.

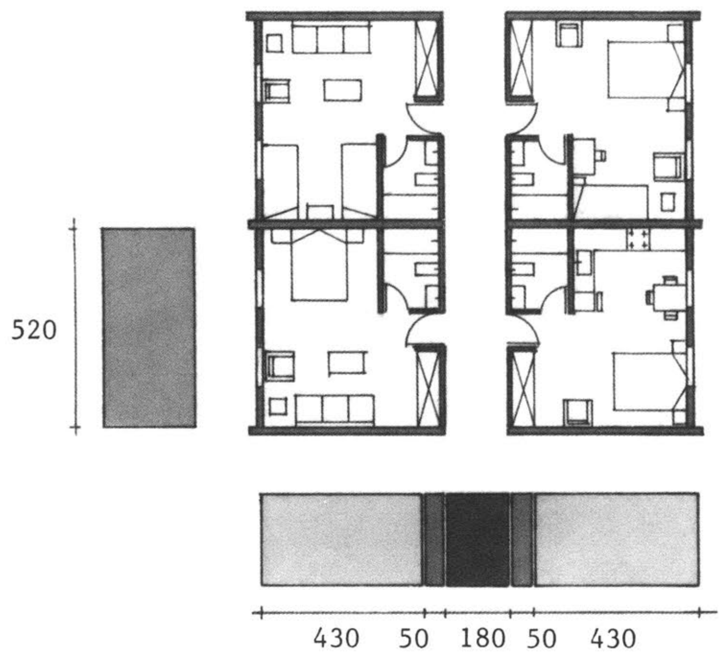
A floor of such units could be inserted, like the previously discussed small apartments, in between two verticle layers of two floor dwellings. These rooms could be used by elderly people or extra children wishing to have some independence and yet that could not afford completely equipped dwellings.

The scheme could also be used for visitor workers to the cooperative or the region. The rooms would be rented and run either by the cooperative or the people themselves.

If the close mixing of the visitors with the families is not desired by the families, the individual rooms system can be reserved to specialized clusters, operated by the cooperative.

These clusters like the old "Khan" would provide a nucleus for social life for the visitors workers who come generally without their families.





Finally, the workers' formula could be used for a low income tourism concept. In this case, the intermediate floor or the specialized clusters would include individual rooms to house tourists.

A more expensive solution could include private bathroom in each unit, even a kitchenette for longer stays.

The benefit of such a solution is to decentralize tourism from the hotel companies, allowing the visitors to mix with the "real people," and the real people mix with foreigners and at the same time receive, themselves, wages for their lodging under the cooperative supervision, rather than companies alien to the area. This formula could be very interesting in a country like Lebanon where the tourism industry plays such an important role in the country's economy. The solution would help redistribute more equitably the tourism revenue.

These rooms could be operated by the cooperative or the individual families (in the case the rooms are mixed with the families' dwellings), under the possible supervision of a tourism agency.

residential related functions

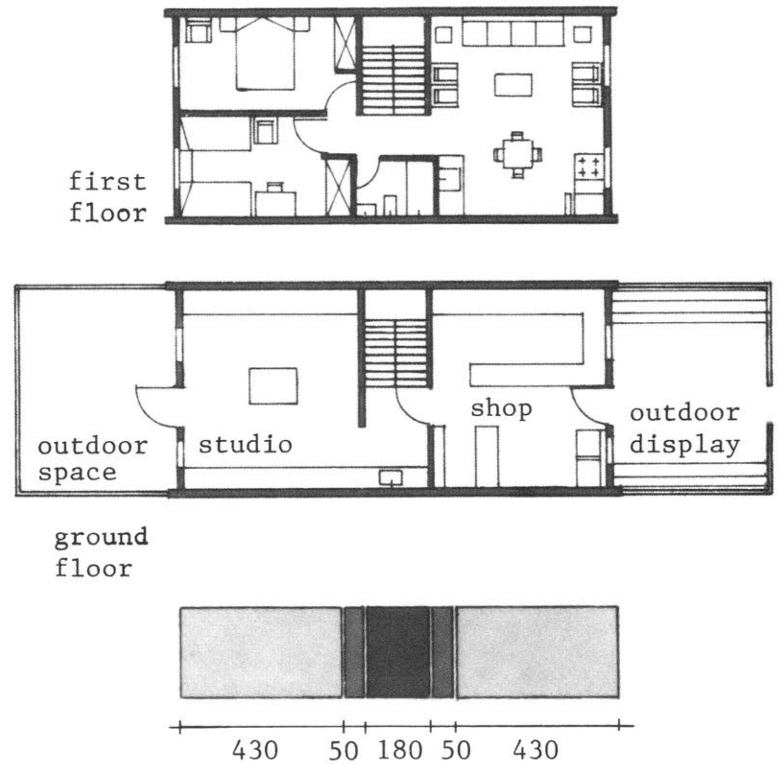
The defined zoning system could also adapt to residential related activities, following the Lebanese tradition.

On shopping streets (see last chapter), the ground floors of the two-floor dwellings could be used for shops or crafts workshops, following the old Lebanese tradition. Many alternatives are possible. The adjacent drawing illustrates a case where the whole ground floor is devoted to a shop and craft studio. The front yard is used as a display area and the front yard as an outdoor working area.

A restaurant area, for the specialized hotel clusters could as well be organized in the lower floors of the specialized clusters, either with peripheral outdoor circulation or indoor central circulation similar to the individual rooms arrangement.

This solution is very closely related to the concept of Khan described in the first chapter,* especially if mixed with a floor of individual rooms for visitors, as illustrated above.

All these alternatives show the possible variations within the same scheme, to adapt to different macro and micro conditions. They especially show that different solutions are possible within the proposed "optimized" construction framework.



the construction approach

ASPECTS OF INDUSTRIALIZATION

As mentioned in the introduction of this study* many non-industrialized countries believe that the only way to solve their housing problems is through full industrialization of the housing construction process.

But as discussed also in the introduction, an immediate and full industrialization of the housing sector is not the safest way to go in a country that is un-industrialized.

The level of housing industrialization should be defined from the study of the general industrialization level of a country.

This section is devoted to the search of an optimal housing construction system to fit the particular conditions of Lebanon.

The first section deals with the problem of industrialization of construction in general.

The second section analyzes the particular conditions in Lebanon and defines a construction approach to fit the existing Lebanese conditions.

A detailed housing building system is then defined, based on the general conditions existing in the country and especially related to the income levels of the 25,000 households that need the help of a housing agency to fulfill their housing needs.**

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* *See pages 11-14*

** *See pages 58-59*

Industrialization is a synthetical notion that should be broken into its main components to facilitate analysis.

The usually recognized four main aspects of industrialization are the following:*

1. Systemization of design
2. Specialization of labour
3. Concentration of production and marketing
4. Mechanization of production.

SYSTEMIZATION OF DESIGN

A process by which all components of an eventual product are standardized to fit together is systemization of design. This does not necessarily mean a closed prefabricated system, but could be an open system that can be applied throughout the country or region. Different materials or techniques of manufacturing can be involved, through a rigorous modular coordination system. A good example is the Japanese Tatami.

SPECIALIZATION OF LABOUR

There are two kinds of labour specialization or skill development: the operative and the professional.

operative A Quick specialization process where the worker learns a few actions to be systematically performed like inserting a few screws in an assembly line product. The advantage of the system is a quick learning process; the disadvantage is a lack of economic and social mobility due to the unlikeliness of progress.

professional Slow and gradual skill development not consisting only of a few isolated actions but of mastering the whole process of a method. Example: a mechanic for car or TV repairs or the highly skilled medieval artisans. This learning process is more costly and slow, but allows social and economic mobility because progress is possible. Also the job is less monotonous and repetitive and more interesting and challenging.

CONCENTRATION OF PRODUCTION AND MARKETING

a. Concentration of production is necessary in order to make economies due to bulk purchase of material, and repetitive efficient applied processes.

b. Concentration of marketing allows larger funds to be available for the marketing media as they are supported by large available stocks.

The increase in both concentrations increases the initial cost of equipment, material, storage area, and also increases the amount of risks, because if everything does not work as predicted, then the loss can be tremendous.

Besides, these production and marketing techniques rely substantially on very predictable supply and distribution mechanisms, and on an infrastructure of communication systems (road, railways,...) and distribution organizations (structure of market) to allow the transportation of finished items at relatively marginal costs. All of these are very scarce and certainly unpredictable in most Third World countries.

MECHANIZATION OF PRODUCTION

The use of machines in the production process. The machines are relatively expensive and raise sharply the initial costs. They are not economically interesting unless a continuous market is guaranteed.

* *Reference 18*

Adapting the machines to required changes in the product is also a costly investment which again, is not economically interesting unless a continuous market demand is guaranteed (which is not often the case in the Third World countries due to the usual political and economical instability).

Automation of mechanization complicates further the issue because it requires much higher investments and a continuous supply of materials not to interrupt the flow in the automated factory lines.

Moreover, unless the machines can be produced in the country, a flow of the tight capital goes out of the country, in a steady way, especially if the country can not even produce the parts or repair them in the future. In this case, an extreme outflow of capital can happen unless the process is given much attention to make the transfers economically realistic.

Finally, mechanization and automation are not sufficient conditions for industrialization. Mechanization can be in non-industrialized products: a private carpenter using a mechanized saw is using mechanization but not industrialization.

There are also degrees of industrialization. Instead of industrializing the dwelling as a full package, one can industrialize only the brick, or concrete block, and leave the assembly of industrialized components to craft methods. An indirect and partial industrialization has less risk than the full industrialization because the machines required are smaller, less costly, and the labour used is less skilled. A large part of the total process is left to non-skilled workers which are much more common in developing Third World countries than the skilled workers.

This relfects a fundamental attitude for non-industrialized countries: the concept of labour-intensive industries as opposed to capital-intensive industries. Capital-intensive industries are a product of the industrialized countries who have an efficient skilled labour force while their unskilled workers are limited and relatively expensive.

In fact, the transfer in technology should not be a mere transportation of processes but the adaptation of a process to fit the local labor, technology, capital, materials and structure of the country. Low technologies should only be gradually replaced by more sophisticated high technology as the country gets more and more structured. This can be done through systems design and modular coordination, which would make low technology products adaptable to higher technologies

As an example, if a concrete block is chosen as the industrial unit for construction, with modular coordinations,* it could first be produced by hand in far away villages for the people to be able to master their own techniques. Then if could be replaced by small block producing machines as electricity comes to the village and/or local mechanics start to be able to weld or repair a broken piece, or can afford having a few pieces in storage, so as not to wait, sometimes months, before getting an advisor or a piece from the big city or the foreign country.

It has been proven by the many case studies available that a technology ahead of the industrial structuration of a region is worthless and produces many more costs than any advantage, and most often results in spectacular bankruptcies and social cost.

As a conclusion, Third World countries, as they start industrializing, should first start with less risky and expensive ventures. Systemization of design and skills specialization are the two first steps of a partial industrialization that does not require expensive or imported equipment, materials, or skills.

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* *See pages 157-159*

Housing and construction are generally a good training school for completely unskilled people. They can gradually specialize into the very skilled labours involved in construction such a mechanics, sanitary, electricity, carpentry and painting.

As the country develops and is more able to invest and produce machinery, it can industrialize gradually the housing process.

If industrialization is considered, though, as an emergency policy for raising the GNP and making it less dependent on the industrialized countries, industrialization should first be the object of less complex items than housing. A dwelling being at the same time a huge bulky object and a very expensive and complex package, it should be left as a later industrial experiment.

Partial and indirect industrialization of housing is, however, possible, and interesting because it can lead to better use of available materials, expertise and labor. The prefabrication of concrete blocks and beams, for example, can prove quite useful.

Other fields should also be considered such as agriculture equipment and tools.

LEBANESE INDUSTRIALIZATION FACTORS

The purpose of this section is to define the level of housing industrialization that would best fit the situation in Lebanon.

The situation in Lebanon will be discussed through its variables related to the problem of industrialization as defined above. The variables are: financing, labour, technology, equipment and construction materials.

financing

Financing has already been discussed in length in the previous section. But as financing has the strong above-described impact on the construction strategy optimization, a few financial considerations will be mentioned here that are directly related to the construction strategies.

The gross national product in Lebanon* is as mentioned above 1500 L.L. per capita in 1970; this corresponds to nearly 600$ per capita. It is quite low compared to industrialized nations or even to oil exporting Third-World nations like Lybia: 1770 $/capita in 1970. But the Lebanese 600$/capita is quite high compared to Sudan, for example, with 120$/capita per year or Egypt with 210$/capita.

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* *See page 61*
& References 11, 37, 38

In fact, the financial possibility of Lebanon is limited but not desperate. That means that on the financial grounds, some industrialization adventure could be attempted, but the risk involved should be minimal, and the initial investment rather limited.

As a result, partial industrialization is favored over total industrialization. Especially, mechanization and automation should be very carefully attempted as they require high initial investments and bear important risk amounts due to their high specialization in a very quickly changing world.

Limited industrialization, through light equipment, aimed towards specific studies products rather than full packages seems the optimal way because initial investments are less important. Such an industrialization could also adapt to the specific area and change following the changing demand.

Systemization of design and skill development through education and training should be emphasized to reduce future risks of industrialization and increase upward mobility of the lower income groups.

labour

The data available for Lebanon include a distribution of the total active population skills and a table of imported labour skills.* Both have been combined in the following table and percentages calculated.

The percentage of the active population over the total population is 538,410 over 2,126,325 = 25.32%. That means that 1 person works out of 5. The active population is made up of 78.8% male and only 21.2% female workers. Around 35,055 people, that is, 6.5% of the active population, are involved in construction.

On the other hand, if agricultural professions (18.9%) and workers (34.1%) are considered unskilled labour, as the case is in Lebanon, then 53% of the active labour force is unskilled.

This is a large number for an industrialized country, but relatively small compared to other Third World countries, as the remaining 47% of the labour force is educated and skilled. Nevertheless, the amount of unskilled people is appreciable, and should be used in any construction system. Still it is interesting to note that imported labour is needed, even for unskilled jobs,6,136 unskilled labourers are imported (which is only 3.3% of the total labour force of Lebanon). But 33.7% of the total imported labour force includes experts, technicians, and businessmen linked with the international banks and other businesses.

The foreign participation is mostly due to the lower wages asked by the foreign workers. These wages represent more to them when they seasonally go back home.

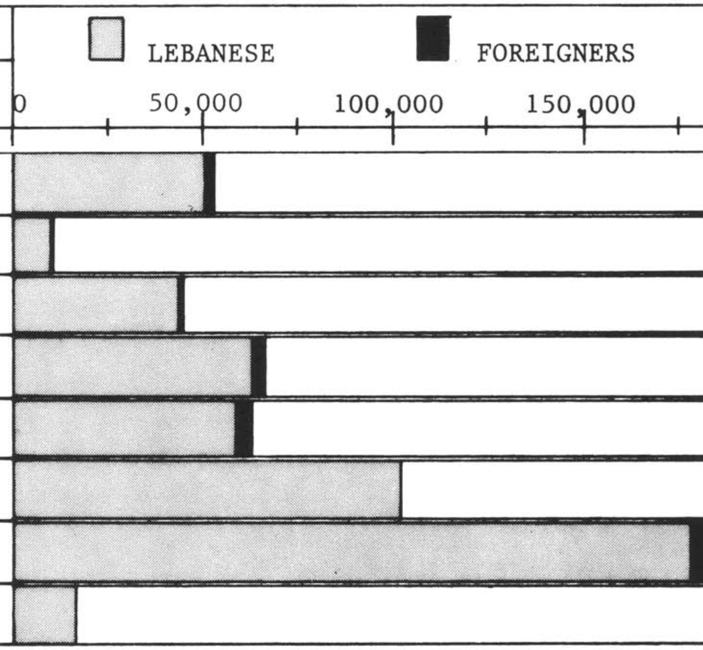
* *Reference 12, pages 134-139*
& Reference 13, page 95

The fact is also due to the low ratio (1 to 5) of active population to total population, and especially the low female participation.

Future policies and industrial (including housing) systems should improve the active participation of people, especially women, by developing education and light physical work jobs in industries to attract and develop female participation.

The ratio of 53% of unskilled active people including 3.3% of foreign unskilled people (mainly Syrian) indicates that a construction system should be adapted to unskilled operations, but yet it should shift at least partially to a more efficient skills-use, as Lebanese unskilled labour is not enough. This would reduce the dependency of Lebanon on foreign workers, especially as the number of available unskilled Syrian workers will diminish when the Euphrates Dam in Syria will need much of the available Syrian labour.

ACTIVE POPULATION IN LEBANON IN 1970



PROFESSIONS	TOTAL		FOREIGNERS		
	Number	%	Number	%	%of Total
Technical and liberal Professions	52,875	9.8	2,695	14.8	5.1
Management	10,590	2.0	553	3.0	5.2
Administration Employees	44,895	8.3	1,033	5.7	2.3
Commercial Professions	65,970	12.3	3,396	18.6	5.1
Workers specialized in Services	62,790	11.7	4,357	23.9	6.9
Agricultural Professions Hunting-Fishing-Farming	101,715	18.9	60	0.3	0.1
Workers (Non-agricultural)	183,720	34.1	6,136	33.7	3.3
Army and Undetermined	15,855	2.9	-	0.0	0.0
TOTALS	538,410	100.0	18,230	100.0	3.4

Also, such a partially-skilled-oriented system would be, at the same time, a good school for skills improvement to allow completely unskilled labour to become gradually more skilled and more upwardly mobile.

Pratically this would favorize partially prefabricated systems, where a part of the unskilled existing and potentially active force would be used.

The unskilled workers would slowly acquire operative skills or professional skills leading to jobs like plumbers, mechanics, electricians or, for the most dynamic of them, jobs like managers of on-site mini-factories.

Also, the low active population ratio is a sign that there is potential labour in the country that is able to back the extra construction required for the extra dwellings needed, as defined earlier.* But this potential fact to become real would need long range policies to encourage more active participation, especially from the female population.

Finally, as described in the financing section,** self-help is probably a necessary "evil" as it is the only way for many families to get a decent house.

In self-help schemes, and especially in incremental processes, i.e., when the users are left on their own to build their own dwellings, the construction system should be devised to be used by unskilled people.

Most of them will not either be able to hire technicians or use sophisticated tools like cranes, etc.

Manual erection and handling should therefore be part of the possibilities of the construction system. This would essentially make sense if materials and help is granted to the self-helpers by their urban cooperative,** instead of being left completely on their own to seek whatever materials they can find.

communication networks

The communication networks have an important bearing on the industrialization of construction because their availability allows the basic fact of building an object (house in this case) in a factory located in an optimal site to be shipped to another site, where the object is needed.

The road, rail, water and air transportation networks situation in Lebanon will be very briefly described in this section.

the road network is quite developed in Lebanon, covering all parts of the country. The two main ways are the coastal highway that links all the coastal cities and leads to western Syria and the mountain highway or Damascus highway linking Beirut to Damascus.

These two ways are highways only in small portions, the rest being generally 3 way roads. These roads do easily accept large standard trucks but probably not the largest used in the U.S., the 16-foot wide truck, which require multilane highways.

The secondary road network is also in fair to good condition, mainly made of 2 to 3 way roads. Finally, due to the mountainous character of Lebanon the secondary road network is quite curvilinear and steep. As a result, for general everyday distribution in the country, medium trucks are more practical, because they run smoother within the secondary road netowrk. Heavier trucks could be employed, and they are, for long distance distribution, through the main highways, especially to Syria, Jordan and the Gulf.

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* *See pages 48-50*
** *See page 68*

the railroad network Only main ways are available: the coastal way from Beirut to Nakoura and Tripoli; and the Beirut-Damascus way. But the two are of different rail width, so the cars cannot be the same. On the other hand, the railway machines are obsolete and used less and less.

So the use of the railway system seems unworthy, for the time being because the system is obsolete and decaying, not standardized in dimension, and not well distributed, requiring costly train-truck operations to reach the site.

the waterways The rivers are generally not navigable. They are too small. The maritime traffic on the Mediterranean is not exploited at a large level. As such, water transportation is non-existent nationally, although an effort could be made for sea transportation in the future.

air transportation Given the state of the art, air transportation is too expensive for the heavy bulky materials involved in housing.

To summarize, the communications system in Lebanon is far from reaching the standards of most industrialized ocuntries. But given the small size of the country (10,000 square kilometers) and a basically fair road network, the communciations networks can face the industrialization demand. Small and medium sizes are however preferable to large elements because of the lack of wide highways.

organization of the market

The market organization, and especially the supply of materials system is more based on craftsmen traditions than industrial standards. The reasons are the following:

a. There is not an existing standardization of materials due to the fact that most raw materials and intermediate manufactured items are still imported rather than made in the country. The imports are also from all countries ranging from Japan to Europe to the U.S. to the Eastern European countries.

b. Information about the available stock is not standardized in catalogues that can be consulted on a long-term basis; rather, information is based on personal contacts and changes considerably with time and place.

c. The stocks are unpredictable. Local suppliers import at individual scale from their own international suppliers and they often run out of stock, while their colleagues have other kinds of items, that do not necessarily match with each other.

As a result, supplies are not standardized, not predictable and their cost varies sometimes considerably. These characteristics are an important handicap to full industrialization. Because the resulting delays in supplies deliveries, and the necessary adaptation to their changes makes a continuous harmonious production quite impossible. This has very heavy repercussions especially in full industrialization, as includes mechanization and automation both requiring a constant and predictable supply.

equipment and technology

Prefabrication in housing is practically non-existent in Lebanon. The usual types of tools and equipment used in the site construction are:

- hand and mechanized concrete mixers and silos
- all sorts of cranes from the hand ones to the mobile ones to the towers, depending on the importance of the job
- bulldozers and tractors for the land work
- manual tools for plumbing, welding, etc.

Most of these tools are part of the mechanization field but not of the industrialized process.

A few other "industrialization" tools are used for the very few prefabrication attempts: tools for prestressing and curing concrete, usually used to manufacture simple elements like claustra, double-tees and mainly concrete blocks for general construction.

There is a skilled labour force to use these tools and equipment. And it seems that this kind of mechanization fits perfectly the Lebanese market infrastructure and financing and labour conditions. Complete prefabrication, requiring a fleet of trucks, cranes and costly precision tools and labor would be really out of scale in a country with relatively limited demand (20,000 to 30,000 units yearly), limited skilled labour, limited capital, and last but not least, non-organized supply conditions.

Technology should therefore be intermediate rather than sophisticated to match the limited tools and equipment that the country can afford, together in terms of financial, labour and lack of market structure.

The emphasis should be on small simple equipment that can be carried often on the limited size of the road networks and be used by not only very skilled but medium and unskilled labour, and that requires limited financing sources and minimally sophisticated repair systems.

A strong emphasis should also be placed on manufacturing the tools rather than importing them systematically, to diminish the dependency on other countries and train labour to service and repair quickly the defective tools.

In fact, tools and mechanized equipments should be the object of industrialization before the more complex housing industrialization.

materials

The materials historically available in Lebanon for building construction have been wood, stone, sand and gravel. Clay, on the other hand, is pratically non-existent.

Wood has become more and more scarce through successive "deforestrations" (cutting trees without replanting) from Biblical times. As a result, wood has been used exclusively for roofing purposes for the last few centuries. Today there are practically no forests in Lebanon, and all construction wood is imported at very high costs.

Stone has been the main construction material. But cutting stone has become extremely expensive and this material has been abandoned, except for very rich dwellings.

Simultaneously, concrete has developed, using cement that could be manufactured in Lebanon and sand and gravel that are very widely spread there also.

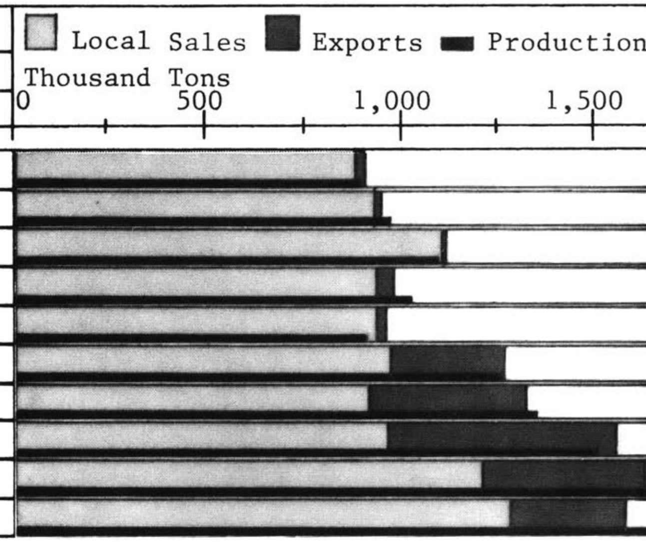
Steel is very expensive in Lebanon because the raw materials do not exist in the country and heavy equipment is necessary for its manufacture. It is therefore imported at extremely high prices from the industrial countries. As a result, steel is not used as an extensive building material, but only for reinforcing concrete.

Concrete, reinforced or not, is therefore the only material that can be used today extensively because it uses sand and gravel that are widespread in the country, and the cement is produced in local factories.

But if sand and gravel seem readily available, cement has to be sufficiently produced to cover the demand. In fact, cement production exceeds the demand; an ever-larger proportion is even exported. The figures in the table below show the situation:

LEBANESE PRODUCTION, LOCAL SALES AND EXPORTS OF CEMENT FROM 1964 TO 1973

YEAR	SALES					PRODUCTION	
	TOTAL (Tons)	LOCAL Tons	LOCAL %	EXPORTS Tons	EXPORTS %	Tons	% of Total Sales
1964	898,000	876,000	97.6	22,000	2.4	881,000	98.1
1965	941,000	924,000	98.2	17,000	1.8	970,000	103.1
1966	1,102,000	1,098,000	99.6	4,000	0.4	1,095,000	99.4
1967	973,000	933,000	95.9	40,000	4.1	1,016,000	104.4
1968	955,000	932,000	97.6	23,000	2.4	906,000	94.9
1969	1,255,000	962,000	76,7	293,000	23.3	1,252,000	99.8
1970	1,315,000	913,000	61.0	402,000	39.0	1,339,000	101.8
1971	1,543,000	959,000	62.2	584,000	37.8	1,499,000	97.1
1972	1,623,000	1,205,000	74.2	418,000	25.8	1,626,000	100.2
1973	1,576,000	1,272,000	80.7	304,000	19.3	1,659,000	105.3



The table shows a difference between the total sales in Lebanon and the total Lebanese production. The difference is sometimes negative and sometimes positive. This is due to the fact that some special qualities of cement are still imported even if the production of Lebanese cement is larger than the sales, (internal or exports). But the difference is below 5%.

On the other hand, the amount of Lebanese exports have increased very much since 1967, reaching 584,000 tons, i.e., 37.8% of the total sales or 39% of the Lebanese production in 1971. The ratio has slightly decreased afterwards to reach 19% in 1973 as the local demand had increased to 1,272,000 tons.

These figures indicate that the cement industry is well ahead of the Lebanese demand, and it seems to be able to adapt to the extra demand estimated in an earlier chapter.* A detailed study should be made, though, of the possibility of further developing this industry and make it an important exportation to the booming Arab oil world.

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* *See pages 48-50*
** *See pages 163-190*

summary

As a summary, most of a low-income housing construction system requirements gravitage around the fact of the limited financial and technical capacities of the country for a set of reasons discussed above.

This limits the equipment to relatively small pieces, and the manufactured objects to dimensions that can be manipulated by the limited size of the equipment. This is even more so in cases where self-help labour is utilized extensively. In such cases the prefabricated objects have often to be limited to bare-hands manipulation. Such cases are illustrated later.*

Prefabrication, as a result, is also limited to an indirect action, that is, prefabricating the elements of a unit rather than the unit itself. The assembly is made on site, with medium- and low-skilled labour, especially when self-help labour is used.

It is also important to devise intermediate technologies that have a firm basis in the expertise of the country, but yet allow for gradual development.

An important prerequisite for that is a strictly applied modular coordination to make sure that the products of different technologies will adapt to each other. This is detailed in the next section.

MODULAR COORDINATION

basic module and multiples

Modular coordination can be defined here as a dimensional relational consistency between the different elements of a building construction system.

The basic way of achieving modular coordination between different elements is to have their nominal sizes a multiple of a basic chosen module. The advantages of a modular coordination are multiple. The major ones are the following:

1. Modular coordination makes a quick joining of the elements to each other possible, both at the factory and on the site. This minimizes waste of material, time and labour.

2. Modular coordination allows the interchangeability of the elements, the suppliers and the materials used in a project.

This has a vital value because it reduces the dependency of a project to one supplier allowing other suppliers to replace the first one in case he runs out of business, and small suppliers to compete with and/or complement each other on a large job. Consequently, it reduces eventual monopolistic attitudes of eventual suppliers.

For this last reason, a national or international modular coordination should be developed and made compulsory.

3. Modular coordination removes the major problem of an incremental development strategy for higher technologies by assuring that a newly-manufactured product could fit the old ones through modular dimensional consistency.

There is not yet an international accepted basic module. Many metric countries have 10 cm as their basic module. The anglo-saxon countries have 4" as their basic module, while Federal Germany has 12.5 cm as its basic module.

The 4" is quite close to 10 cm, it is exactly 10.16 cm, and as most countries are trying to adopt simultaneously the 10 cm basic module, the choice of 10 cm seems on the international point of view quite interesting to choose, especially as many elements in the Third World countries will still need to be imported until their own supply industries develop.

On the other hand, the 10 cm basic module has the advantage of easy calculations for its multiples or submultiples.

Finally, 10 cm seems pragmatically an interesting dimention as it is neither too large a dimension nor too small for the general building construction use.

Multiples of the basic module or submodules (submultiple of the basic module) can be used to better fit the scale of a particular set of elements.

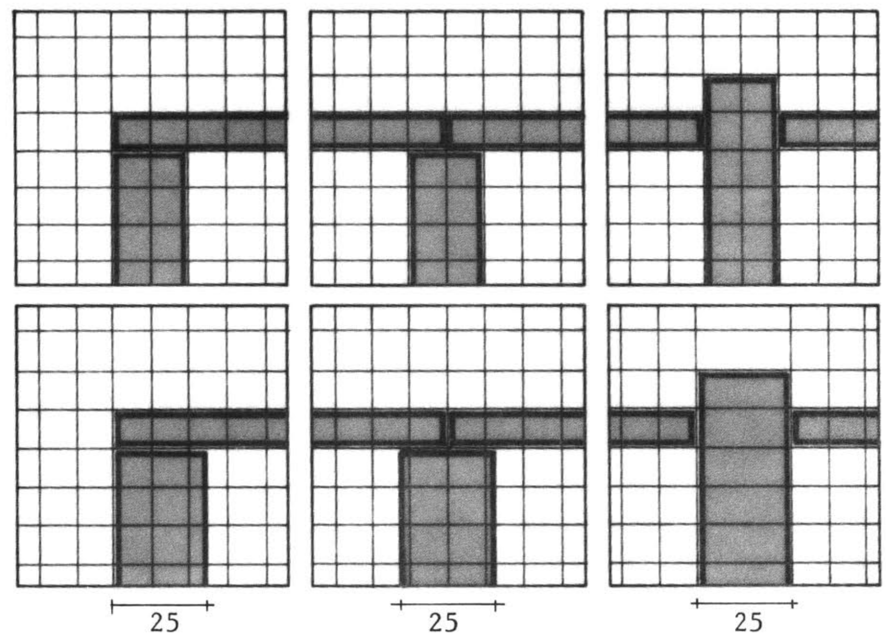
The international tendency is to use 30 cm as a planning module while 5 cm and 2.5 cm are reserved (if possible) to the small elements.

This does not mean that all elements should be exact multiples of the basic module or even of its multiples or submodules.

non-modular dimensions

Sometimes, elements are uneconomical if they have to fit the basic module; for example, a bearing wall of 25 cm may be economically and technically optimal for a certain purpose. This "odd" dimension can be used if certain precautions are taken to maintain the general coordination system. Such precautions depend on the specific case and involve measures as:

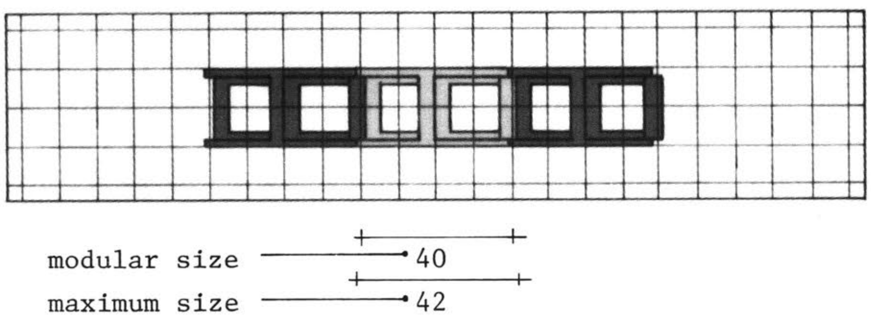
10 cm modular grid

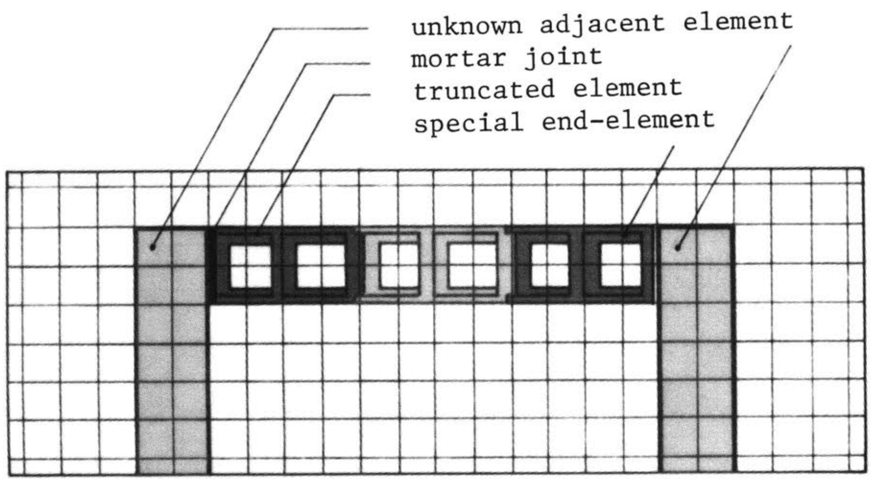


edge alignment | central axis alignment | neutral zone alignment

Aligning the wall to the modular grid on its center-lines or on one of its edges following the case, or even creating a "neutral" non-modular zone for the wall and restoring the modular grid between the walls for the coordination of other elements. The choice of either technique depends on the details of the elements used, and the way they will fit together.

On the other hand, if an element is produced at a standard modular dimension and for a certain job another non-modular dimension is required, an attempt to factory produce such an "odd" element could be un-economical. The economical alternative in many cases is to build such a piece on situ.





Finally, only the nominal sizes are multiples of the basic (or multiple) module. The real sizes depend on the joining details and the tolerances required by the technology and labour used, which should be determined statistically. The general rule for tolerance evaluation is a pragmatic one: "The man who gets there first is always right."

Detailed studies should be made for each specific case to determine the real sizes of the prefabricated elements, especially if prefabricated elements are to be mixed with on-site construction.

Such considerations are too specific for this general model. But as a general rule, in an open system, i.e., not for a specific job, the adjacent elements of each element are not known a priori. As a result, the real sizes should not be larger than the nominal sizes of an element, in order to allow any modular adjacency

If however, dented joints are required for whatever construction purpose, then, end elements will be required to restore the modular coordination at the end of a series of an element.

In case the element has a real dimension smaller than its nominal dimension, the joint itself could restore the modular system rather than the end element itself, and as a result, it would be the same as the others.

This system is particularly interesting when the "buffer" joint can be done on site, custom made, without therefore implying the extra prefabrication expenses inherent with the different end-elements required otherwise.

The most obvious buffer joint example is the usual mortar that can fit any end conditions due to its plasticity.

These principles of modular coordination, briefly discussed here, will be strictly taken into consideration in construction alternatives proposed in the next sections.

THE CONSTRUCTION SYSTEM

construction strategies

As briefly mentioned in the last section, the housing construction system has to take into consideration the housing distribution modes.

The housing distribution modes refer here to the different ways in which a dwelling can be delivered to the household.

The concept is clarified by the following description of the two main distribution approaches:

INSTANTANEOUS CONSTRUCTION

In this case, the dwelling is delivered to the user as a complete package.

There are however two alternatives:

market labour

All construction workers are market workers, skilled and unskilled.

aided self-help

The emphasis here is on self-help-workers. Usually a cooperative is organized to gather and check the seriousness of eventual self-helpers. If they are chosen, they participate in the construction of a group of dwellings (cluster) during the week-ends of 9 months to 1 year, and at the end, the dwellings are distributed to each one of them on a lottery basis.

INCREMENTAL CONSTRUCTION

In this case, only a partial dwelling is delivered to the user by any of the above discussed instantaneous approaches. And he keeps on adding elements to the first package, as his needs and his means rise. Here he acts alone, without the tight control of a professional team.

The package first delivered depends on the amount available from both the government and the user. This strategy can be called "incremental self-help" and can vary following the resources available, between the two following extreme cases:

«fill-in-the-blank» incremental self-help

In this case the starting dwelling package includes all structural elements to insure the general dwelling construction strength at any stage of its completion. The package leaves only to the user the non structural parts to complete, requiring limited effort and skills. This alternative has been called a "Fill-in-the-blank" solution because the structure is already present and only the fillings have to be gradually completed.

With such an alternative, large economies can be achieved, but they presuppose a definite building system (that can incidentally be offered by a cooperative materials bank, along with advice).

The major advantage of this alternative is that the unfinished present structure and the relative easiness of completing it make it very appealing to the user to finish it.

The major disadvantages are the following:

1. The family lives within an unfinished structure for a long time, a few years perhaps. The "unfinished ugly environment" can lead to apathy rather than desire to improve and embellish one's environment. This could be the case both at the individual level and worse at the collective level, as one would not have any motive to improve his house if the immediate environment would still look like a construction site. The result could be neighborhood decay.

In order to short-circuit this negative aspect, the dwellings should be far completed (e.g., have their envelopes already completed) before being delivered to the users. This would increase tremendously the initial cost.

2. The second disadvantage of this alternative is that is seems contradictory, given tight resources, to invest at the start in a complete structure where only a part of it will be used immediately, while the rest may take many years before being used.

autonomous self-help

The autonomous self-help approach is used to avoid the above disadvantage. More responsibilities, effort and initiative are left to the users. This alternative costs therefore less initially and is meant for very low budgets. Many experiments have already been tried in Third World countries.

They include the extreme: "Sites and Services" scheme, where only a lot and running water are delivered to the users, and each one of them has to build his own dwelling with the materials he can get, whether concrete or pieces of wood or mud, etc.

This alternative is an extreme one that should be used only in extreme cases. It is only a poor ersatz, as only below than acceptable conditions often result, and it is very difficult to control the growth of such dwellings from hygiene or safety points of view. For example, often the whole lot is covered, leaving no ventilation or sun penetration in the dwelling. This sharply increases various sicknesses like tuberculosis.

As a result, compromise alternatives should be designed even for very scarce conditions whereby only the immediately used element is built and delivered to the user, but where a system is still devised to help him continue the rest within maximum safety conditions, and with limited skills.

The choices of either alternative will depend on the following criteria:

1. the available short-term resources
2. the observed priorities of people
3. the safety during the suprastructure operations (in unmonitored user's self-help)
4. the legal observation of laws and their enforcibility (especially related to neighbors rights and hygiene matters)
5. the long-term construction strength
6. the "real" choices left to people (opposed to futile choices)
7. the cost of the infrastructure versus total cost (K value)
8. the climatic conditions.

The next sections will define a building system that takes into consideration these different modes of distribution, as well as the recommendations emphasized in the precedent chapters.

But due to the limits of this study, and the fact that the proposals are not based on a specific case study, the puspose of the proposed construction system is to illustrate a set of attitudes toward the defined problem rather than to fix details precisely.

Details, when described, are also meant as illustrations, bound to change in each specific case study once they have been thoroughly studied on all technical grounds.

In other words, the following illustrations are still at the conceptual level. They are physical concepts.

CONCRETE CONSTRUCTION

The domain of the possibilities has been largely narrowed down by the precedent sections. And to start by the major choice, the choice of the building materal, concrete seems the only realistic material given the Lebanese conditions.

In concrete technology, there are two broad options that could be chosen: Prefabrication, and on-site construction. Prefabrication can be either of large elements or of small elements.

Prefabrication of large elements can be already discarded for the numerous reasons discussed above. A mixture of on-site traditional construction to use the available unskilled or semi-skilled labour force is a healthier long-term policy.

With a partial indirect industrialization, the prefabrication of small elements can be very fruitful as it develops the existing small skilled labour force, requires only medium and even low-capital investments (and risks) and simultaneously develops gradually the industrialization of the country.

Traditionally, the concrete construction system has been limited mainly to "on-site" construction in Lebanon.

Typically a skeletal post and lintel concrete framework (or sometimes a concrete bearing wall), is poured in situ. The non-structural walls are made of prefabricated concrete blocks (which are the only prefabricated elements in the usual construction system in Lebanon).

But in the present study, dealing with very scarce resources and other special conditions like self-help, some changes can be made to the existing system to improve it further. Such changes will now be described for each of the housing construction elements.

the walls

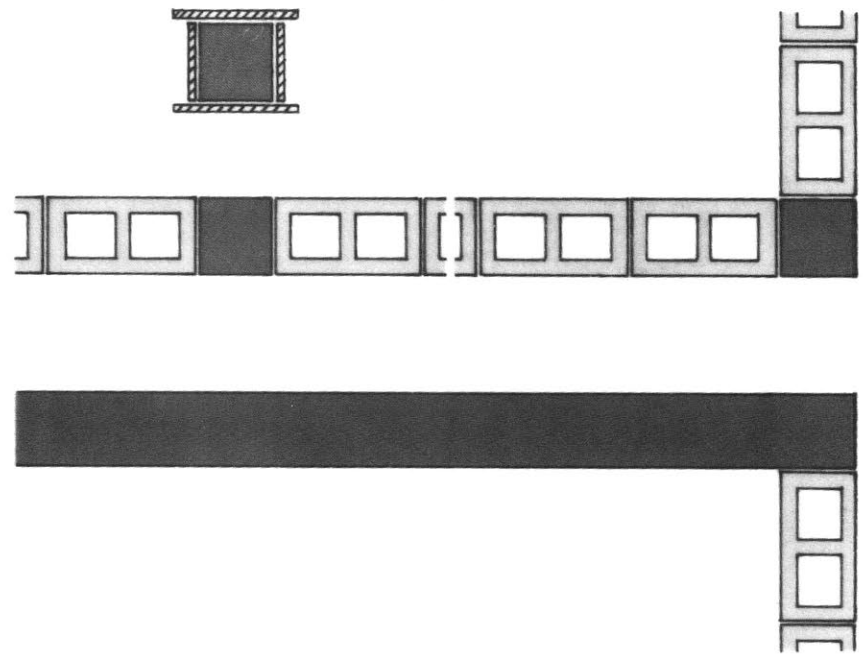
EXISTING METHODS

The most widely used wall systems in Lebanon are either of the two following:

1. In most cases a concrete framework post and lintel system is first built and then concrete blocks are laid in between the structural elements or freely as partitioning walls. They have no structural role to play.

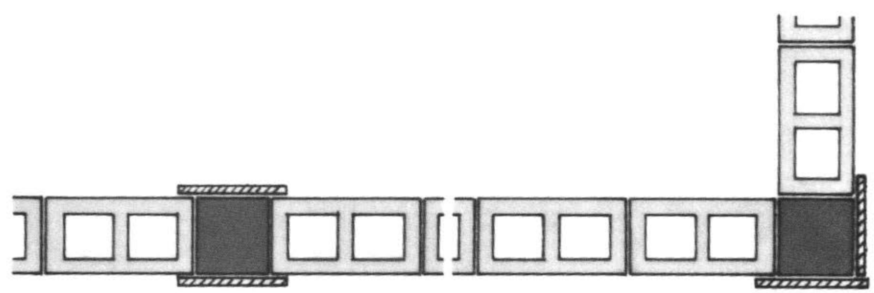
2. The second alternative, less prelevent but still quite widely used is concrete bearing walls poured on site, instead of columns.

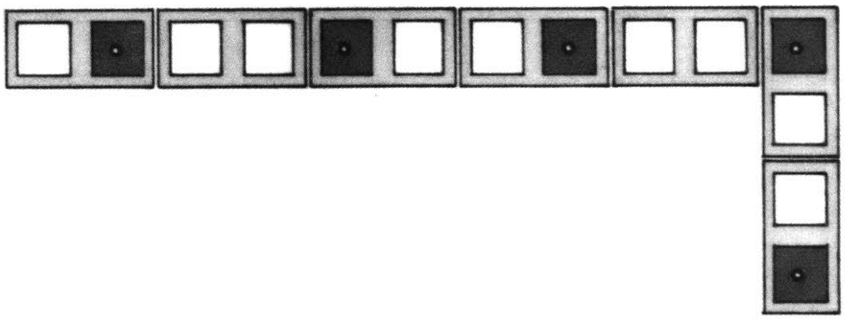
The choice of either system depends on the specific design problem. Both of these solutions use the materials, expertise and labor available in Lebanon.



PROPOSED SYSTEM

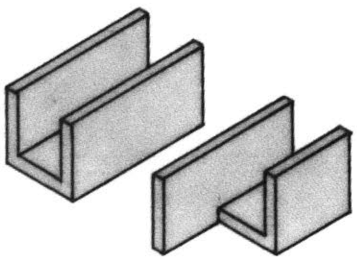
1. One way of diminishing the wooden forms necessary to pour the concrete is to first erect the walls with concrete blocks and then pour the concrete columns in between two blocks, leaving only two faces to be framed by wood forms.

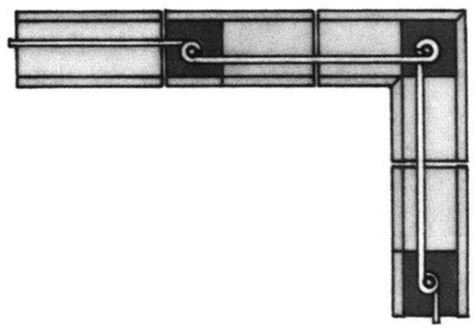




2. A better way is to use the cavities of the block themselves, to place the reinforcements and pour concrete in the (already made) concrete forms.

The advantage of this solution, besides the economy in wooden forms, is that the reinforcement can be placed as frequently as needed. This makes out of the concrete block wall a bearing wall that can stand strong earthquakes (which sometimes happen in Lebanon as in 1956).

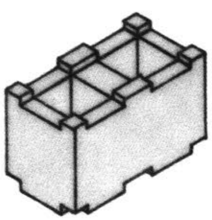


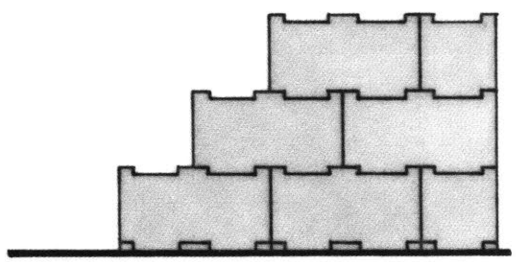


3. To make the wall completely monolithic, against earthquakes, the top running reinforcement, traditionally poured also in wooden forms could be replaced by a U-shaped prefabricated concrete block.

These blocks can be cast in the same manufacturing equipments as those used for the rest of the concrete block.

Variants could be available for corners, and to allow room for the beamlets and the wall vertical steel bars





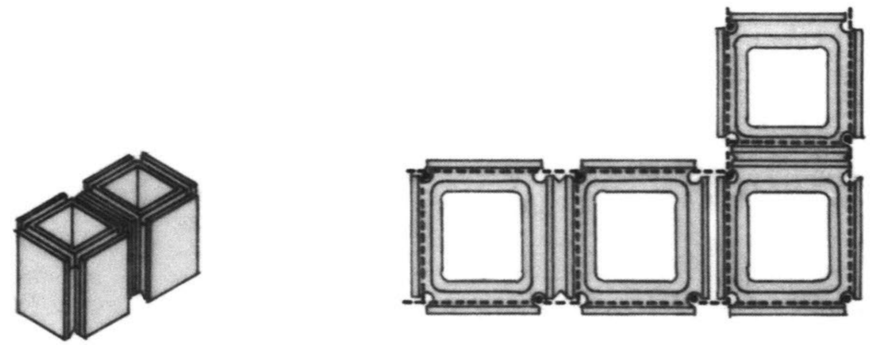
4. One of the problems involved in this method is the constant care necessary to align the concrete blocks to have the cavities aligned vertically for pouring the concrete. Self-aligning bricks could be manufactured, especially if to be used by self-helpers and more so by incremental self-helpers who would build the walls on their own.

5. Another difficulty is that concrete, to be homogeneous, can not be poured in the narrow concrete blocks from the top of the wall, but after each few layers are placed. So the blocks would have to be placed around the reinforcements from quite high (3.00 m) which is cumbersome.

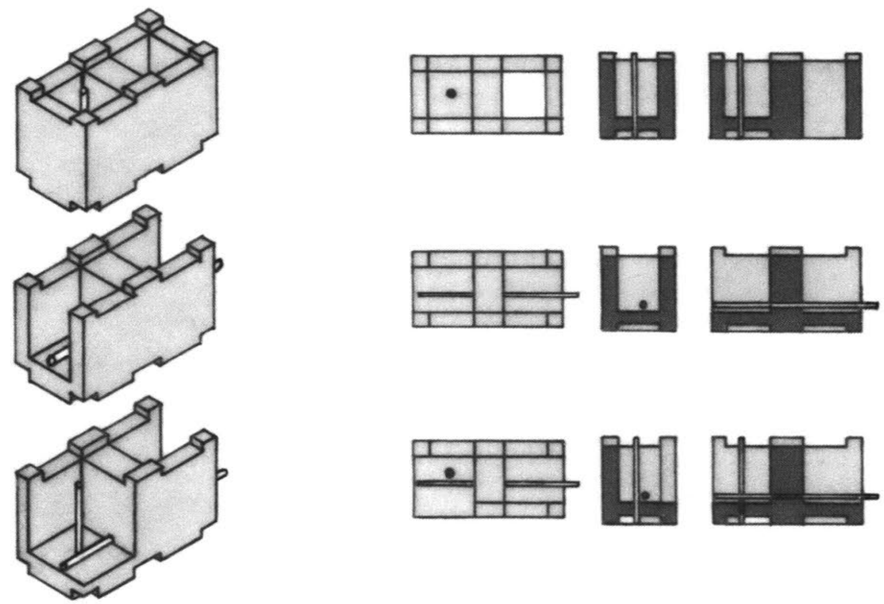
The alternative would be to cut the reinforcing bars into 3-4 pieces and put them as the wall goes up. But both these alternatives are somewhat complex and time consuming. They are still done usually.

Two solutions are possible to make this easier:

1. One is putting the reinforcements from outside, as proposed by Prof. W. Zalevski (M.I.T.). The reinforcement could be either horizontal or vertical, and therefore a U-shaped top block would not be necessary. There is a strong disadvantage to this interesting solution, which is the repetitive grooves left which would keep the dirt and dust. Also when partially filled with concrete for the reinforcement, they would produce irregular patterns of groves and ugly fillings. And filling all the groves would be time consuming and expensive.



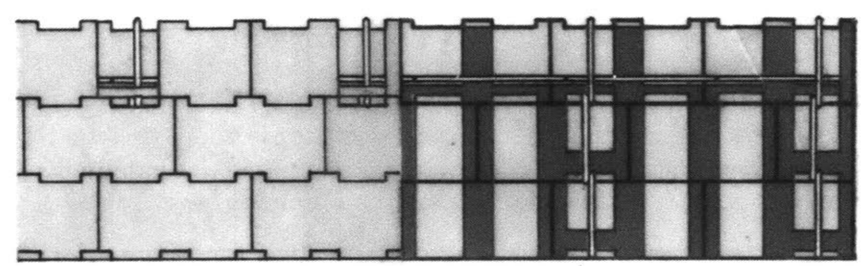
2. The second possible solution is the manufacturing of the concrete block with its reinforcement. This solution could be a little more expensive on steel, but could be an ideal solution for individual self-helpers that do not have a continuous monitoring skilled people. Similarly U-shaped top blocks could also be prereinforced (engineering details remain to be solved).



All these blocks allow "wet joints" to insure the monolithicity of the structure against potential earthquakes. Working details will be developed later.

These sophisticated blocks would probably only be used for individual incremental self-help solutions, and not in aided self-help or simple instantaneous solutions as in these last cases, some skilled workers could check the reinforcements erected on-site before pouring the concrete.

The use of these blocks would insure a certain safety "without engineers" for the houses of the self-helpers. For that they should be cost attractive to the self-helper and as a result they should be distributed in the cooperative shop or "construction materials bank" at costs lower than what he would find in the market. This is possible within the cooperative organization as discussed earlier.



6. A last improvement is possible to make the self aligning block tighter against water, humidity, and temperature.

It consists in a "zig-zag" or dented joint between each block. This provides a cleaner surface, as mortar is kept inside the blocks, and the overlap insures a better protection for the joint.

This last concrete block example can, as the previous ones, be manufactured in "U" shapes, or half "U" shapes, for the beam detail.

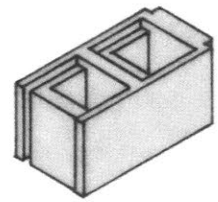
As the details of this solution are more delicate, a more precise manufacturing process is probably required. This could make this alternative less readily usable in certain cases.

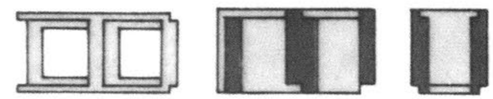
However, as much as the global construction system is concerned, any concrete block can be used (with its inherent advantages), following the case, without infirming the construction system as a whole, provided modular coordination is present, to allow a consistant eventual completion.

The hollow concrete block (in any of its forms), besides its advantage of becoming a column or a bearing wall, have many other advantages that make the system a real asset:

1. They are small elements that can be carried by one man without any special equipment. The cavities increase their volume, without increasing their weight, and this decreases the number of time consuming and potentially hazardous joints.

2. Being small elements, their manufacturing is easy to make and does not require sophisticated expensive and large equipment. The blocks can be handmade or automatically made following the region's various conditions.

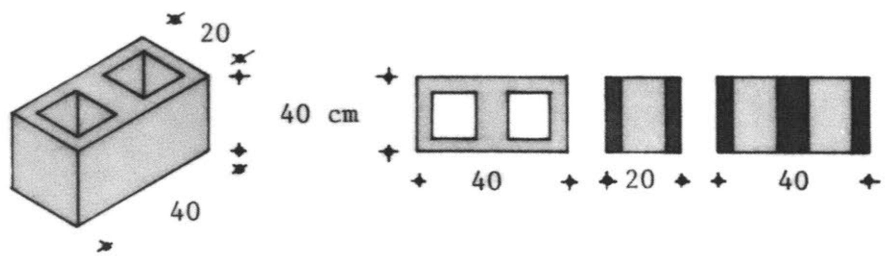




3. Climatically and acoustically, the air buffer zone between the two concrete layers is a good barrier against heat, humidity and noise. Also it minimizes the material and makes it store less of the day's heat.

4. Concrete blocks are made in many parts of the country. As a result, one can rely on this system which has many available suppliers, and does not require foreign technical aid for their manufacture (an effort could be made to start building the machines themselves, in the country rather than importing them from the industrialized countries).

The blocks usually available in the market, are simpler than those described above. But fortunately, they have modular dimensions (see next paragraph), and as said above, they could therefore be used as such, especially in instantaneous construction.



For self-help purposes, the proposed more complex blocks could be manufactured, in most cases, with the same market machinery, only with different moulds.

The nominal sizes of the concrete blocks are usually either of the following ones:

20 x 40 x 10 cm
20 x 40 x 20 cm
20 x 40 x 15 cm.

The two first sets of dimensions are completely modular, while the third one has one dimension, the 15 cm, not fully modular.

This dimension is however sometimes economical, and could be used with the above described modular coordination techniques.

The actual dimensions are 1 cm less for the 1 cm mortar joint thickness.

These dimensions (especially the 2nd one) are the larger convenient sizes because they can still be carried by one man with relative ease. Above these dimensions they become too heavy, and below, they increase the number of manipulations per unit area and the number of potentially leaking joints.

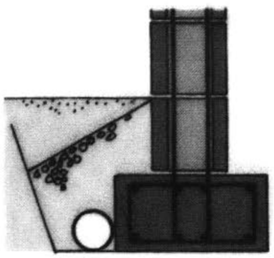
The 20 cm block wide block is generally used reinforced for bearing purposes but it is also used as party walls for noise considerations, and on the outside for climatic considerations.

The 10 cm block is used for interior partitions, and does not need for that purpose any reinforcement.

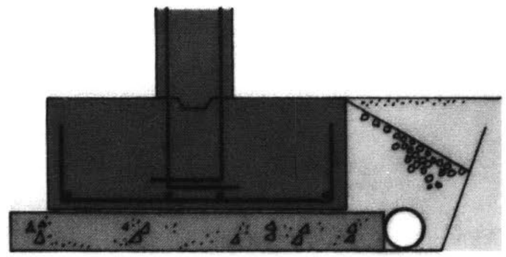
The 15 cm block is less used, but in the case of two party walls rather than one, in incremental self-help solutions, it could be used instead of the 20 cm block for economy. The use of 10 cm block, reinforced, is even possible if detailed engineering studies permit it.

The use of two party walls is necessary in incremental self-help solutions when the party walls cannot be provided entirely in the first package. Otherwise the risk is that each user would wait for the neighbors to build the middle wall. The result would be either construction stagnation or vehement fights.

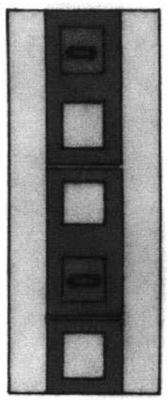
In the case of the more sophisticated concrete blocks, there also would have to have the same modular sizes to allow continuity in construction.

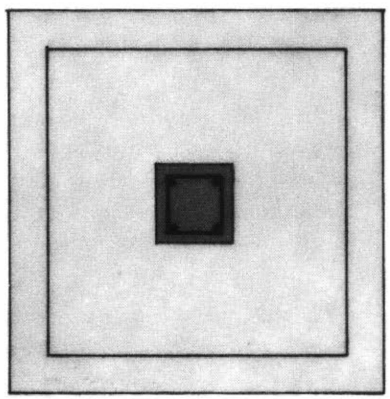


strip

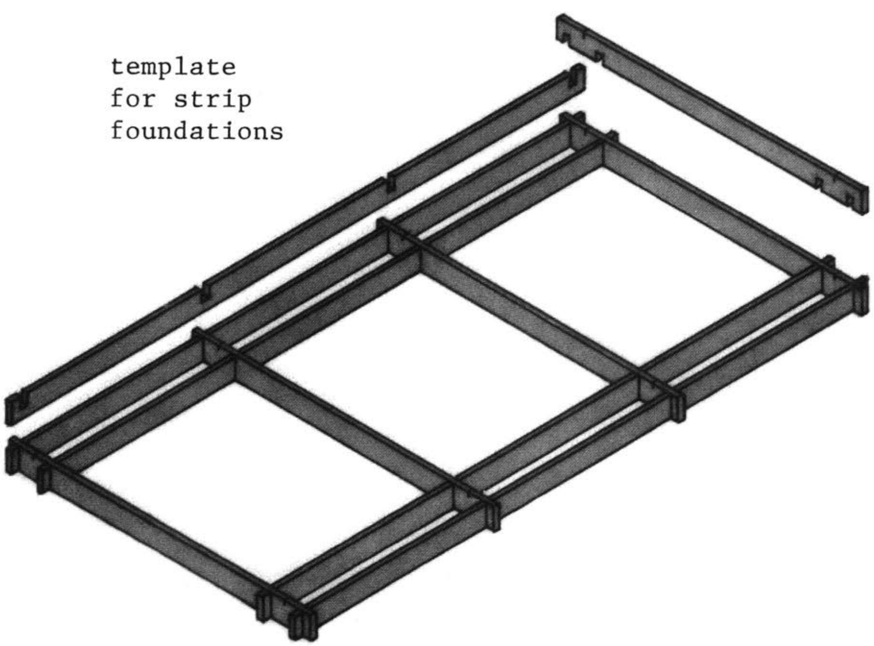


step foundation





template
for strip
foundations



foundations and ground slab

THE WALLS FOUNDATIONS

existing methods

Foundations are usually poured on site, either in strips, for bearing walls, or in individual footings for columns.

After excavations are made manually or mechanically, wooden forms are assembled, reinforcing bars are laid and concrete is poured.

Foundations are most difficult to prefabricate at the present state of the art, as they have to rest on various unpredictable soils. As a result they have to be custom made.

proposed system

A time-saving device could be introduced to facilitate the job of excavation and the building of concrete forms, especially in the case unskilled workers and self-helpers.

The devices would be simple, durable, real size templates. Simple fastened pipes could be used to define the excavations limit while steel plates could be used as concrete forms.

The concept is possible as the general dimensions would be the same for all dwellings, even in incremental schemes, where foundations would be, at any rate, provided as a minimum package.*

The repetitive use of easy to carry templates (especially in the case of the strip foundations used here to support the bearing walls), would make them economically acceptable by a cooperative, for their many dwellings. Details are not studied at this level, but the concept seems quite feasible at this stage.

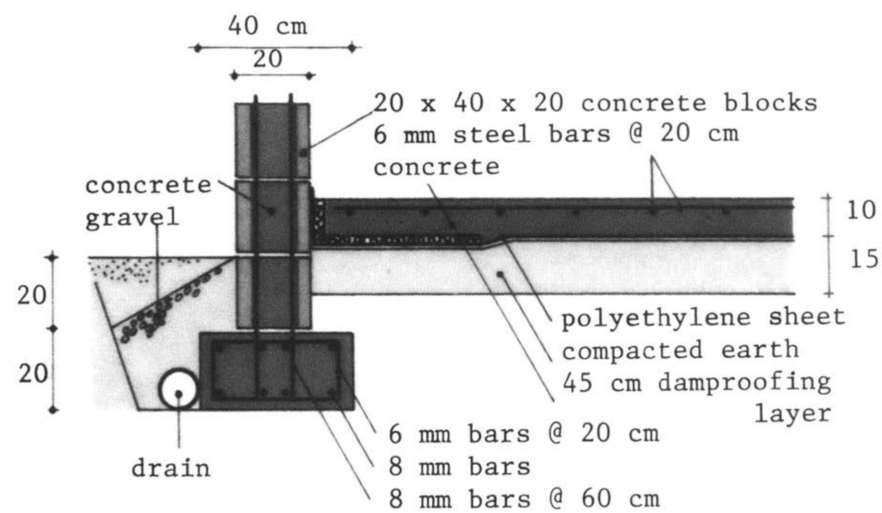
Also, along with the template, the steel reinforcements could be prebent and prefastened and sent to the site as well, especially in the case of unskilled self-help labour. This would minimize the required skilled labour on site, and optimize its output in factory conditions.

THE GROUND SLAB

Like the foundations themselves, the ground slab is custom made on site, of reinforced concrete.

Concrete is poured between the foundation on a rock bed or on compacted ground, depending on the soil. A dampproofing layer is inserted for waterproofing at the ground floor. Details should be studied for each case.**

Here also, steel templates and prebent reinforcements could be used on site to simplify the task of the on-site labour, especially in the case of unskilled self-help workers.



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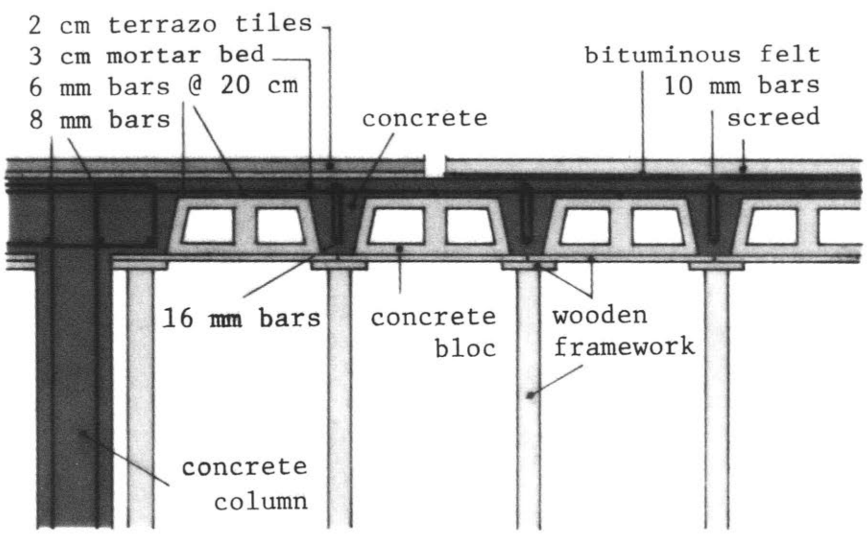
* *See pages 196-197*
** *Reference 42*

the slabs



EXISTING METHOD

Technically, the traditional slab is usually poured over a wood framework, carrying the necessary steel bent on site and some special concrete blocks that have cavities to decrease their weight and the total slab weight. This solution is quite interesting, as the know-how and the blocks are available. (The blocks have 2 of their vertical sides inclined to ease the concrete pouring. The usual dimensions being 42 and 38 cm for the horizontal dimensions, 15 cm in depth and 20 cm in the 3rd dimensions).

When the slab is a roof, a waterproofing membrane made of bitumen paper is laid over the concrete and covered with a few centimeters of light concrete for protection and insulation.

The top layer of concrete has a slight slope (1%), for quick water drainage.

When the slab is an intermediate one (and not a roof) a layer of terrazo tiles usually replace the light concrete of the roofs. The terrazzo tiles require generally a two to three centimeters bed of sand to produce a smooth surface and the desired slope.

PROPOSED SYSTEM

The time- and material-consuming wooden framework could be completely avoided with the following simple technique:

Small beams or beamlets could be prefabricated either in a central factory, and sent to the site, or in minifactories, placed for the job, on the site.

The beams are first placed on the already erected bearing walls without any wodden scafoldings or forms, then concrete blocks are placed between them, as in the previous case, along with the reinforcing bars, and then concrete is poured above, as in the previous case.

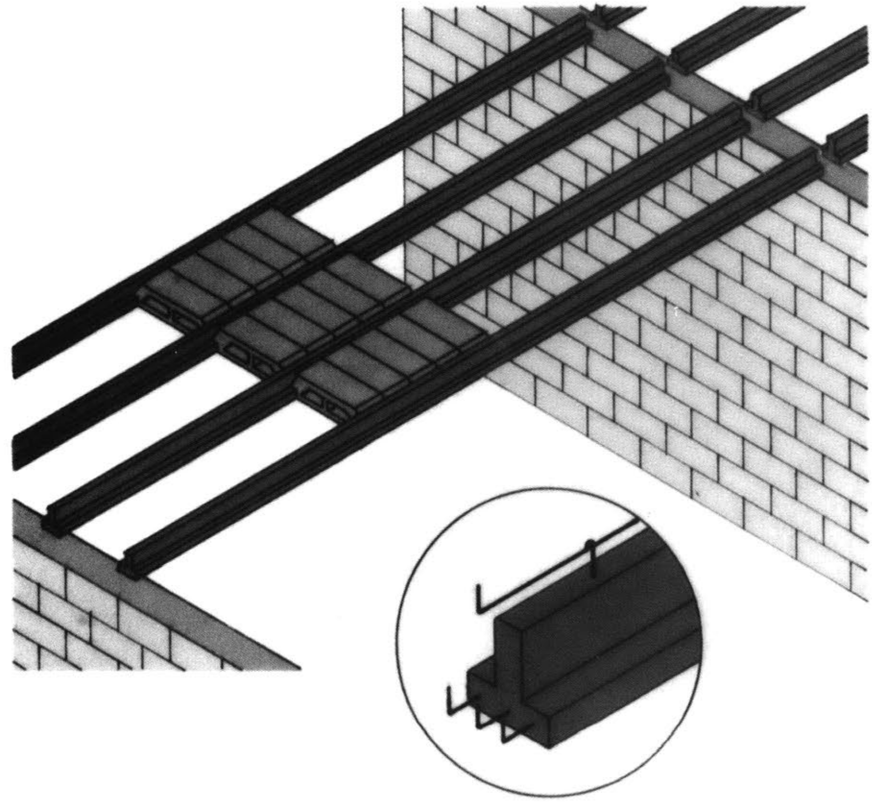
In order to decide the spacing between each beamlet, many factors should be considered:

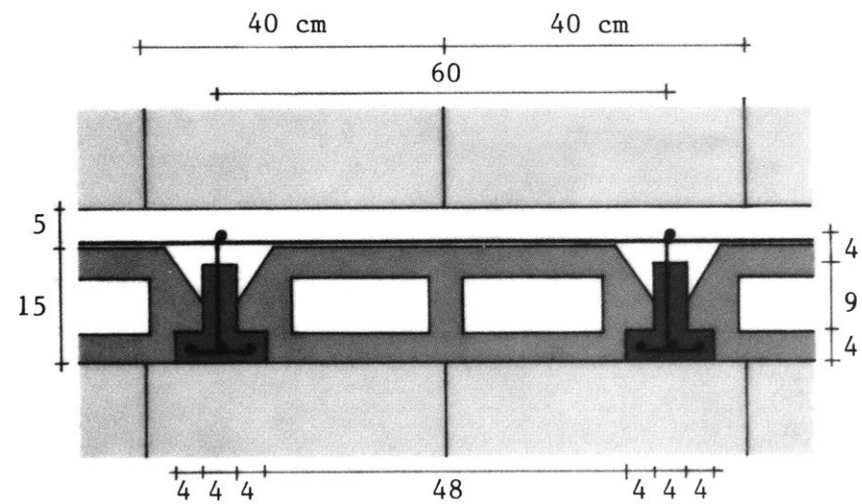
1. The blocks in between 2 beamlets should be manipulable by 1 person, i.e., should be around 25 kg at most. That includes a span around 50 cm for the concrete block.

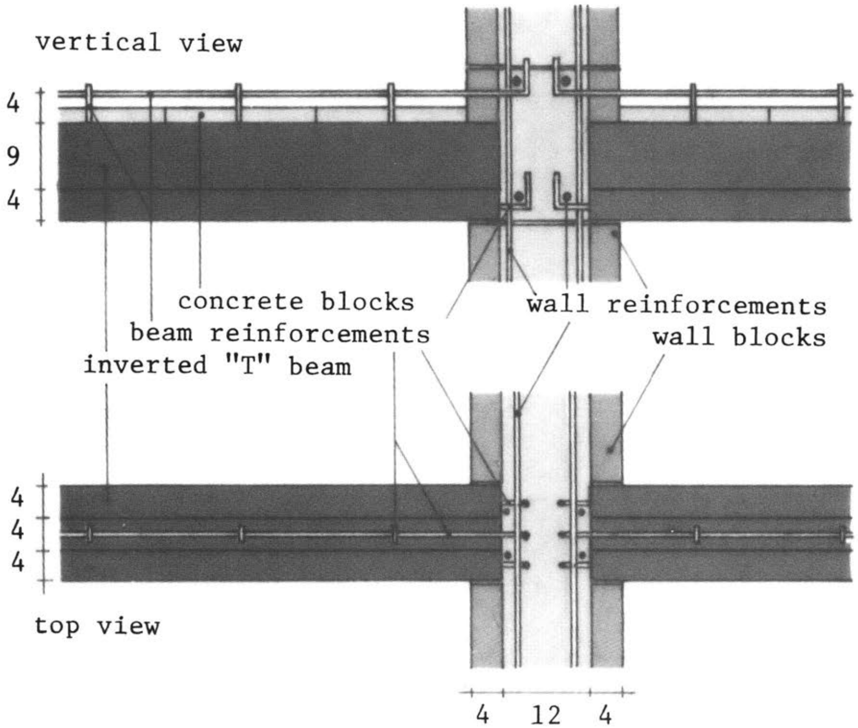
2. On the other hand, the 540 cm beamlet itself should not be too heavy as not to require more than either a light mobile crane or a pully and rope system, or even 3 to 4 men carrying it, if labor-intensive schemes are required.

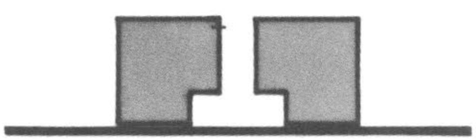
3. Finally, the beam should related to the 20 cm frequency of the 40 cm staggered blocks in the walls.

As a result, 60 cm between beamlet centre lines seems best as it requires concrete blocks of 40 to 50 cm span which could still be light enough if they are properly shaped.









Moreover, 60 cm is a submultiple of both 540 cm and 1140 cm, the two dwelling dimensions.

In order to decrease the weight of the beam, an inverted T shape would decrease the top width of the beam while leaving it with a wide basis to sit on the 540 cm apart walls, and carry the concrete blocks.

These 120 kg beams could be erected as mentioned above either by a light mobile crane, a system of cords and pullies, or even by four men, in labor-intensive schemes.

The horizontal reinforcement bars, extending from the two extremities of the beam, should then be fastened to the vertical and horizontal wall reinforcements.

If the beams and the bearing walls are all delivered to the household, the total long-term safety of the construction is thus insured, and the self-helper is then only left with manipulations that he can perform with his bare hands and no special equipment. This illustrates the "fill-in-the-blank" process.

Incidentally, these beamlets could be covered with any temporary material as straw or mesh or "grapeplants," as in the local Lebanese tradition to protect the eventual porch from heavy sunshine, until all the dwelling has been completely finished.*

The beams could be simply cast on a somewhat leveled ground with the forms inverted to be retrieved after a much shorter amount of time, while the beam remains unmoved until it completely hardens.

As said above, this element could be manufactured either in central factories and carried to different sites by intermediate size trucks with no problem.

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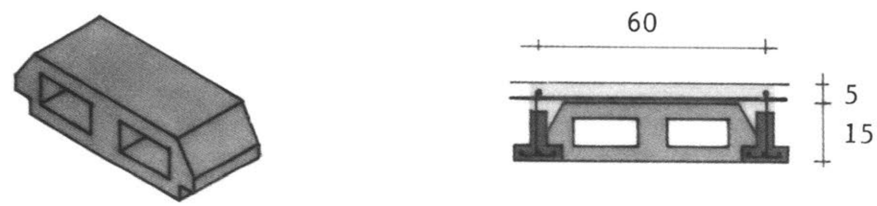
* *See pages 197-215*

Or, in case the site is too far away from a central factory, a minifactory can be sent to the site, requiring only one trip. As these elements do not require sophisticated and heavy equipments. The steel bars could also be prebent and fastened and sent as well to the site.

After the beams have been erected on the bearing walls, the remaining process would be to add the steel reinforcements and the concrete blocks and pour the concrete above. Two different techniques are possible

1. Placing the concrete blocks first, then placing the steel bars and then pouring the concrete above, as in the traditional case.

a) The concrete block could first be modified in order to provide a flush ceiling surface.

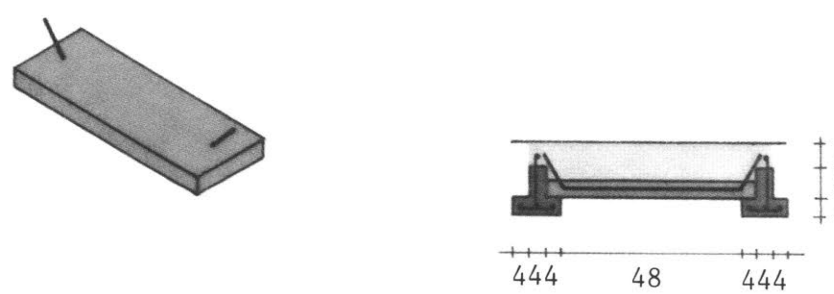


This again will not require any change in the manufacturing of the blocks besides another mold. This should be considered as it gives more flexibility for the partitioning of space. Besides it also gives a family feeling compared to the factory feeling that is produced by the repetition of the ribs, which is a feeling that many people resent.

b) On the other hand, if a cheaper detail is needed, the concrete block could consist of a simple flat full concrete block, leaving the ribs apparent.

The steel bars, as before, would then be added, and the concrete as poured above.

2. The second technique, in the line of the "fill-in-the-blank" concept, would consist of prereinforcing the previous flat concrete block.



In this case, no additional reinforcement is required, and the only steps would be to place the reinforced block between the beamlets and pour the concrete.

As in the other techniques, tiles could be added or bitumen paper and an inclined layer of screed above for protection could be used.

With this method, a high probability of structural safety could be expected, even, and especially in the case of incremental unskilled self-help labour.

The complexity of the task would also be tremendously reduced and an eventual monitoring of incremental self-help scheme reduced to a bare minimum.

For that, however, the compulsory use of this "fill-in-the-blank" concrete block should be required.

Like the wall blocks, these slab elements could be either centrally prefabricated or made in site mini-factories mechanically or manually, following the available labour and know-how required.

The different kinds of concrete blocks along with other construction elements as well should be also stored in a "construction bank" or simply a shop of the cooperative. Simple advice could be given as part of the cooperative services, for those who need it, especially when the use of specified elements is compulsory.

The materials would be delivered at lower prices than in the market due to the fact that the cooperative is a non-profit organization and other critieria already discussed in the financing section.*

The materials bank could also store the prefabricated beamlets if they are not provided at the beginning. They could be carried in simple carts to the site and carried by 3-4 men and pullies or if possible they could be transported and erected directly on the walls (when the self-helper is ready) by a small truck with a simple crane.

Illustrations of the different dwelling packages will be given in the next chapter.**

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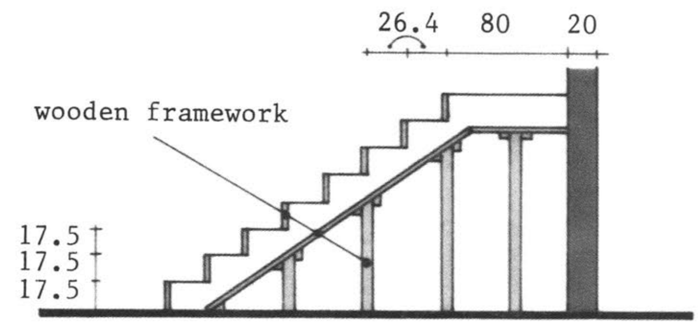
* *See pages 63-65*
** *See pages 193-217*

the stairs

EXISTING METHODS

Traditionally, as for the rest of the structure, the stairs are poured on site in inclined wooden forms, where reinforcements have been placed. The steps are thus shaped by vertical wooden frames.

This procedure is time consuming and needs quite a degree of skill.

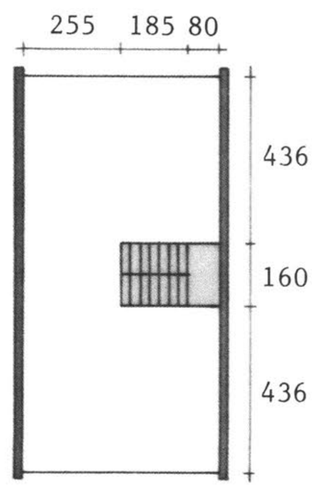


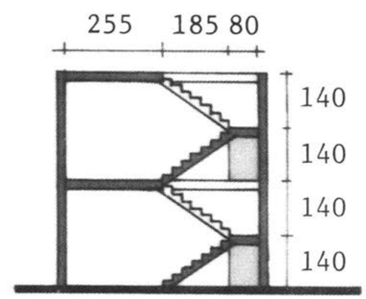
PROPOSED SYSTEM

Here also, small prefabricated elements, factory or on-site manufactured could be useful. In the case of incremental self-help, the elements would be stored in the materials bank, as the rest of the elements.

As a result of planning considerations,* double-run stairs seem to be the answer to the problem.

Only the landings would be installed in the self-help incremental solutions, while in instantaneous schemes, the whole stair would be installed at once.





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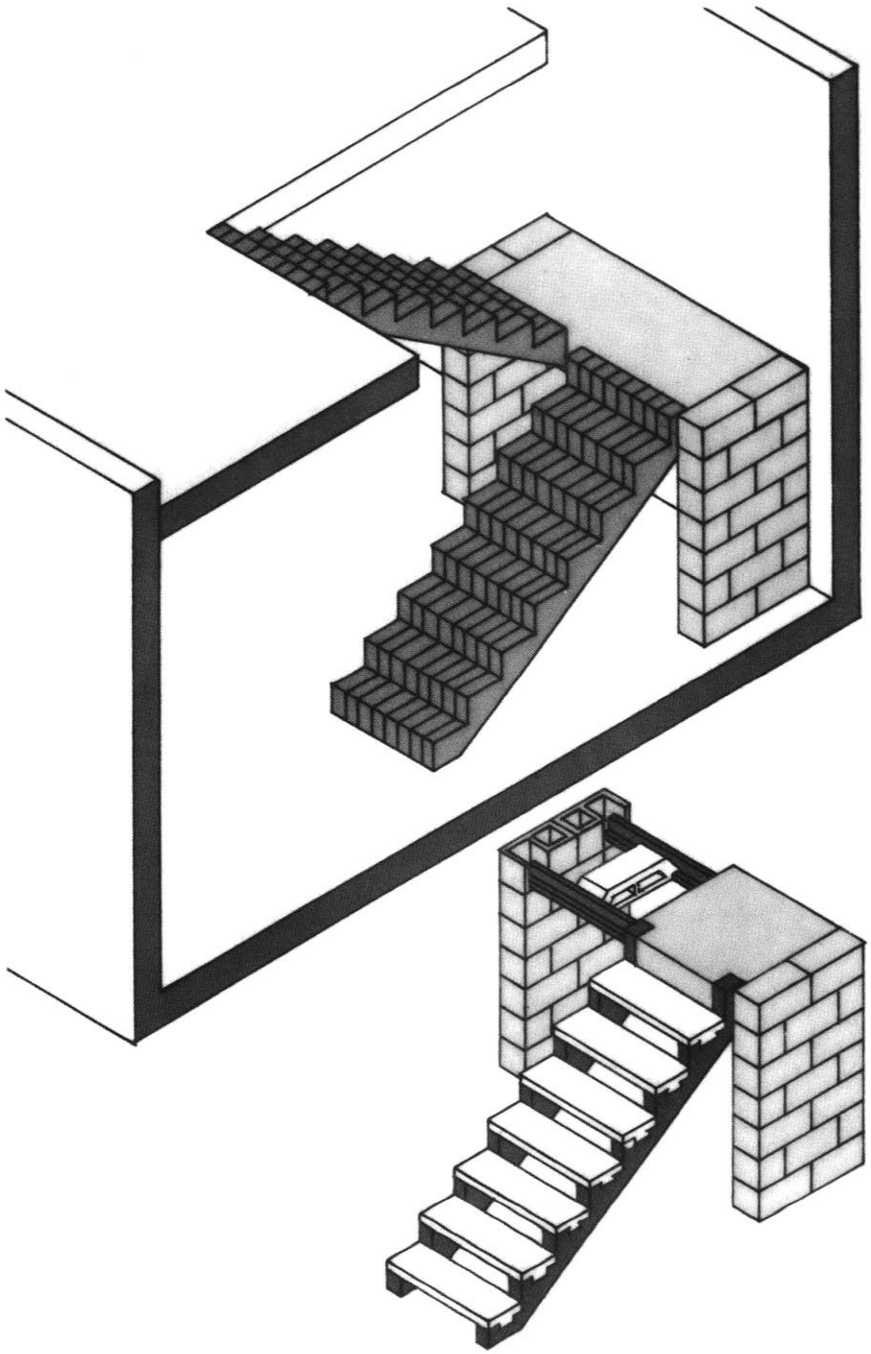
* *See pages 128, 132, 133*



Landings are installed, even in the most elementary solutions for two main reasons:

1. To give permanent structural stability to the future stair cases which will be self-help built.

For instance, a simple wooden structure could still be safe enough, if it leans on the prebuilt concrete landings. The same holds true even for later concrete additions.

2. To make sure that the dark, non-ventilated central space of the dwelling will not be used to house an unhealthy middle bedroom, but rather to house the staircase (that elsewhere would occupy better spaces).

In both strategies (instantaneous construction and incremental self-help schemes) the landings would be built in the following way:

First, the two supporting walls would be built as, and with, the bearing walls. Then the horizontal landings would be asembled like the slabs with two beamlets, and concrete blocks in between.

The landing of the first floor does not need the small bearing walls, as it rests directly on the main slab beamlets.

On the already-placed landings, prefabricated stair elements would be hung. These elements consist in 8 to 10 cm thin "slices" of stairs put near each other. This would make them lighter and easier to manipulate by a couple of self-helpers. These elements would weigh around 70 kilograms each.

A cheaper and lighter technique to be used mainly in incremental self-help schemes, consists in installing only the two extreme prefabricated elements and placing between these elements some mini-stair-landings prefabricated elements.

These small landings would be easier to manipulate. They can either be concrete or simple wooden boards, assembled by the households who can not pay for the concrete landings.

The overall stability will still be insured by the staircase main landings and the eventually installed two oblique side elements.

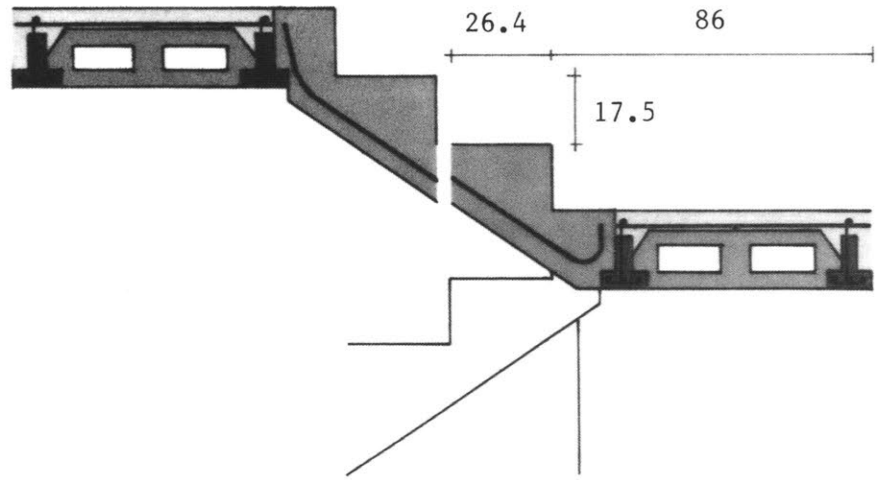
Precise construction details remain, however, to be studied. The adjacent construction representation is only a concept rather than a detail representation.

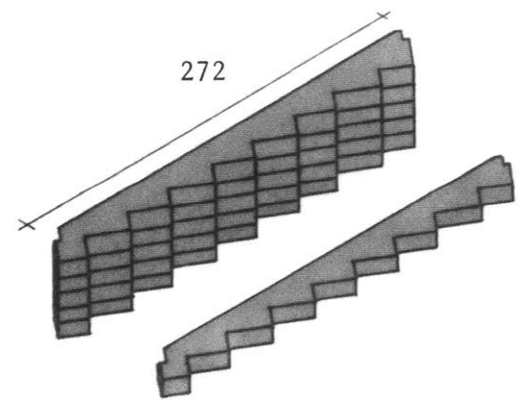
Incidentally, in incremental self-help solutions where only the main landings are delivered in the first package, any wooden structure could lean on the given landings, thus having a certain stability, without necessarily using the proposed oblique concrete prefabricated stair elements.

Besides the easy manipulability of the stair "slices," this concept has another major advantage: it allows a relatively much easier manufacturing process than the large three-dimensional staircase.

As the elements are two-dimensional, they can be cast on the ground in simple forms. This is an important advantage, especially in the case of on-site mini-factories, that would have light and limited equipment.

The working space can also be quite minimized by the possible casting of the elements one above the other after a minimal hardening of the lower element.





piping

The factors that shape a dwelling piping system are numerous. The most important of them being the water pressure, the amount of water equipment in the dwelling and the local construction habits.

EXISTING METHODS

water pressure

As the national water supply is more and more loaded without proportional resources to expand it, the efficiency, regularity and pressure of the water supply have quickly decreased during the last decades.

As a result, a usual custom for all who can afford it is to have a water tank on the roof of the dwelling to make up for the cities' low water pressure and unpredictable water cuts.

The recent asbestos industries have provided light prefabricated water tanks at affordable prices. These water tanks have usually a capacity of one cubic meter, which is enough for one household.

heating

High and medium-high income dwellings usually have a central heating system for both hot current water and heating itself. This requires a sophisticated hot water piping system.

For the medium-low and low-income people considered here, a central heating system can not usually be afforded. Heating is usually done by small transportable individual gas or petroleum heaters, while water heating is done by a fixed cylindrical wood or petroleum heater. This water heater requires an exhaust pipe. It is usually placed either in the kitchen or in the bathroom.

Very low income people can not afford even these heaters and they heat water in a pan on their cooker.

pipes installation

The usual technique in pipe assembly is to avoid the relatively costly orthodox shaft system. The vertical pipes are laid in goves made in the (already built) concrete block walls. The horizontal pipes are laid on the concrete slab in the mortar below the tiles.

Only the new upper-income, multi-story apartments have shafts, but even then, they are restricted to the main pipes connecting all apartments. The private pipes, vertical or horizontal, are still laid in the above "primitive" method.

There are two main disadvantages in this method: a lack of flexibility for future modifications and a great difficulty in eventual repairs.

The two disadvantages are due to the fact that the pipes are caught in places where they can not be reached without complex and costly destructions: tiles to be removed or walls to be destroyed.

Even when shafts are available, they are often too narrow to be reached after the construction is ended. Larger shafts would be too expensive.

PROPOSED SYSTEM

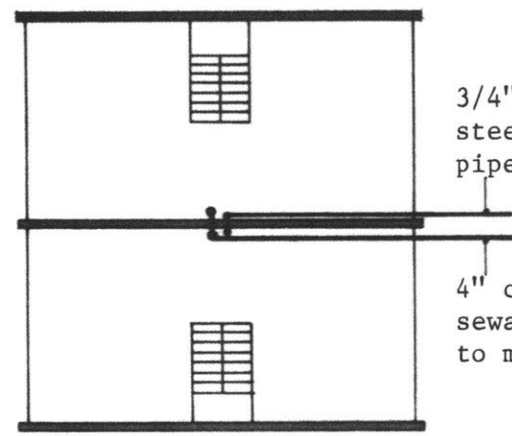
The proposed methods will try to take into consideration the three major required factors: a low-cost technique, flexibility for incremental additions and easy repair and self-help unskilled participation.

dwelling-to-street pipes

The pipes linking the dwelling to the main city street pipes are usually laid underground.

This technique makes repairs difficult but seems, for the time being, the only alternative.

In order, however, to minimize excavations and the piping materials, every two lots will share a common set of pipes (water supply and sewage pipe) each on one side of the common party wall of the two lots. The sewage pipe will be lower than the water supply pipe to avoid risks of contamination in case of leakage.

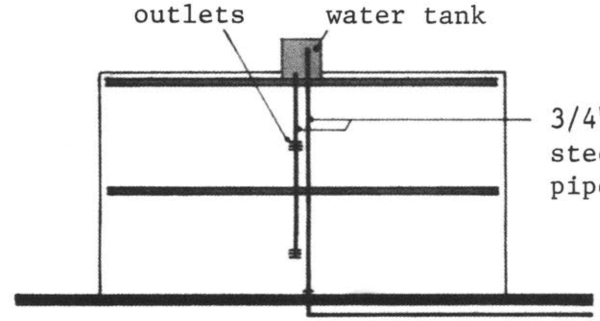


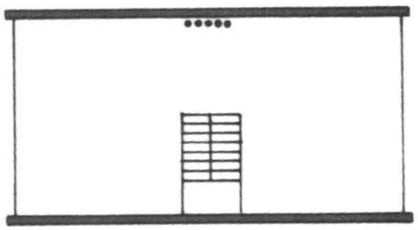
dwelling pipes

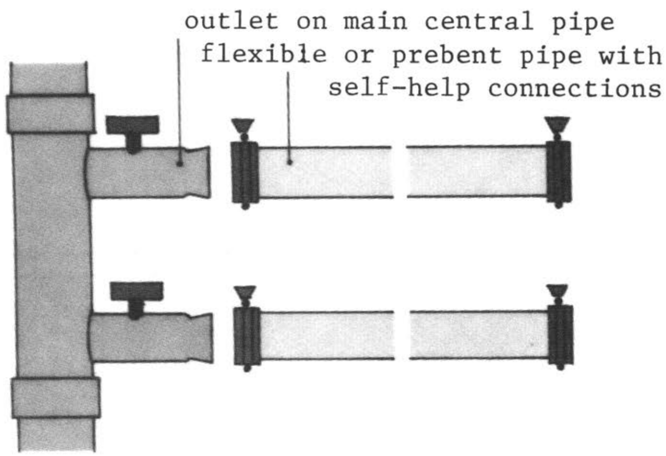
The concept here is to have a main central piping system where incremental connections or changes could be made.

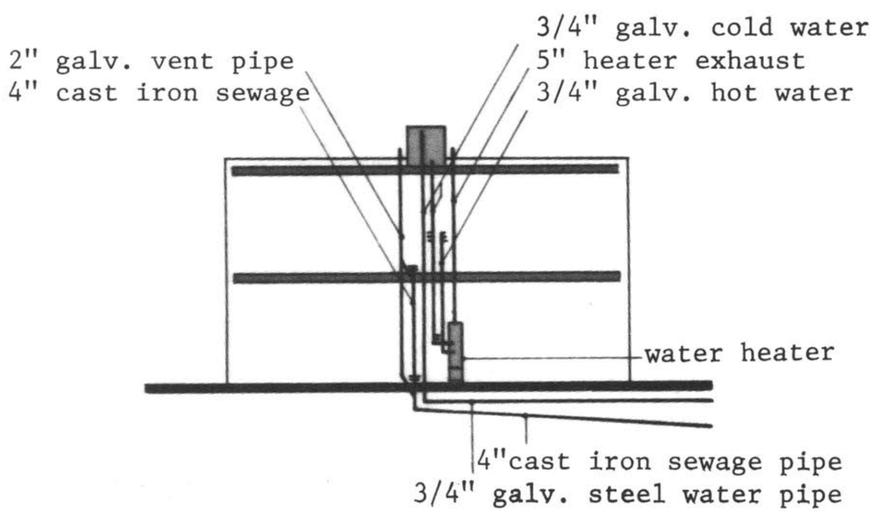
A vertical water supply pipe would run from the ground to the adopted roof water tank. Parellelly, another pipe would go from the water tank to the lower floor.

At each of the two floors, outlets would be preinstalled on the pipe (three per floor, as an average) to allow any desired connection, at the initial construction time or later.









These pipes would run, near the party bearing wall in the central zone, opposite the staircase.

This area will be the "shaft" area. This shaft will not be, however, enclosed in four walls, but will be open on the three sides, the fourth side being the bearing wall.

Curtains or a wooden cupboard type structure could be installed by the owner, later, provided an easy access to the pipes is left.

The outlets on the pipe could be either a simple screw, to be removed when a pipe is to be screwed for some new equipment, or a usual tap that could be open when a flexible (or rigid) pipe is connected to it.

Incidentally, preassembled flexible pipes (rubber or other plastic pipes) could be available in the cooperative shop with "do-it-yourself" end connections that would not require a skilled worker for installation.

The concept is similar to the one used to connect a modern washing machine to a usual kitchen or bathroom tap.

If, however, more rigid pipes are desired, a local (cooperative or not) plumber could be called when an addition or a change is desired.

If a water heater is installed, it would be connected, as the other equipment, to the main water pipe. A hot water pipe would be connected to the heater; it would run vertically, parallel to the other pipe and have, as well, two or three outlets per floor, for the same reasons.

The same system should be applied to the sewage pipes: a main pipe with connectable outlets, at the lowest level of each floor.

Here, however, as the pipes need to be larger in diameter, the connections would probably be made by the local plumbers when additions or changes are required.

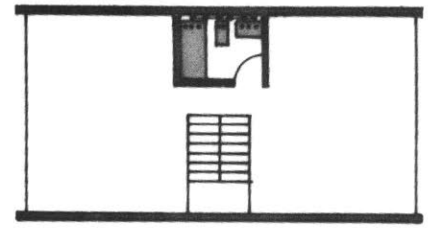
The outlet system concept would, in any case, make the task possible at reasonable rates.

Finally, the pipes connecting the different equipment elements to the central pipes would run along the walls in order to be easily installed, checked and repaired. Their visual pollution, a subjective "snob" attitude, would at any rate be very limited, as all equipments will probably cluster in or close to the central zone where the central pipes would be situated.*

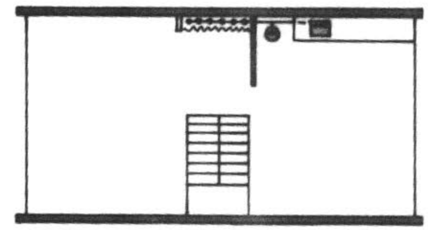
These pipes could, however, like the central ones, be hidden in closets or the like, by the owner.

This method should be used even in instantaneous constructions because it provides, at a relatively cheap price (the price of a few screws or taps), a real flexibility for repairs and additions or changes.

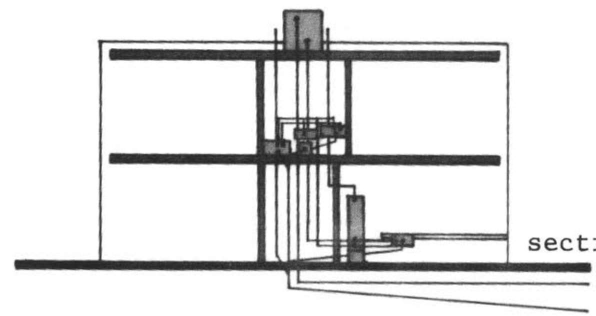
The pipe materials and connections should be studied in detail in further, more elaborate studies, as well as the package in which the set of pipes would be brought, prebent and prefastened to the site, to allow semi-skilled workers to easily do the on-site connections.



first floor



ground floor



section

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* *See illustrations on pages 163-190*

electricity

EXISTING METHODS

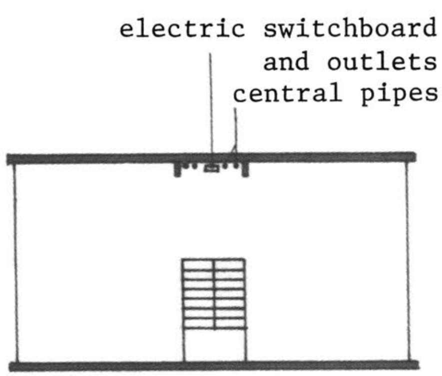
The traditional electrical system is quite a complex task requiring very skilled workers.

There are usually two circuits: one for the outlets, along the walls, and the other for the fixtures and their switches, running from the walls to the different ceilings.

A third circuit is installed in the middle-upper income dwellings: a circuit for bells.

These two or three circuits originate all from a central switchboard with a sealed company accounting box. The electric cables are then laid through thin steel or plastic pipes, encasted in groves made in the concrete walls and ceilings, along with junction boxes to store connections, switches and outlets.

This system is complex, costly and has to be installed by specialized electricians.



PROPOSED SYSTEM

The three factors that will be taken into consideration here, like in the previous section are: low-cost, flexibility for additions and repairs and self-help unskilled participation.

The proposed concept is to install, in the first delivered package, only the company's sealed counter, a switchboard and half a dozen of the usual outlets at each of the two floors.

These elements will be located in the central zone near the pipes. This area is built in all proposed incremental dwelling packages.

The different desired electrical fixtures and appliances will be linked by the usual cables, ended by the simple market-gound plugs. The cables will be either kept loose on the floor for the most usual electric appliances, or they would be nailed to the walls, following the desires of the users, along with the hung appliances.

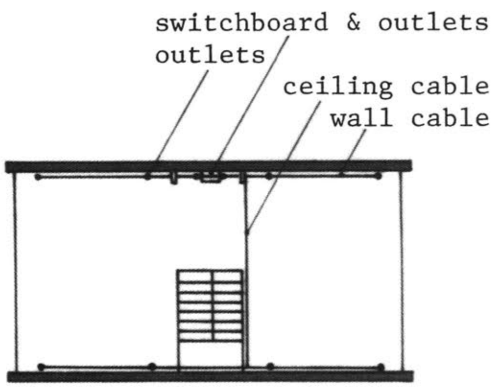
Due to the small and compact sizes of the considered dwelling and the central location of the switches, there will be a minimum amount of electric cable.

This solution is extremely simple, inexpensive, flexible and can be installed incrementally by the unskilled user, as he desires.

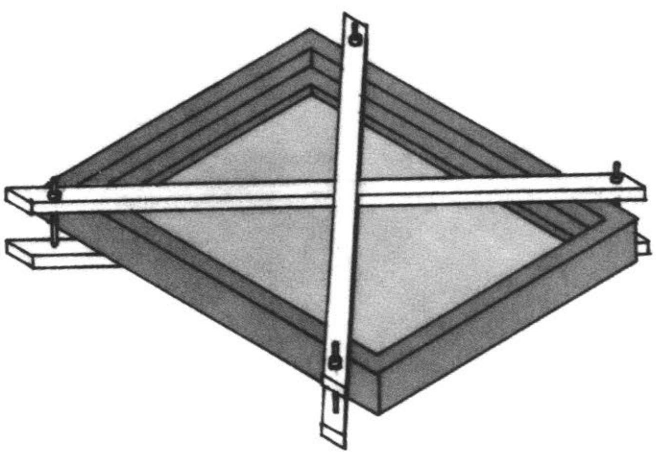
Furthermore, it is not more dangerous or less orderly than the use of the usual electric appliances bought with their flexible cable and plugged into any outlet of the traditional dwellings. And as for these traditional appliances, the switches will be linked to the desired electric appliance rather to different switches encased in the walls, due to their inherent high cost, complexity and lack of flexibility for eventual changes or repairs.

A compromise solution is also possible, budget permitting: it consists in including, in the first delivered package, not only the switchboard, but also outlets, distributed along each bearing wall, two on each side of the central "shaft" zone, totaling eight outlets per floor.*

The cables could either be apparent, or if highly desired, they could be installed in pipes, in the bearing walls and the ceiling slabs as in the traditional way. Individual switches would be omitted here and left to be installed by the user, with the appliances.



* *The cost estimates on pages 195-214 are based on this compromise solution.*



carpentry

This section includes doors, windows and cupboards. The doors and windows will be first discussed, followed by the cupboards.

DOORS AND WINDOWS

existing methods

Doors and windows are traditionally constructed on site by highly skilled carpenters, once the concrete walls have been erected. In case aluminum sections are used, the elements come from the factory to the site already cut. They are then just assembled on site, and jointed to the walls.

This construction strategy requires, however, quite a professional degree of skills on site, which is well beyond unskilled workers, self-help or not.

proposed system

An alternative to the on-site skilled carpentry work would be to prefabricate the windows and doors in a central factory, and send them braced to the site.

The advantage of this system is to optimize the required skilled work in factory conditions and leave the easier work to be done on site by the existing unskilled labour force. Incidentally, their transportation would not be much of a problem as these elements have light weights and compact dimensions. They would be braced for required extra rigidity.

In the case of incremental self-help, such doors and windows could be stored and obtained if and when desired from the construction materials bank, along with the required advices.

In order to simplify the site job, especially if it is to be performed by unskilled workers, in instantaneous or incremental schemes, the braced frames could be installed before the concrete walls have been erected, thus easing the jointing process between the wooden elements and the wall elements. It is easier to build the concrete blocks around a window or door frame than it is to try to fit a prefabricated frame into an existing space left in a wall. This latter technique requires high skills.

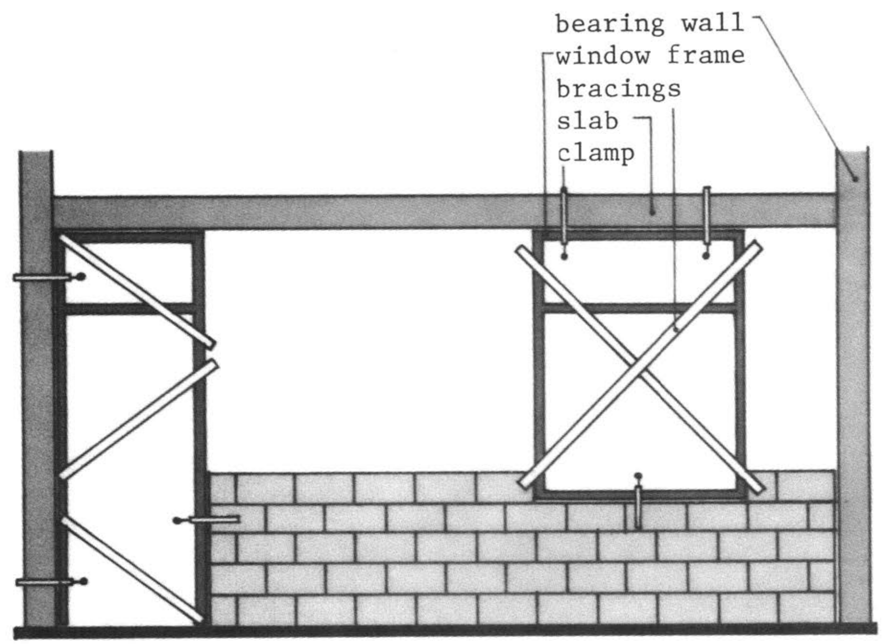
The wooden frame would also be used as a momentary guide framework for the couple of blocks eventually required above the door or window.

One disadvantage of the method is the exposure of the wood to heavy work conditions. But in the considered case, all bearing walls and slabs could be previously built, as they have no relation to the doors and windows.

Also, only the frames would be left, once they are installed, during construction.

It is obvious that as prefabricated elements are used in this alternative, they should have strict modular dimensions.

The elements should therefore, firstly, be a multiple of 10 cm, the basic module. They should as well be a multiple of 20 cm in both the vertical and horizontal dimensions to fit the height of the concrete block which is 20 cm and the half length of the block which is also 20 cm.



windows

For windows, the dimensions are not as tight, as narrow windows or large windows could be preferred following the furnishings or the life style.

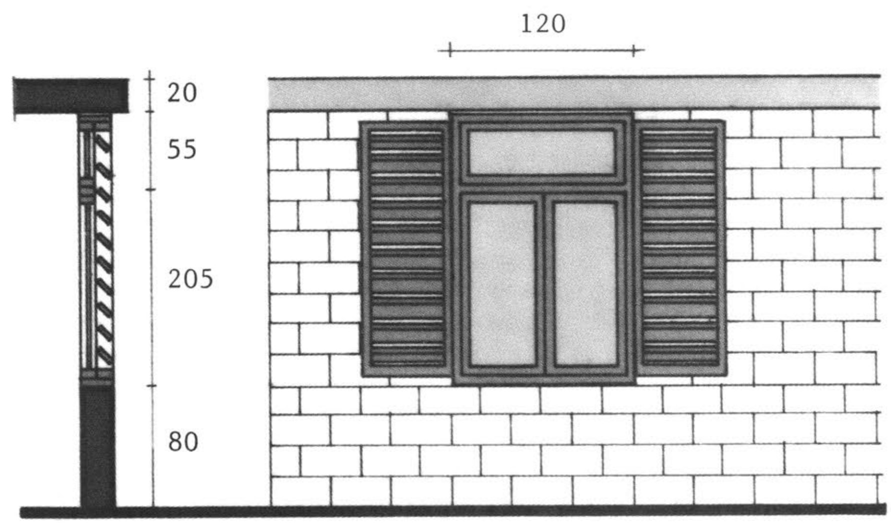
The main requirement is again modular dimensions, i.e., all dimensions should be multiples of 20 cm.

For best ventilation and cooling of the roof,* the windows should be flush with the ceiling. One high window could be the case or better, a small window above the lower large one to be open while the lower might be closed against glare or for security.

Also for climate, privacy and security reasons, louvers are recommended to be installed with the windows.*

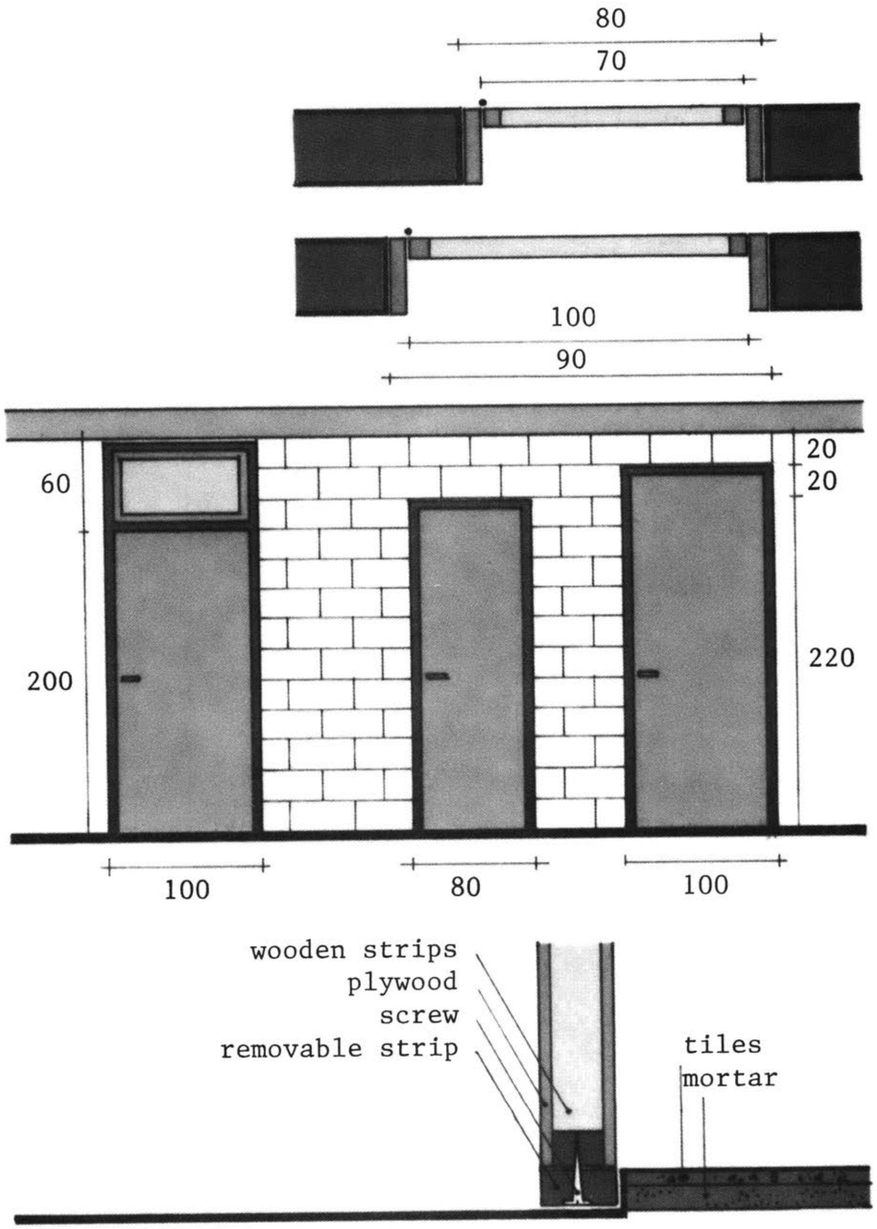
Several different modular dimensions of windows and their louvers could be prefabricated to fit the different major alternatives. They could, like the other construction elements, be stored in the urban unit construction bank.

The construction details do depend on the quality and cost of wood or aluminum available. And as long as they fit the nominal modular sizes they will not be discussed here.



* *See pages 79-81*

doors



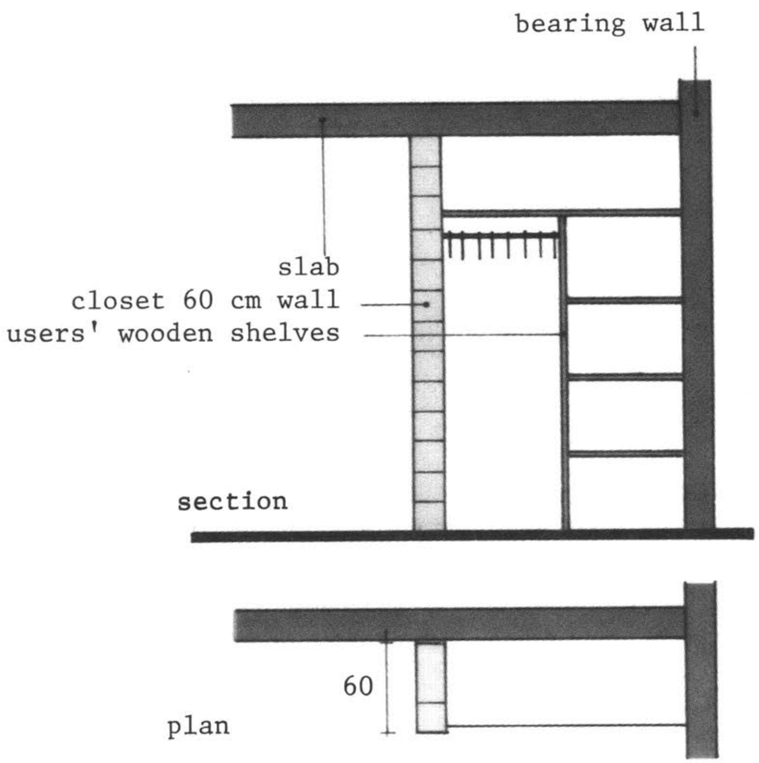
For most functions, two width of doors seem necessary, one for bathroom, closets...to take as little space as possible, and one for all of the other purposes, entrance, roomdoors, etc. The two dimensions should also be related to the modular possible openings of the concrete blocks and the frames thickness.

As a result of all these considerations, the two door widths would be 70 cm for the bathroom and closets, and 90 cm for all other room doors. Their respective wall openings would be around 10 cm wider to allow room for the frames, namely: 80 cm and 100 cm, respectively (thus matching the blocks' dimensions).

As far as the height of the door is concerned, the dimensions should also be multiples of 20 cm, the concrete block height, 200 cm is the minimum acceptable functional dimension; such a door could be delivered with a 45 cm net top window, for continuous ventilation.

Heights of 220 cm or 240 cm could also be envisaged, but they will not allow a window to be squeezed below the slab. The course of blocks to replace it will be more complex to install. The potential advantage of the 240 cm height door is that it uses most straightfordly the sheets of wood that are usually delivered in layers of 240 cm.

As tiles will not be installed at the beginning, for economical reasons and left, with other finishes, to the initiative of the user, a usual door will not be able to fit the two situations. The thickness of tiles, mortar and sand is around 5 cm. As a result, the door should have its lower 5 cm removable for when the tiles are installed in the house. Specific details could be easily devised.



CUPBOARDS

existing methods

Traditionally, the old houses had plastered mud built-in cupboards. Then, more recently, the habit became to buy or inherit separate cupboard furniture and place them in the empty rooms. The newest, modern trend in the new expensive dwellings is to provide concrete built-in cupboards with wooden doors and shelves. This last solution is unfortunately very expensive and can only be afforded by upper-income groups.

proposed system

A cheaper solution, as economy is required, is to include only the concrete walls (small additions) and leave it to the user to add wooden shelves with a minimal effort, and if he wants, a curtain or doors following his desires or wealth.

This solution also enables him to use his already-bought or inherited cupboard in between the walls.

Here also, the dimensions should be modular, to fit the modular wall dimensions. The length of the cupboard depends on the rooms dimensions and on the needs of the user. The width should be of at least 60 cm to make possible the vertical hanging of clothes.

shading devices

As dicussed in the environment section,* overhangs are needed on the south walls, because of the hot Lebanese sun.

This is due to the fact that the sun hits the south walls during almost all of the day.

The situation is less acute on the east and west walls, that are only hit by the sun for a few hours a day.

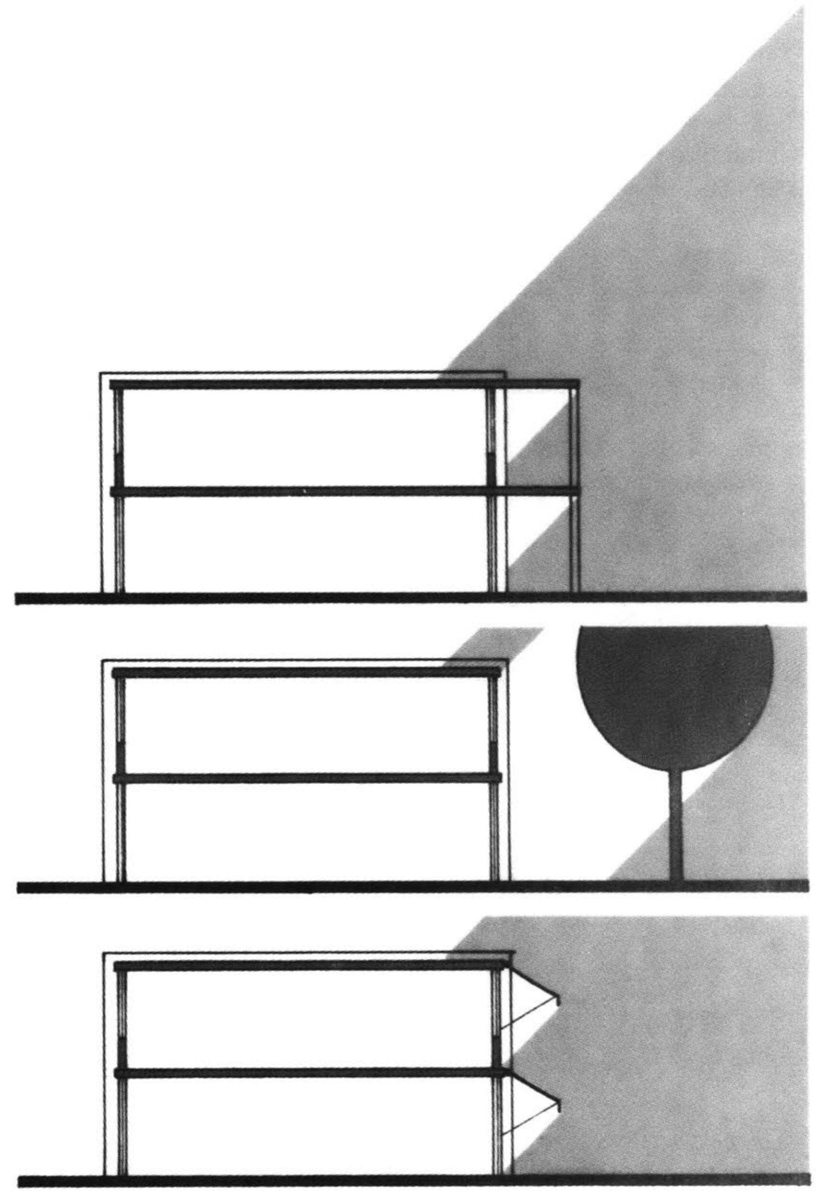
The north walls receive a very little amount of sun only during winter, when it is welcomed. As a result, no overhangs are needed on the north walls.

Two-meter concrete horizontal louvers would be required for the south walls, while full story height or at least one meter hanging vertical louvers would be needed for the east and west walls. Traditional arcades could also be used, as discussed above, to solve all the sun problems.

But all these solutions are very expensive ones, far away from the budgets here available.

A cheaper and simpler solution is to plant trees in the courtyards, especially those which loose their leaves in winter, when the sun is welcomed.

Another very simple and efficient traditional solution consists in using the market-available inclined mesh sun-breakers, that can be hourly rolled up or down, following the needed protection.



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* *See pages 78-81*

This solution is therefore suggested for the south walls. Steel frames only would be provided in instantaneous schemes and the fabric would be sold at the cooperative shops (or elsewhere) or made of woven straws, as the habit is in the area. These colored elements would add a personal touch to the facade of the dwellings. Any other light structure could also be added by the individual users.

A warning will conclude this section. All the construction details described above are just to illustrate the feasibility of the concepts described previously. They are by no means unique and their details remain to be technically solved.

But given the present level of generality and the lack of a specific case study, the proposed system optimizes as much as possible the known facts of the country described in the previous chapters.

In the next section, different incremental alternatives are presented along with their construction costs, based on the details described above and on the 1975 costs in Lebanon.

dwelling alternatives and cost estimates

detailed construction costs

This section is devoted to the analysis of the costs of different possible dwelling alternatives.

The dwelling alternatives are based on the dwelling zoning approach defined previously and on the construction details described in the precedent chapter.

Both the zoning dwelling approach and the construction details optimize as much as possible the conditions existing in the country.

The cost estimates are based on the market materials, equipments and labour costs in Lebanon in 1975.*

The present estimates should be made more precisely in further studies. These estimates should only serve as comparison tools between the different alternatives.

Especially in the case of the prefabricated elements, like the slab beamlets, the costs have been estimated on the assumption of simple manual tools and not sophisticated mechanized equipments.

The incidence of any available or potential equipment on the costs should be studied separately for given case studies.

The table on the next page shows the different costs involved in the individual double-floor four-bedroom dwelling.**

The dimensions of each floor are 5.4 m and 11.4 m, leading to an area of 61.56 m^2 per floor and a total area of 123.12 m^2 for the whole dwelling.

The cost of this completed dwelling, including all finishes (tiles, plaster and paints) is estimated to be 13,955 L.L., which implies a cost of 113.34 L.L./m^2 for the described dwelling.

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* *Reference 42*

** *See alternative 12 on pages 214, 215*

It is interesting to note that in the present conditions in Lebanon, the carpentry works (doors and windows) account for 25.3% of the total construction cost and the finishes (plaster, tiles and paints) for 21.9% of the total costs.

If the finishes are left to the responsibility of the household, due to the tight resources, the total cost of the dwelling is reduced to 10,904 L.L., or 88.56 L.L./m^2.

On the other hand, in self-help schemes, where labour is not monetized, the cost of the construction is reduced by 32.5%. In this case, the K value* becomes: (100.0 - 32.5)/100.0 = 67.5%.

The equivalent amount of materials, 9,419 L.L. might still be quite high in many cases. But this cost corresponds to the completed double floor dwelling with all finishes and carpentry which, by themselves, account for 47.2% of the total cost of the dwelling.

Some of the doors for instance might not be really needed by some households. They could replace them with curtains or recycled littered wooden boxes. This would depend on the household's income level and set of priorities.

More importantly, many households might not need immediately the two floors of their dwelling. In this case the K value might be reduced much further.

In the present framework of self-help process, the priorities of the different households can be actualized by the households themselves in a long-term process.

The next few pages show in an increasing order of cost a series of twelve different alternatives. The choice of one of the alternatives depends on many factors like the size and age of the household, its income level and the possible government subsidy in each case.

These problems will be discussed in the next section, after the different alternatives have been described.

The dwelling alternatives correspond therefore to what is defined by the infrastructure* that is delivered to the household as a first dwelling package from which he can build up his suprastructure as his needs and means increase in time.

For each alternative two K values will be mentioned. One assuming that the household will provide all the remaining labour itself, while it will be required to buy the materials. The second K value will assume that the household will manage to get all materials and labour in non-monetized ways (from extended families, friends, mutual helps, etc.). All K values will be with reference to the complete and finished double floor dwelling.

The first alternative** is the minimum package above the site and services package. It only provides the household with an equipped bathroom. The last alternative*** is the completed and finished double floor dwelling.

All the costs of the infrastructures considered are based on the market's labour costs and materials in 1975. Self-help is assumed here to start only after the first package is delivered. But if further economy is required, in extreme cases, then self-help can start even at the level of the infrastructure as explained before**** in cooperative organizations. In this case the costs of the monetized labour should be deducted from the total costs.

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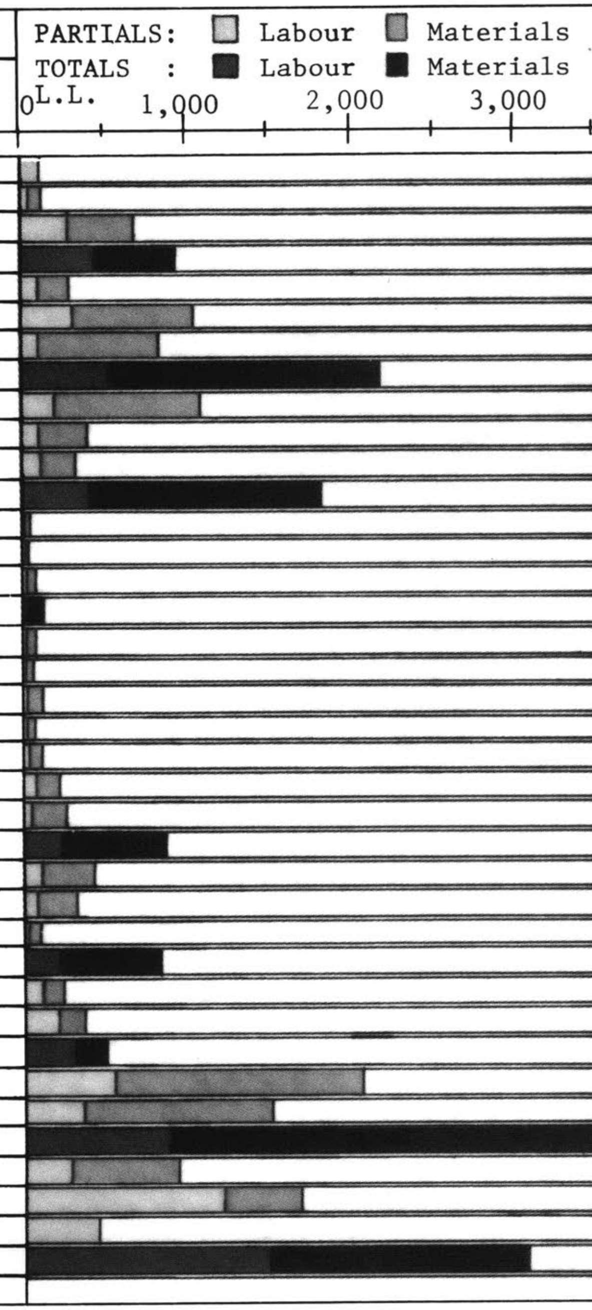
* *See pages 68, 160-162*
** *See pages 196-197*
*** *See pages 214-215*
**** *See pages 63-65*

1975 COSTS OF THE PROPOSED FOUR BEDROOM DOUBLE FLOOR INDIVIDUAL DWELLING COMPLETED AND FINISHED(***)

ELEMENTS		COSTS (L.L.)				LABOUR PERCENTAGE
CATEGORIES	ITEMS	LABOUR	MATERIALS	PARTIAL TOTALS	% OF TOTAL	
FOUNDATIONS	Excavations	115		115	0.8	100.0
	Wall concrete	45	83	128	0.9	35.2
	Slab concrete	293	397	690	4.9	42.5
	TOTAL	453	480	933	6.7	48.6
SLABS	Joists	106	194	300	2.1	35.3
	Concrete	324	734	1,058	7.6	30.6
	Insulation	105	729	834	6.0	12.6
	TOTAL	535	1,657	2,192	15.7	24.4
WALLS	Bearing	196	901	1,097	7.9	17.9
	Facade	96	312	408	2.9	23.5
	Partition	123	199	322	2.3	38.2
	TOTAL	415	1,412	1,827	13.1	22.7
STAIRCASE	Landing joists	8	14	22	0.2	36.4
	Landing concrete	6	12	18	0.1	33.3
	Stairs	19	67	86	0.6	22.1
	TOTAL	33	93	126	0.9	26.2
EQUIPMENT	Lavatory	25	65	90	0.6	27.8
	Shower	5	45	50	0.4	10.0
	Asiatic WC	25	85	110	0.8	22.7
	Drain & Cleanout	25	35	60	0.4	41.7
	Sink	30	70	100	0.7	30.0
	Water tank	75	140	215	1.5	34.9
	Heater	35	210	245	1.8	14.3
	TOTAL	220	650	870	6.2	25.3
PIPING	To street	106	313	419	3.0	25.3
	Vertical main	85	235	320	2.3	26.6
	Horizontal	26	65	91	0.7	28.6
	TOTAL	217	613	830	5.9	26.1
ELECTRICITY	Outlet circuit	110	120	230	1.6	47.8
	Lamps circuits	200	160	360	2.6	55.6
	TOTAL	310	280	590	4.2	52.5
CARPENTRY	Doors	539	1,509	2,048	14.7	26.3
	Windows	336	1,152	1,488	10.7	22.6
	TOTAL	875	2,661	3,536	25.3	24.7
FINISHES	Tiles	274	655	929	6.7	29.5
	Plaster	1,204	481	1,685	12.1	71.5
	Paints	437	–	437	3.1	–
	TOTAL	1,478	1,573	3,051	21.9	48.4
TOTALS		4,536	9,419	13,955	100.0	32.5



DWELLING ALTERNATIVE ONE. COST: L.L. 2,370					
ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS	Partial Costs / Total Costs Thousand L.L. 0 1 2 3
Excavations				115	
Wall conc.				128	
Slab conc.				690	
FOUNDATIONS				933	
Joists	29			29	
Concrete	38			38	
Insulation					
SLABS				67	
Bearing	111			111	
Facade					
Partition	108			108	
WALLS				219	
Land.joists	11			11	
land.conc.	9			9	
Stairs					
STAIRCASE				20	
Lavatory	90			90	
Shower	50			50	
Asiatic WC	110			110	
Drain & Cl.	60			60	
Sink					
Water tank					
Heater					
EQUIPMENT				310	
To street				419	
Vert. main	100			100	
Horizontal	91			91	
PIPING				610	
Outlet circ	86			86	
Lamps circ.					
ELECTRICITY				86	
Doors	125			125	
Windows					
CARPENTRY				125	
Tiles					
Plaster					
Paints					
FINISHES					
TOTALS				2,370	

alternative one

COST: 2,370 L.L.

This alternative is the least expensive alternative above the sites and services package. It provides to the household the following items:

1. It provides the foundations, ground floor and the first layer of blocks of the two party walls, with their reinforcements.

These items are provided because they are the "basis" of the long-term construction and they are the most difficult construction for an unskilled worker.

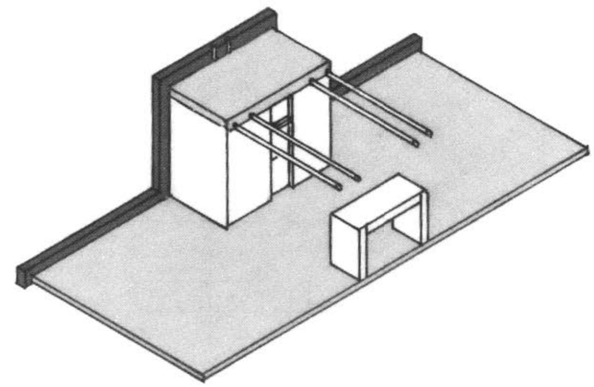
The basis of the wall is also delivered to show the limits of the possible construction to the household and settle the basis of the modular coordination.

2. It also provides a bathroom equipped with a W.C., a shower room and a lavatory. These equipments are assumed to be essential to a hygienic life and are among the difficult technical tasks beyond the skills of most unskilled self-helpers.

The interior doors of the bathroom have been omitted due to their high costs and their relative lesser importance. They could be replaced by curtains until real doors can be afforded by the users. Only the exterior door of the bathroom is therefore provided.

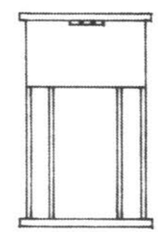
3. An electric switchboard and a counter are also provided in this minimal package with no further installations. The electrical box is fixed on one of the bathroom walls, from where future connections may be easily made.

4. Finally, the landing of the staircase is also provided for many reasons. It provides a certain stability to the future staircase (prefabricated or made from wooden boxes). And it implies the division of the house into two breathing zones around the central dark area devoted for the bathroom and stairs.



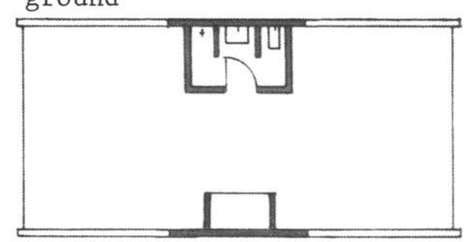
This package is certainly not enough to be livable. Yet sometimes it is the only possible package that can be provided to people that would otherwise squat in the suburbs of a city without any organization services, utilities or equipments. It is only when compared to this alternative that the present package can make sense.

This solution gives at least the minimum utility organization and a bathroom unit from which the household can build up shelters with their own means and keep improving them from a sound organized starting infrastructure.



In this case, the infrastructure cost is 2,370 L.L. which is 17% of the total completed and finished dwelling (see alternative 12).

ground

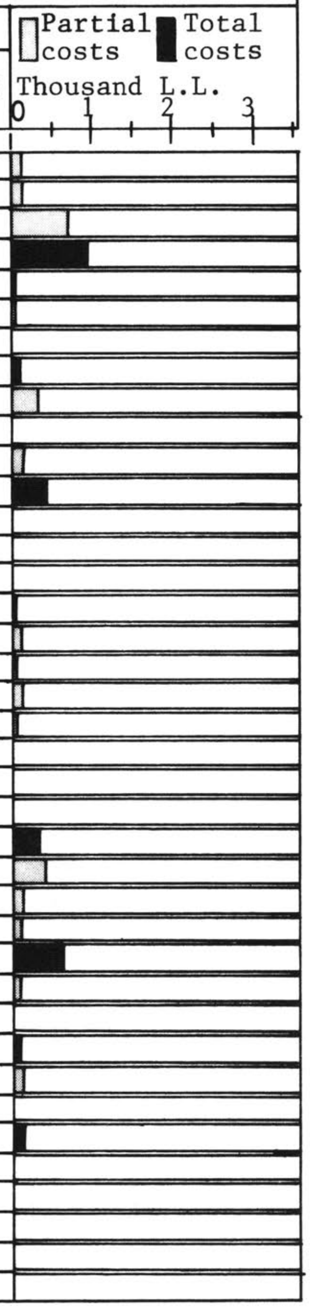


And if only this package is paid for (by the combination of the household participation and the government subsidy) and the completion of the dwelling is assumed to be done by free self-help labour and freely obtained materials, then the K value is quite high: because the only paid part is the initial 2,370 L.L. The K value is in this case: (13,955-2,370)/(13,955)x100 = 83%.

Finally, if only the labour can be free while all the materials will have to be eventually bought, the long term K value or economy is much lower; the free part becomes: (13,955-2,370)x32.5/100 = 3,765 L.L., and the K value: (3,765/13,955)x100 = 27%.

DWELLING ALTERNATIVE TWO. COST: L.L. 2,612

ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
Excavations				115
Wall conc.				128
Slab conc.				690
FOUNDATIONS				933
Joists	69			69
Concrete	38			38
Insulation				
SLABS				107
Bearing	313			313
Facade				
Partition	108			108
WALLS				421
Land.joists	11			11
Land.conc.	9			9
Stairs				
STAIRCASE				20
Lavatory	90			90
Shower	50			50
Asiatic WC	110			110
Drain & CL	60			60
Sink				
Water Tank				
Heater				
EQUIPMENT				310
To street				419
Vert. main	100			100
Horizontal	91			91
PIPING				610
Outlet circ	86			86
Lamps circ.				
ELECTRICITY				86
Doors	125			125
Windows				
CARPENTRY				125
Tiles				
Plaster				
Paints				
FINISHES				
TOTAL				2,612



alternative two

COST: 2,612 L.L.

This alternative is just slightly more expensive than the previous one. It is more expensive by 242 L.L. which is not more than 10.2%.

But this solution has an important advantage over the previous one: it makes it much easier for the household to complete the roof of its small shelter unit. This is done, as explained previously* by adding the few light concrete blocks with their reinforcements and pouring the concrete.

Also the nonstructural facade walls can be built as easily. They can even be made of bits of wooden or cardboard boxes until more solid materials can be afforded.

If delivered in summer, a straw cover can even be laid on the joists to provide a sun shelter for an immediate settlement. So previous rents can be stopped immediately and the money diverted to the construction of the owned house of the family.

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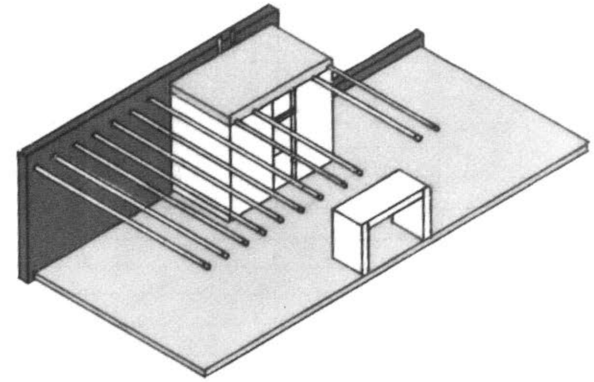
* *See pages 170-174*



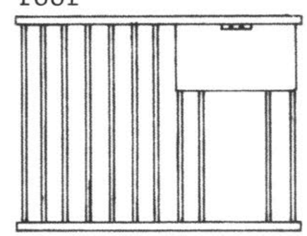
Illustrations indicating how the half dwelling zone can be used by a household are shown along with the illustrations of alternatives 4.*

In this case the unit costs 18.7% of the completed unit (alternative 12). In case the rest of the dwelling is not monetized, the K value is therefore around 81.3% of the total cost.

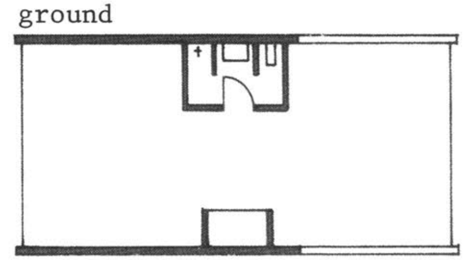
And if the rest of the dwelling's materials will have to be paid, but the labour is self-help, then the K value or economy is only 26.4%.

Again, as mentioned previously** all materials and technical advice should be made available by the local urban unit cooperative to help optimize and monitor the development of these dwelling nuclei.

roof



ground



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* *See pages 202-203*
** *See pages 160-162*

DWELLING ALTERNATIVE THREE. COST: L.L. 3,727

ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS	Partial costs / Total costs — Thousand L.L. 0 1 2 3
Excavations				115	
Wall conc.				128	
Slab conc.				690	
FOUNDATIONS				923	
Joists	137	137		274	
Concrete	38	26		64	
Insulation					
SLABS				338	
Bearing	508	508	81	1,097	
Facade					
Partition	108	12		120	
WALLS				1,217	
Land.joists	11	11		22	
Land.conc.					
Stairs					
STAIRCASE				22	
Lavatory	90			90	
Shower	50			50	
Asiatic WC	110			110	
Drain & Cl.	60			60	
Sink	100			100	
Water Tank					
Heater					
EQUIPMENT				310	
To street				419	
Vert. main	75	75		150	
Horizontal	91			91	
PIPING				660	
Outlet circ	122			122	
Lamps circ.					
ELECTRICITY				122	
Doors	125			125	
Windows					
CARPENTRY				125	
Tiles					
Plaster					
Paints					
FINISHES					
TOTAL				3,727	

alternative three

COST: 3,727 L.L.

This alternative is the first illustration of the "fill-in-the-blank self-help" concept.* The household in this case is only left with the non-structural small elements to install on the infrastructure of its dwelling. The bearing walls are already installed with all the structural joists of the two floors.

The advantage of this solution is that it encourages the user to complete his dwelling because the most difficult construction problems are already solved for him, and he is only left with manipulations that he can perform with his family or friends with no complex or bulky equipment whatever. Moreover, the site of a non-finished construction is disagreeable. This might lead the household to quickly complete it to "feel at home."

On the other hand, if the household needs a few years to be able to complete its dwelling, it will still have to live in an unfinished structure for a long

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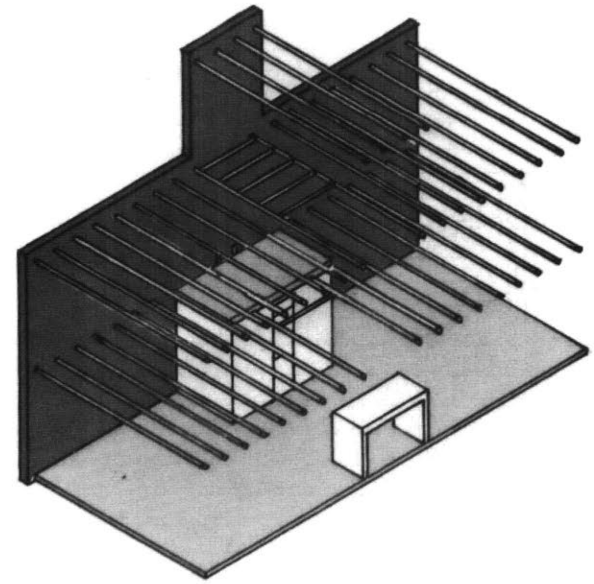
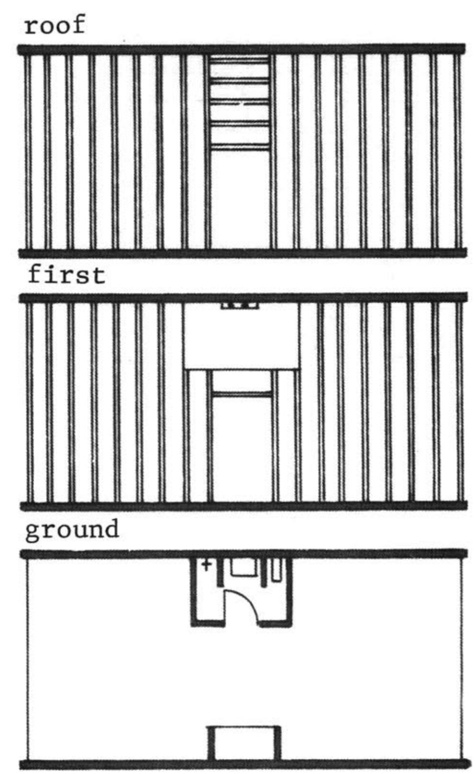
* *See page 161*



time. This is unpleasant for the household itself and for the whole neighborhood. This in turn might bear a risk of inducing people into stagnation, because even if they care to complete their building, their neighborhood will still look like a construction site until all the other dwellings have been completed.



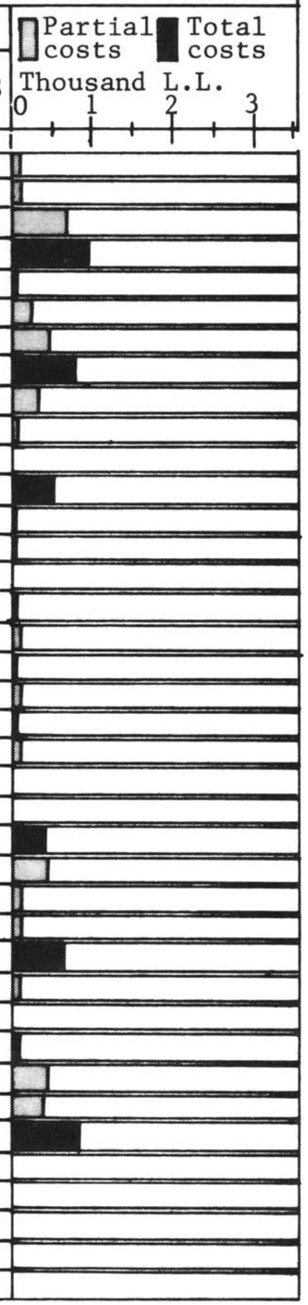
Finally, this solution costs 47% more than the previous one for the same immediate benefits. Therefore, it should only be delivered to the people that can afford the materials required to further develop their dwelling but want to economize on labour cost by going into self-help.

For these people, the present infrastructure will allow them to build their whole house with minor technical expertise.

This initial cost is still only 26.7% of the completed and finished dwelling (see alternative 12). Its K value is 73.3% if labour and materials is not monetized. On the other hand, the K value or economy is 23.8% if the household has to pay all the materials for the completion of its dwelling.

DWELLING ALTERNATIVE FOUR. COST: L.L. 4,191

ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
Excavations				115
Wall conc.				128
Slab conc.				690
FOUNDATIONS				933
Joists	69			69
Concrete	253			253
Insulation	455			455
SLABS				777
Bearing	313			313
Facade	72			72
Partition	138			138
WALLS				523
Land.joists	11			11
Land.conc.	9			9
Stairs				
STAIRCASE				20
Lavatory	90			90
Shower	50			50
Asiatic WC	110			110
Drain & Cl	60			60
Sink	100			100
Water Tank				
Heater				
EQUIPMENT				410
To street				419
Vert. main	100			100
Horizontal	91			91
PIPING				610
Outlet circ	86			86
Lamps circ.				
ELECTRICITY				86
Doors	460			460
Windows	372			372
CARPENTRY				832
Tiles				
Plaster				
Paints				
FINISHES				
TOTAL				4,191



alternative four

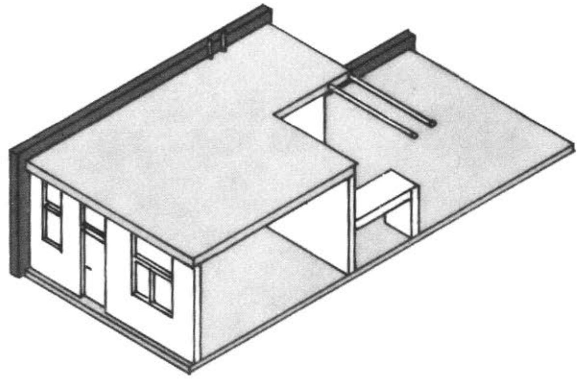
COST: 4,191 L.L.

This alternative is the first immediately livable alternative. It provides a complete half floor with a waterproofed ceiling, a facade with a door and two windows and a back wall with a door. The same bathroom as in the previous case is provided plus an extra kitchen sink on one of the walls of the bathroom.

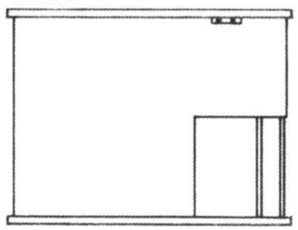
The relatively expensive carpentry and insulation make this alternative 12.4% more expensive than the previous one which provided the two floors bearing walls and slab joists.

This is not a "fill-in-the-blank" solution and as a result what is paid for it used immediately. This solution could prove especially advantageous for either: a young couple needing a small house immediately but wants to be able to expand it with time. Or a somewhat larger family (having one or two babies) that would "camp" in a small dwelling to stop paying its rent while it is expanding its small unit. The possible use of the front and back yards in the mild climate increases the vital space of the house enormously (see the illustrations on the right part of the adjacent page).

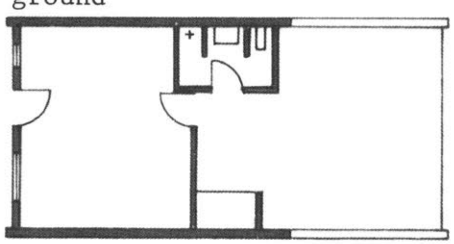
The cost of this alternative is still only 30% of the total cost of the completed and finished dwelling (alternative 12). And if the rest of the dwelling is nonmonetized, the K value of this alternative is therefore 70%. If the materials have to be paid, the K value is reduced to approximately 22.7%, which is still a fair economy. This means that the household would have to pay an extra amount of 6,590 L.L. to obtain the alternative 12 dwelling, economizing 3,173 L.L. of labour cost.



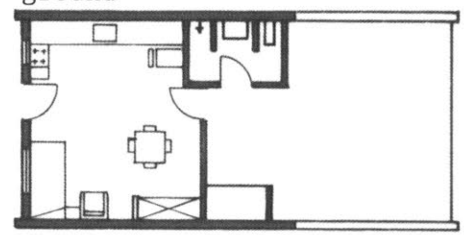
roof



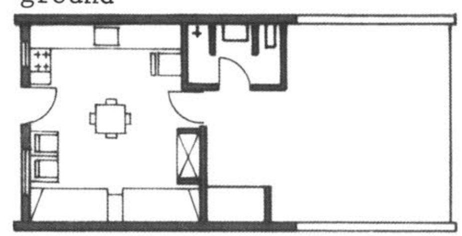
ground



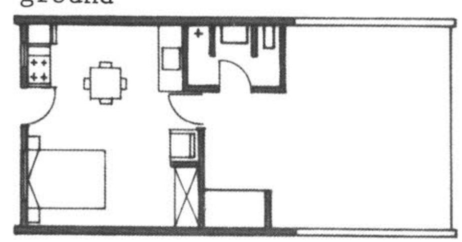
ground



ground



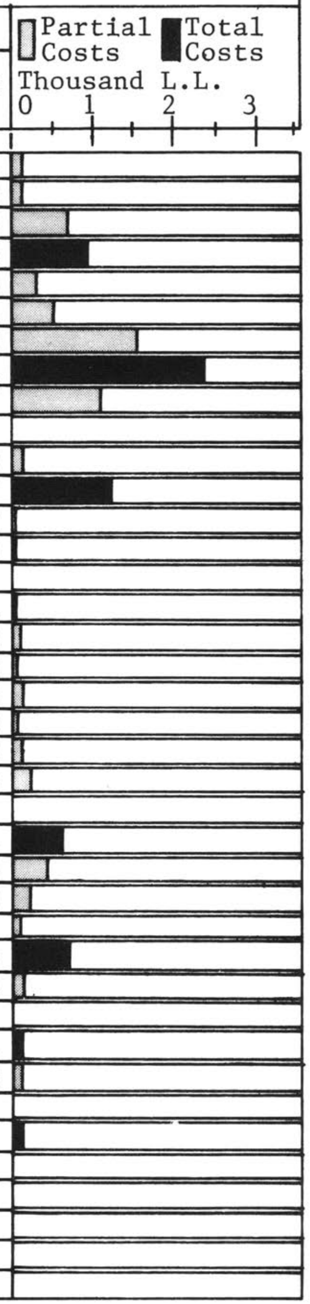
ground



SPACE USE
ILLUSTRATIONS

DWELLING ALTERNATIVE FIVE. COST: L.L. 5,327

ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
Excavations				115
Wall				128
Slab conc.				690
FOUNDATIONS				933
Joists	137	137	26	300
Concrete	506			506
Insulation	758			758
SLABS				1,564
Bearing	508	508	81	1,097
Facade				
Partition	108	12		120
WALLS				1,217
Land.joists	11	11		22
Land.conc.	9			9
Stairs				
STAIRCASE				31
Lavatory	90			90
Shower	50			50
Asiatic WC	110			110
Drain & Cl	60			60
Sink	100			100
Water tank			215	215
Heater				
EQUIPMENT				625
To street				419
Vert. main	100	100		200
Horizontal	91			91
PIPING				710
Outlet circ	122			122
Lamps circ.				
ELECTRICITY				122
Doors	125			125
Windows				
CARPENTRY				125
Tiles				
Plaster				
Paints				
FINISHES				
TOTALS				5,327



alternative five

COST: 5,327 L.L.

This alternative, instead of giving a half floor roof with a facade wall, like the previous alternatives, it gives a full roof, with no facade walls. It also gives the bearing walls and joists of the 2 floors to allow a easy fill-in-the-blank self-help process.

A water tank is also provided in this more elaborate solution.

The advantage of this solution is to allow an immediate cover, while the facade walls can be built with no difficulty. Another advantage is the ease of building the second floor.

This solution is especially useful to couples with two or three children that can not fit in the previous half floor alternative, but would need from the beginning at least a whole floor.

The amount of time required to build the two facades and make the dwelling inhabitable should be minimal if prefabricated doors and windows are used as explained previously.* This could best work in an urban unit cooperative.

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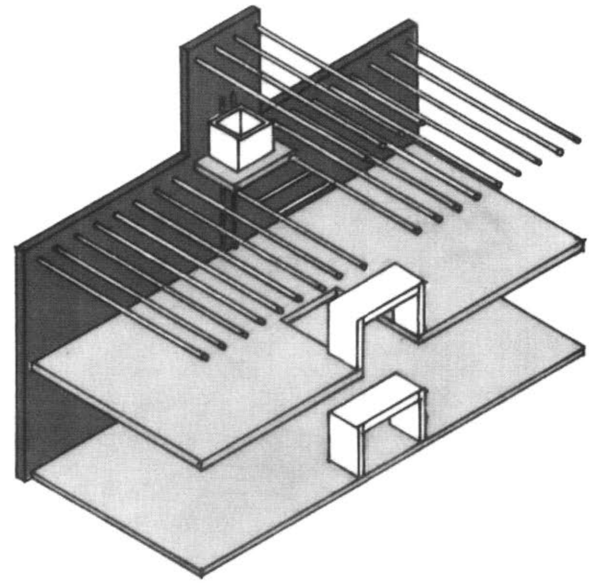
* *See pages 184-187*

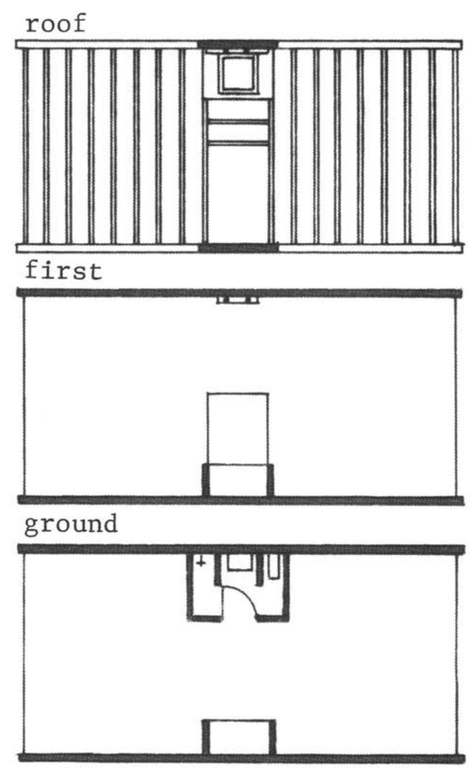


A couple of illustrations of the possible use of the first floor space is shown in the next alternative's illustrations.

A disadvantage of this solution is that the slab has to be waterproofed. This cost 758 L.L. for the whole slab. This expense is necessary unless the top roof is going to be built before the raining season. Methods of waterproofing should be therefore studied to make them cheaper, as eventually the 2nd floor will make the use the first slab insulation redundant.

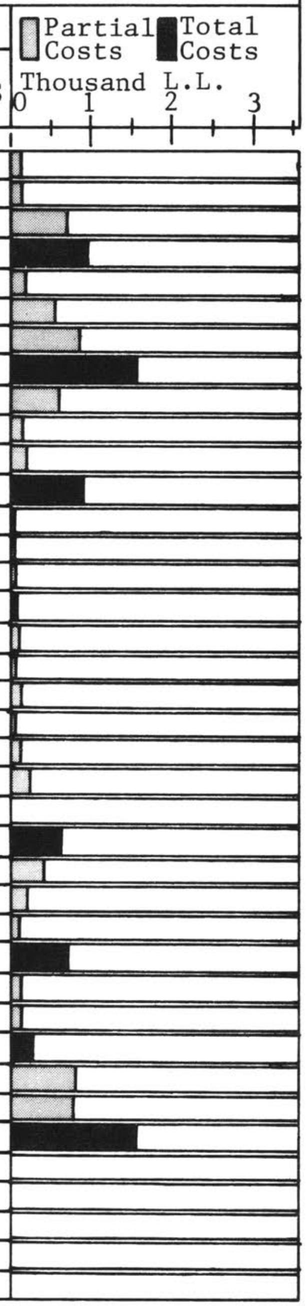
In the meantime, this redundancy is meaningful in an incrementalist process whereby the slab of the first floor may remain exposed to the rain for a few years. (Another possibility is discussed later, in alternative 8.)

This alternative costs approximately 38% of the totally completed and finished alternative 12. Its K value if the rest of the construction is not monetized is around 62%, and if materials have to be paid, then the K value is reduced to 20%. In this case, the household has to pay an extra amount of 5,824 L.L. for the remaining materials to be bought, while they economize 2,904 L.L. of labour to complete the dwelling with their own self-help work.



DWELLING ALTERNATIVE SIX. COST: L.L. 6,614

ITEMS		COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
	Excavations				115
	Wall conc.				128
	Slab conc.				690
FOUNDATIONS					933
	Joists	137	29		166
	Concrete	506	46		552
	Insulation	758	76		834
SLABS					1,552
	Bearing	508	81		589
	Facade	145			145
	Partition	108	74		182
WALLS					916
	Land.joists	11	11		22
	Land.conc.	9			9
	Stairs	43			43
STAIRCASE					74
	Lavatory	90			90
	Shower	50			50
	Asiatic WC	110			110
	Drain & Cl.	60			60
	Sink	100			100
	Water tank			215	215
	Heater				
EQUIPMENT					625
	To street				419
	Vert. main	100	100		200
	Horizontal	91			91
PIPING					710
	Outlet circ	122			122
	Lamps circ.	144			144
ELECTRICITY					266
	Doors	627		167	794
	Windows	744			744
CARPENTRY					1,538
	Tiles				
	Plaster				
	Paints				
FINISHES					
TOTALS					6,614



alternative six

COST: 6,616 L.L.

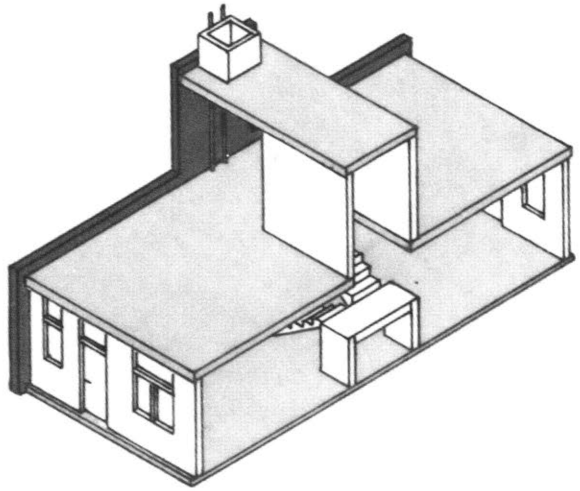
This alternative provides to the household an enclosed first floor with an insulated roof, two facade walls with their doors and windows and a roof to the staircase to make the first floor completely sealed.

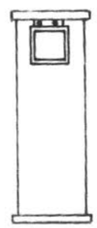
The bearing walls of the second floor are not provided in their alternative to make all of the investments of this solution immediately usable.

This basic alternative is large enough to accomodate comfortably one bedroom and possibly two bedrooms as shown in the two illustrations.

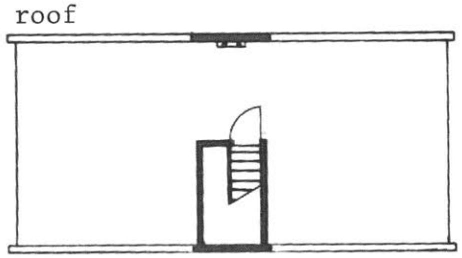
An extra minimal cost is required to provide the interior walls and two doors of the (furnished) illustrations. Their costs is respectively 93 L.L. and 334 L.L., and their total cost to be added to the previous 6,616 L.L. is therefore 427 L.L. The cost of the illustrations is therefore 7,043 L.L.

But if the basic 6,616 L.L. cost is taken into consideration, it represents approximately 47% of the completed and finished alternative 12. Its K value is 53% if the rest of the construction is not monetized. If only the labour is not monetized and the materials have to be paid, the K value becomes 17% and 4,954 L.L. should be paid for the materials while 2,385 L.L. are economized by the self-help labour, to reach alternative 12.

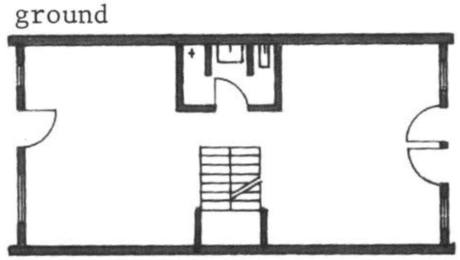




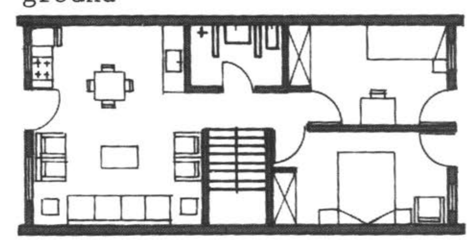
roof



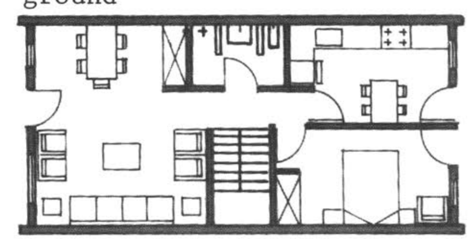
ground



ground



ground

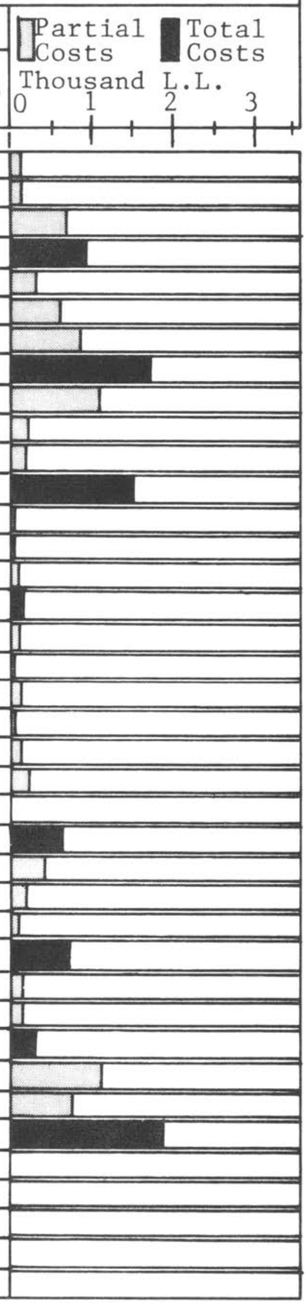


SPACE USE
ILLUSTRATIONS

alternative seven

COST: 7,793 L.L.

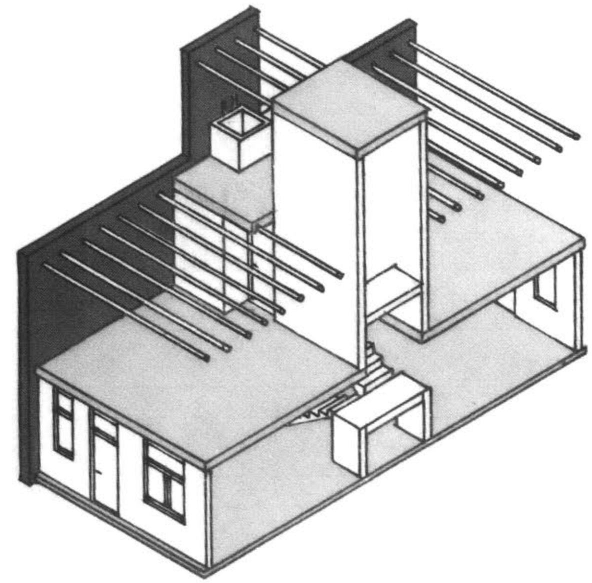
DWELLING ALTERNATIVE SEVEN. COST: L.L. 7,793				
ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
Excavations				115
Wall conc.				128
Slab conc.				690
FOUNDATIONS				933
Joists	137	137	26	300
Concrete	506	46	46	598
Insulation	758		76	834
SLABS				1,732
Bearing	508	508	81	1,097
Facade	145		74	219
Partition	12	182		194
WALLS				1,510
Land.joists	11	11		22
Land.conc.	9	9		18
Stairs	43	43		86
STAIRCASE				126
Lavatory		90		90
Shower		50		50
Asiatic WC		110		110
Drain & Cl.		60		60
Sink	100			100
Water tank			215	215
Heater				
EQUIPMENT				625
To street				419
Vert. main	100	100		200
Horizontal	15	76		91
PIPING				710
Outlet circ	122	18		140
Lamps circ.	144			144
ELECTRICITY				
Doors	502	460	167	1,129
Windows	744			744
CARPENTRY				1,873
Tiles				
Plaster				
Paints				
FINISHES				
TOTALS				7,793



This alternative is 18% more expensive than the previous one and yet it only differs by the second floor bearing walls and joists, and the bathroom placed on the second floor rather than on the first one, because the first increment will place the sleeping area on the second floor.

This alternative is a "fill-in-the-blank" solution that is quite easy to complete. And due to its given level of completeness, it encourages the household to develop it further, while, as the same time, it is not a visual "offense." On the contrary, the second floor can be used as a vast balcony during the six warm months. A cover of straw or mesh can also be attached to the joists to provide the household a cover against sun and humidity.

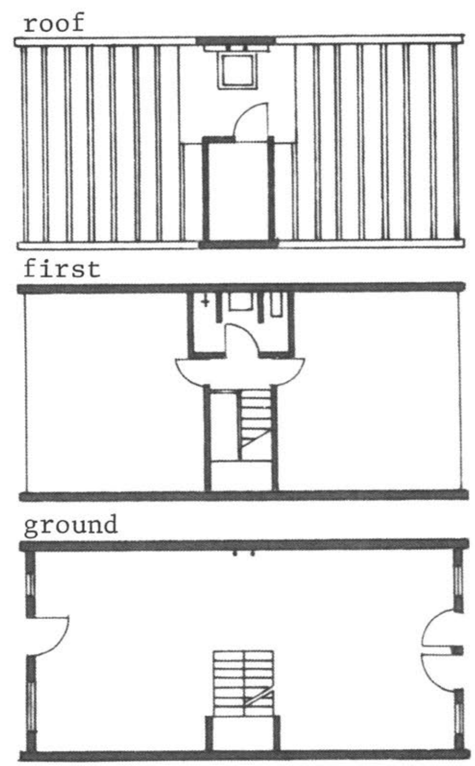
All these advantages make it quite preferable to the previous one if the extra cost can be afforded.



Illustrations for the use of the first floor space are the same as those of the previous alternative and also like those for the previous alternative, 427 L.L. are needed to partition the interior space and provide the doors.*

This alternative costs approximately 56% of the completed and finished twelfth alternative. Its K value is 44% if the rest of the construction is not monetized. But if materials have to be bought the K value becomes 14% approximately, and 4,159 L.L. have to be paid for the materials while 2,003 L.L. are economized from the self-help labour of the household, if the twelfth alternative is to be reached.

It is incidentally interesting to notice that carpentry in this alternative is the most important single category of expense.



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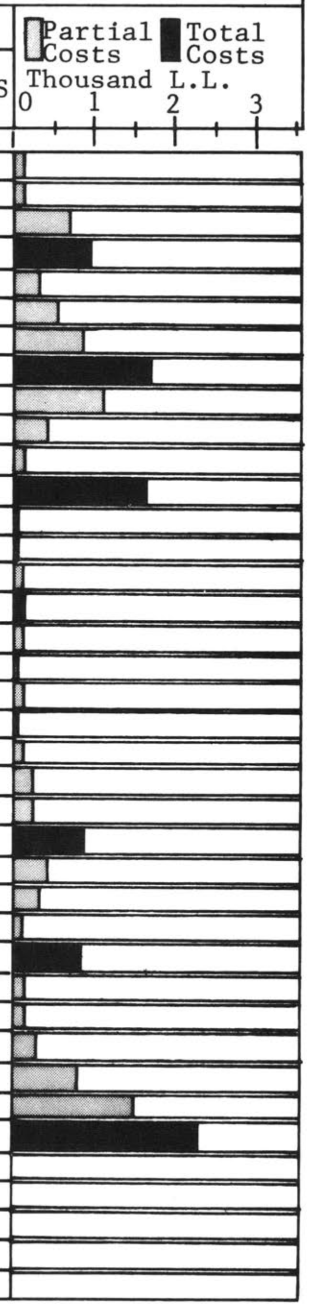
* *See page 207*

DWELLING ALTERNATIVE EIGHT. COST: L.L. 8,632

ITEMS		COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
	Excavations				115
	Wall conc.				128
	Slab conc.				690
FOUNDATIONS					933
	Joists	137	137	26	300
	Concrete		506	46	552
	Insulation		758	76	834
SLABS					1,682
	Bearing	508	508	81	1,097
	Facade	145	189	74	408
	Partition	12	108		120
WALLS					1,625
	Land.joists	11	11		22
	Land.conc.	9	9		18
	Stairs	43	43		86
STAIRCASE					126
	Lavatory		90		90
	Shower		50		50
	Asiatic WC		110		110
	Drain & Cl.		60		60
	Sink	100			100
	Water tank			215	215
	Heater	245			245
EQUIPMENT					870
	To street				419
	Vert. main	160	160		320
	Horizontal	15	76		91
PIPING					830
	Outlet circ	122	18		140
	Lamps circ.	144			144
ELECTRICITY					284
	Doors	502	125	167	794
	Windows	744	744		1,488
CARPENTRY					2,282
	Tiles				
	Plaster				
	Paints				
FINISHES					
TOTALS					8,632



alternative eight

COST: 8,632 L.L.

This alternative costs 843 L.L. (or 11%) more than the previous alternative.

Its concept is to provide the whole envelope of the dwelling as the initial package. The top slab is insulated and the two facade walls are completed.

One of the advantages of this solution is that all the remaining construction is done indoors. This solution fits therefore the colder climates particularly.

A simple mesh laid on the mid-slab joists could reduce considerably the heating requirements of the dwelling before the mid-slab is completely built (which is an easy process, as the joists are already installed*).

Another important advantage of this alternative is that its top slab is waterproofed since the beginning. This avoids the redundancy of waterproofing eventually the two slabs, as in the previous solution.

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* *See details on pages 170-174*

They are notified in detail in the different cost tables. And a comparative table is shown later.* In this alternative, for instance, a heater is added to the rest of the bathroom equipments.

It is understood that this solution is quite more expensive than the first alternatives. As a whole it represents 62% of the cost of the completed and finished alternative 12. This means a K value of 38% if all the rest of the construction is not monetized.

And if the rest of the materials have to be paid (to reach the level of alternative 12), then the K value is approximately 12%. This implies an extra amount of 3,590 L.L. to be paid for materials while the 12% economized due to self-help labour amounts to 1,729 L.L.

Incidentally, various increments (equipments, electrical circuits, etc.) are made as the alternatives become more and more expensive to answer the expectations of the higher income groups and the variations in their priorities.

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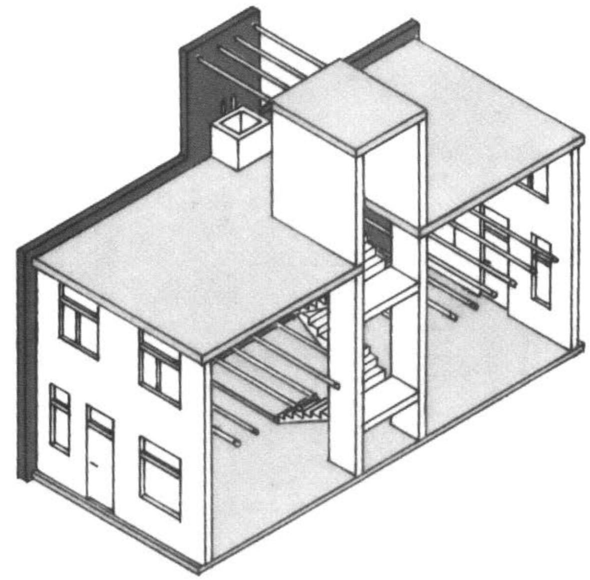
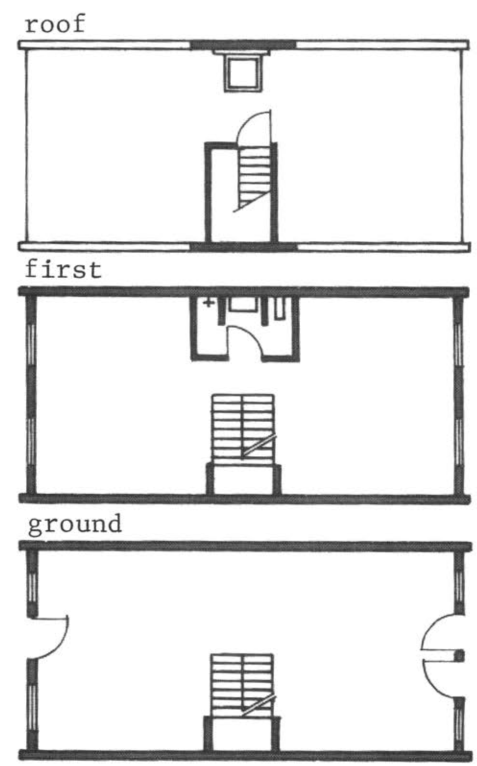
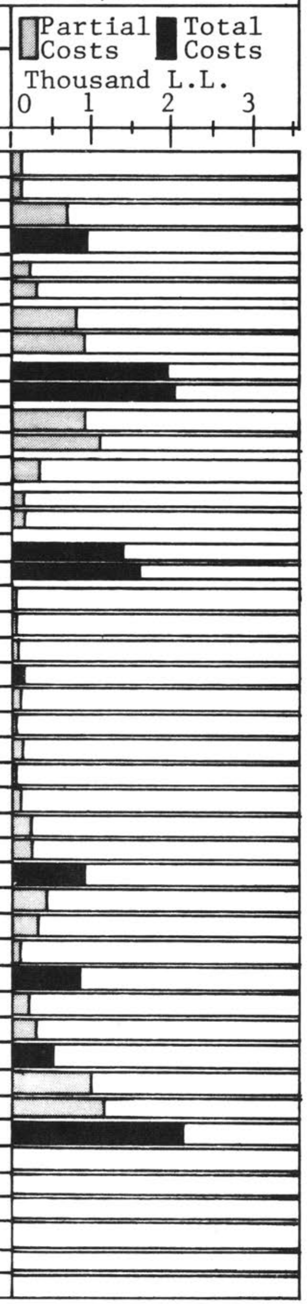
* *See page 217*





DWELLING ALTERNATIVE NINE. COST: L.L. 8,636
DWELLING ALTERNATIVE TEN. COST: L.L. 8,902

ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
Excavations				115
Wall conc.				128
Slab conc.				690
FOUNDATIONS				933
Joists	137	69 / *137*	26	232 / *300*
Concrete	506	253	46	805
Insulation	379	455	76	910
SLABS				1,951 / *2,015*
Bearing	508	313 / *508*	81	902 / *1,097*
Facade	145	95	74	314
Partition	12	138 / *145*		150 / *157*
WALLS				1,366 / *1,568*
Land.joists	11	11		22
Land.conc.	9	9		18
Stairs	43	43		86
STAIRCASE				126
Lavatory		90		90
Shower		50		50
Asiatic WC		110		110
Drain & CI		60		60
Sink	100			100
Water tank			215	215
Heater	245			245
EQUIPMENT				870
To street				419
Vert. main	160	160		320
Horizontal	15	76		91
PIPING				830
Outlet circ	122	72		194
Lamps circ.	144	144		288
ELECTRICITY				482
Doors	502	293	167	962
Windows	744	372		1,116
CARPENTRY				2,078
Tiles				
Plaster				
Paints				
FINISHES				
TOTALS				8,636 / *8,902*



alternative nine COST: 8,636 L.L.

alternative ten COST: 8,902 L.L.

Alternative 10 is represented in the adjacent illustrations. Both alternatives have in common all the ground floor and half the second floor completed.

They differ by the lack of bearing walls and joists in the half uncompleted second floor of alternative 9.

Alternative 10 offers the advantage of being a "fill-in-the-blank" solution and should really be provided due to the minimal cost increase (270 L.L.*) over alternative 9 unless the household prefers to have a completely open balcony, and no desire to expand its dwelling in the near future.

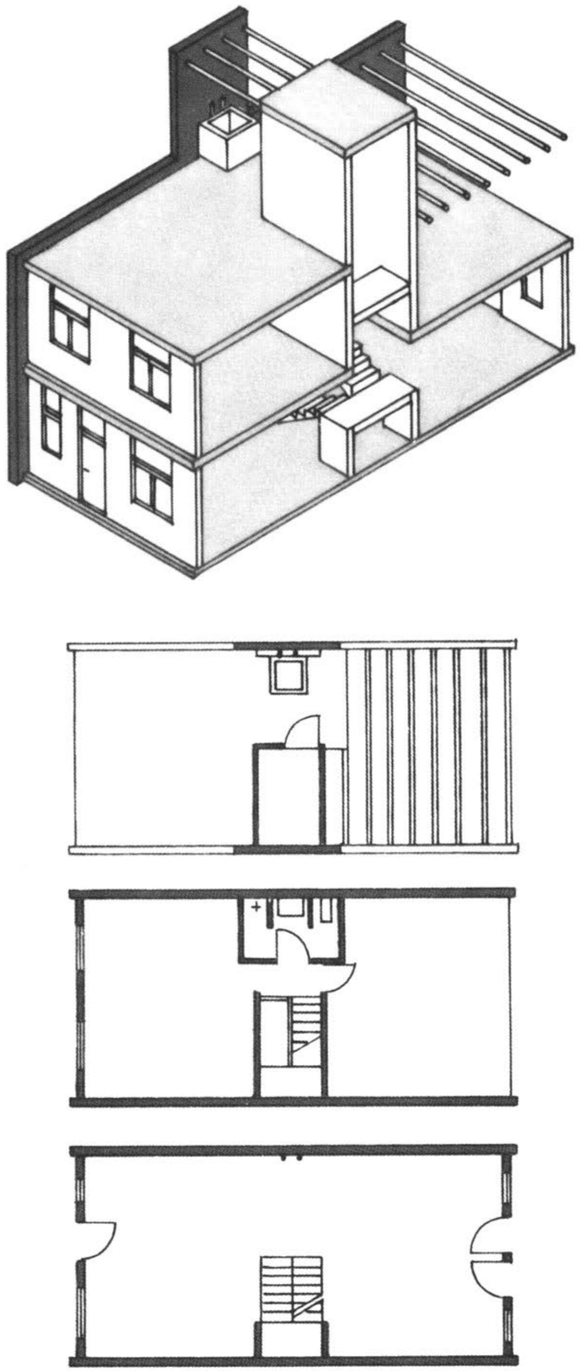
The adjacent space use illustrations show an example with two bedrooms and another with three bathrooms.

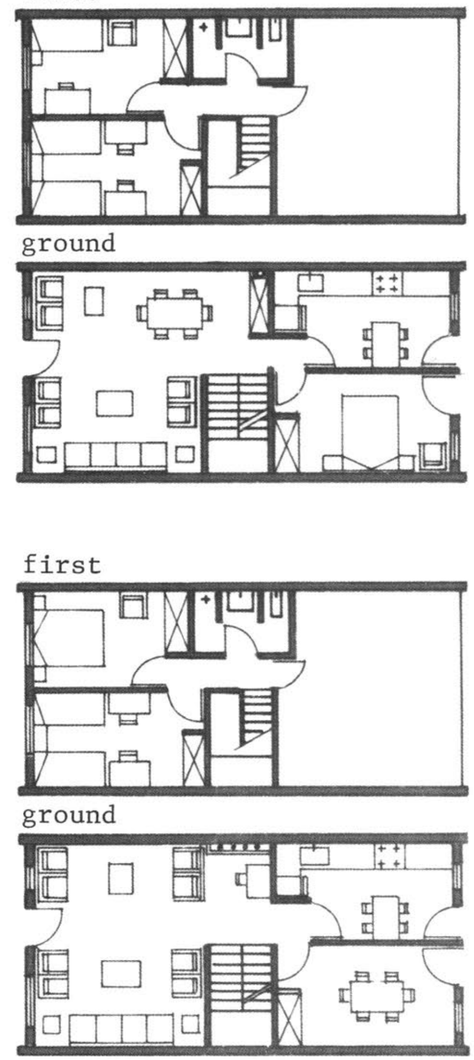
The extra indoor partition walls and three to four doors would cost to the household an extra mount of 800 L.L. approximately, if bought in the market.

But the basic alternative 10 (alternative 9 is similar to alternative 8) costs 64% of the completed and finished alternative 12; its K value is therefore 36% if the rest of the construction (to reach alternative 12) is not monetized.

If materials have to be paid for the rest, 3,411 L.L. have still to be paid (including the 800 L.L. already mentioned), while 1,642 L.L. are approximately economized due to self-help labour, implying a K value of 12% approximately.

* *The extra costs of alternative 10 are shown in italics on the cost table.*





SPACE USE
ILLUSTRATIONS

DWELLING ALTERNATIVE ELEVEN. COST: L.L. 9,460
DWELLING ALTERNATIVE TWELVE. COST: L.L.13,955

ITEMS	COSTS (L.L.) FLOOR 1st	2nd	Roof	TOTALS
Excavations				115
Wall conc.				128
Slab conc.				690
FOUNDATIONS				933
Joists	137	137	26	300
Concrete	506	506	46	1,058
Insulation		758	76	834
SLABS				2,192
Bearing	508	508	81	1,097
Facade	145	189	74	408
Partition	12	120 *310*		132 *322*
WALLS				1,637 *1,827*
Land.joists	11	11		22
Land.conc.	9	9		18
Stairs	43	43		86
STAIRCASE				126
Lavatory		90		90
Shower		50		50
Asiatic WC		110		110
Drain & Cl		60		60
Sink	100			100
Water tank			215	215
Heater	245			245
EQUIPMENT				870
To street				419
Vett. main	160	160		320
Horizontal	15	76		91
PIPING				830
Outlet circ	122	108		230
Lamps circ.	144	216		360
ELECTRICITY				590
Doors	502 *836*	125 *1,045*	167	794 *2,048*
Windows	744	744		1,488
CARPENTRY				2,282 *3,536*
Tiles	*483*	*446*		*929*
Plaster	*697*	*779*	*209*	*1,685*
Paints	*176*	*214*	*47*	*437*
FINISHES				*3,051*
TOTALS				9,460 *13,955*

alternative eleven COST: 9,460 L.L.

alternative twelve COST: 13,955 L.L.

Both the alternatives are represented in the same adjacent illustrations. Both alternatives have the structure of their two floors completed.

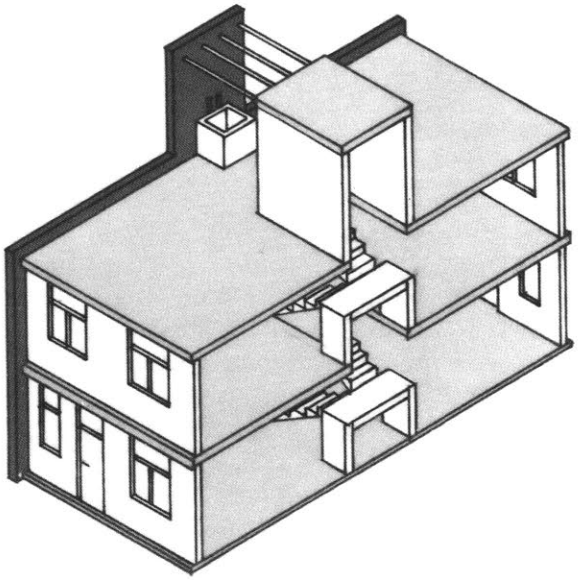
Alternative 12 has in excess of alternative 11 all the indoor partition walls and doors that are represented in the adjacent illustrations. (As can be seen, four bedrooms can be comfortably installed. Even a fifth bedroom can be installed on the ground floor in case of emergency.)

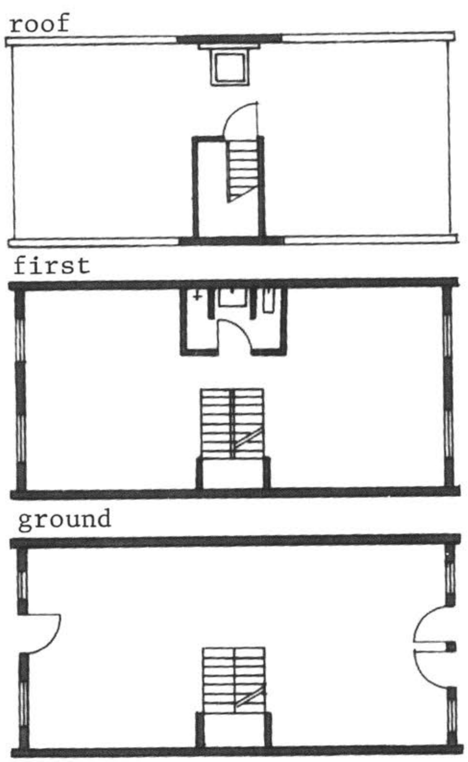
Alternative 12 has also in excess all the finishes. These were not provided in any of the previous alternatives. Finishes are quite expensive, they account for 22% of the total cost of alternative 12.

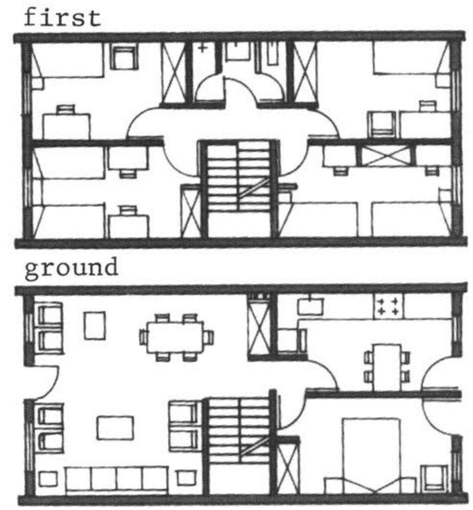
In the case of alternative 12, the completed dwelling is delivered as the infrastructure, and therefore the K value of this solution is zero.

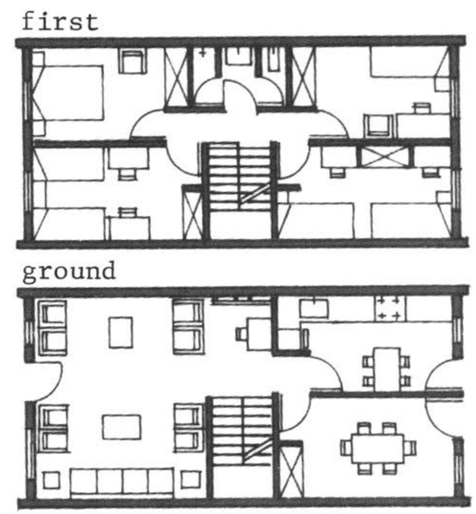
As for alternative 11, its basic cost of 9,460 L.L. corresponds to 68% of the completed alternative 12. This means that if the rest of the elements of construction are self-provided, the K value of this alternative is around 32%.

If, on the other hand, only labour is not monetized, but materials have to be paid to reach alternative 12, then only 1,461 L.L. is economized from the self-help labour, while 3,034 L.L. have to be paid for materials, implying a long-term K value of only 10.5%.









SPACE USE
ILLUSTRATIONS

comparative costs of the different dwelling alternatives

The adjacent graphs shows the evaluation of the different costs in each of the twelve dwelling alternatives.

The curves represent, therefore, an interpretation of the evolution of the priorities of the people, as their income levels rise.

This interpretation is nevertheless somewhat subjective, even if an attempt of rational observation is at the basis of the curve.

But in reality, given the present dual process of infrastructure and suprastructure, the designer does not have to decide precisely for the user. The user should be able to chose between a series of different infrastructures the one that best fits both his budget and his set of priorities. From there he personally takes the initiative of shaping his dwelling.

Different dwelling packages (or levels of dwelling infrastructure) could be available in each cluster of an urban unit, for a mix of incomes, or conversely, each cluster could be made of a series of the same dwelling alternatives. In this latter case, the construction of the infrastructures can be more efficient, and the mix of incomes still present, at the level of the urban unit itself.

The left columns of the table indicate the various costs of each of the twelve (initial) alternatives.

The three right columns indicate the costs in labor, materials and their sum, required to reach the level of complition of alternative 12.

These costs indicate therefore the K values i.e., the economy possible in each alternative, if labor or materials are obtained free, in self-help schemes, with recycled or available materials.

The total costs are the difference between the cost of alternative 12 and each of the intermediate alternatives. The partial labor and materials costs are obtained in a simplified way: by applying the average ratio of labor to materials costs* to the total costs.

A more precise evaluation should calculate the partial costs by applying a specific ratio to each added item. The different ratios are available in the detailed table of costs*.

As mentioned in the introductory remarks, these dwelling alternatives are only a few illustrations among the many possible ones to prove the flexibility of the dwelling zoning system to adapt to different budgets and sets of priorities.

They also illustrate the concept of providing immediate relief alternatives with the immediately available resources while allowing, at the same time, potential long-term solutions.

As mentioned before, the cost estimates are very approximate. They are based on the market prices in Lebanon in 1974-75. And these prices are bound to change with time. The costs serve mainly as comparison tools between the different alternatives presented.

In the following chapter, these costs will be related to the costs of land and to the different income levels of the people.

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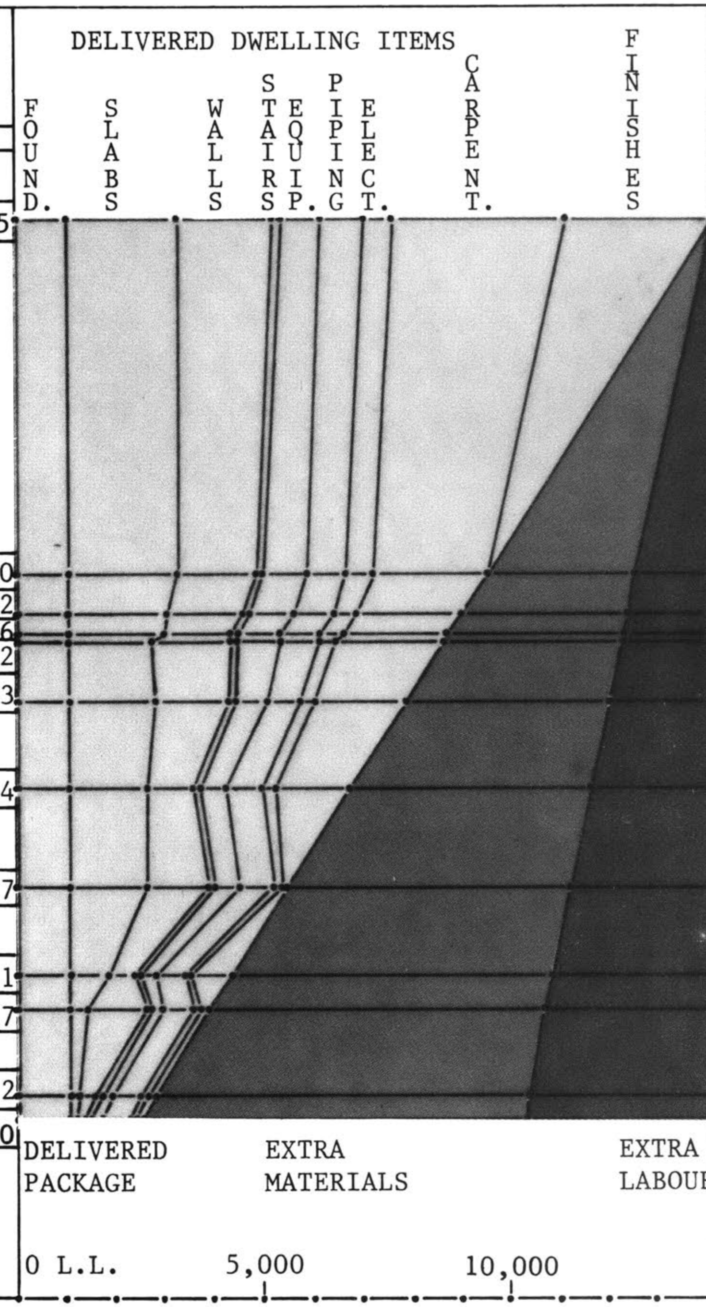
* *See table on page 195 (right column)*

IMMEDIATE AND INCREMENTAL COSTS OF THE DIFFERENT DWELLING ALTERNATIVES.

NUMBER	FOUNDATIONS	SLABS	WALLS	STAIRCASE	EQUIPMENT	PIPING	ELECTRICITY	CARPENTRY	FINISHES	TOTALS	K-VALUES (MAX. COMPLETION COST) MATERIALS	LABOUR	TOTAL
12	933	2,192	1,827	126	870	830	590	3,536	3,051	13,955	0	0	0
11	933	2,192	1,637	126	870	830	590	2,282		9,460	3,034	1,461	4,495
10	933	2,015	1,568	126	870	830	482	2,078		8,902	3,411	1,642	5,053
9	933	1,951	1,366	126	870	830	482	2,078		8,636	3,590	1,729	5,319
8	933	1,682	1,625	126	870	830	284	2,282		8,632	3,590	1,733	5,323
7	933	1,732	1,510	126	625	710	284	1,873		7,793	4,159	2,003	6,162
6	933	1,552	916	74	625	710	266	1,538		6,614	4,954	2,387	7,341
5	933	1,564	1,217	31	625	710	122	125		5,327	5,824	2,804	8,628
4	933	777	523	20	410	610	86	832		4,191	6,590	3,174	9,764
3	933	338	1,217	22	310	660	122	125		3,727	6,907	3,321	10,228
2	933	107	421	20	310	610	86	125		2,612	7,659	3,684	11,343
1	933	67	219	20	310	610	86	125		2,370	7,820	3,765	11,585



financing strategies

The number of households that can not get a house without a subsidy have been defined in the first chapter of this study.*

Their income levels and the budget of a housing agency have been estimated in the second chapter.**

Chapters three to seven were devoted to the study of local existing conditions and the consequent formulation of an optimal housing approach.

In chapter eight, optimal dwelling alternatives were cost-estimated as precisely as possible.

This present chapter is devoted to relating all these variables to each other. Namely, to determine what dwelling alternatives could be afforded by the different defined groups of households, given their income levels, the budget of the housing agency, the location of their housing needs and the costs of the different dwelling alternatives.

income versus dwelling alternatives

The yearly 25,000 households that should be helped to get their housing facilities have been divided into ranges of estimated income levels.**

It is generally accepted that a household with a low or medium-low income should not spend more than 20% of its income for housing.

The housing budget includes the cost of the dwelling structure and the cost of the land on which the dwelling is built.

The dwelling costs have already been estimated in the previous chapter, but it is difficult to estimate the cost of land because it varies from site to site.

One can still narrow down the range of possible land prices from 0 to 100 L.L. per m^2. Above 100 L.L. the cost of land becomes prohibitive for low-income housing.

Fortunately, even in the suburbs of Beirut, lands can be found within this range,*** and they are at reasonable distance from the center of the city (twenty minute drive).

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* *See pages 48-50*
** *See pages 58-59*
*** *See pages 62-63*

The adjacent chart relates the cost of the dwelling alternatives to the price of land, to the income level of the households and to the possible financing rates in the country.

The object of this chart is to visually relate these variables to quickly show a decision-maker or a user how these variables affect each other.

The table is divided vertically into two areas, one above the middle row (indicating the range of land prices), and one below it.

The lower section of the graph represents the variation of the cost of the non-private lands,* the utilities and the facilities associated with the dwelling.

The one above is devoted to the costs of the twelve different dwelling alternatives (12 oblique parallel lines), as they vary with the price of land variations (represented in the lower oblique line).

The non-private lands are here discussed within the frame of the urban unit defined above.* These lands include the semi-private lands (the cluster courts), the semi-public lands (the urban unit central area), and the public area (streets and pathways).

The utilities and facilities costs are very roughly estimated for the sake of the illustration, to be around 4,000 L.L. per lot. (This figure should be made more precise from specific case studies.)

Both sets of lines are oblique because they show the evolution of the different costs as the price of land rises from 0 to 100 L.L. per m^2.

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* *See pages 102-104*

The four heavy oblique lines starting from a single point in the upper area of the chart relate the incomes and the housing budgets (horizontal scale, on the bottom of the chart) to the costs of the dwelling alternatives (vertical scale), at different financing conditions.

The incomes (lowest row) vary from 0 to 2,000 L.L. per month. The consequent housing budgets (second lowest row) vary from 0 to 400 L.L. per month. They represent 20% of the incomes.

The financing characteristics of each heavy oblique line is indicated in the two top rows of the chart

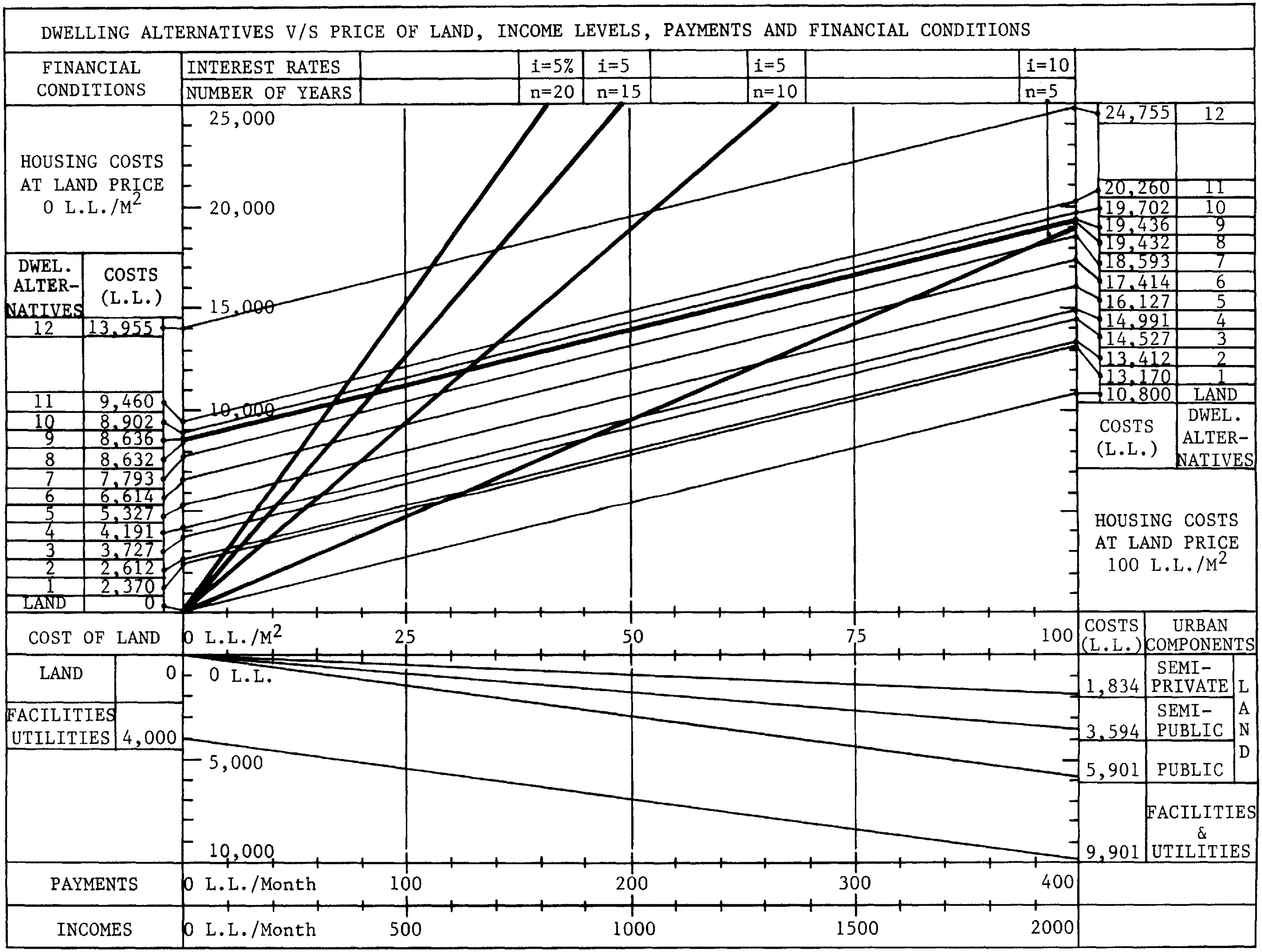
The lowest line represents more or less the usual Lebanese market conditions: an interest rate of 10% over a period of 5 years. The three other lines represent three possible levels of subsidy, indicated here as references. The three subsidies would allow loans at an interest rate of 5% for periods of 10, 15 or 20 years, respectively.

For each case the oblique line relates the monthly payment (or income) to the consequent affordable dwelling package as represented on the vertical scale.

For reference purposes, the two verticle columns indicate the 12 dwelling alternative costs. The left column indicates the costs at a price of land of 0 L.L. while the right column indicates those at a land price of 100 L.L. per m^2.

To clarify the use of the chart, an illustration will be discussed starting first from an assumed income level to find the consequent possible dwelling alternatives and then vice versa, defining a desired dwelling alternative and finding out what income groups it can serve.

Suppose that a household earns an income of 500 L.L. per month (lowest row). A vertical line, at this


DWELLING ALTERNATIVES V/S PRICE OF LAND, INCOME LEVELS, PAYMENTS AND FINANCIAL CONDITIONS
FINANCIAL CONDITIONS
INTEREST RATES
NUMBER OF YEARS
i=5% n=20
i=5 n=15
i=5 n=10
i=10 n=5
HOUSING COSTS AT LAND PRICE 0 L.L./M2
DWEL. ALTER-NATIVES
COSTS (L.L.)
12 13,955
11 9,460
10 8,902
9 8,636
8 8,632
7 7,793
6 6,614
5 5,327
4 4,191
3 3,727
2 2,612
1 2,370
LAND 0
25,000
20,000
15,000
10,000
24,755 12
20,260 11
19,702 10
19,436 9
19,432 8
18,593 7
17,414 6
16,127 5
14,991 4
14,527 3
13,412 2
13,170 1
10,800 LAND
HOUSING COSTS AT LAND PRICE 100 L.L./M2
COST OF LAND
0 L.L./M2
25
50
75
100
URBAN COMPONENTS
LAND 0
FACILITIES UTILITIES 4,000
0 L.L.
5,000
10,000
1,834 SEMI-PRIVATE
3,594 SEMI-PUBLIC
5,901 PUBLIC
LAND
9,901 FACILITIES & UTILITIES
PAYMENTS
0 L.L./Month
100
200
300
400
INCOMES
0 L.L./Month
500
1000
1500
2000

level shows that its (20%) housing budget is 100 L.L. per month. The same vertical line hits the four heavy oblique financing lines at four different points.

Horizontal lines drawn from these intersection points indicate on the left vertical scale the costs of the dwelling packages that the household can afford.

They can respectively afford 4,700 L.L. at the market conditions (lowest line, $i = 10\%$, $n = 5$ years), 9,400 L.L. if the interest rate is 5% and the period 10 years, 12,700 L.L. and 15,200 L.L. if the periods reach 15 and 20 years respectively, with the same interest rate of 5%.

For the above market cases, the subsidy is equivalent to the difference between the higher values and the market value. For instance, in the second case, the subsidy to the household is 9,400 - 4,700 = 4,700 L.L.

On the other hand, the dwelling package that the household can get in any of the financial conditions depends also on the cost of land. The area of the private lot* being 108 m^2 (5.4 x 20 m), the cost of land varies from 0 to 10,800 L.L. as the price of land varies from 0 to 100 L.L. per m^2.

At the market level ($i = 10\%$, $n = 5$ years), the household can get 4,700 L.L. as mentioned above. The horizontal line, at this level, hits the different dwelling alternative lines.

If the price of land is zero, the household can afford alternative 4.** At a price of land of 25 L.L. per m^2 it can only afford the land, not even alternative 1.

If the same household is given a subsidy which will allow it, for instance, to get an interest rate of 5% and a period of 10 years, then it can get the 9,400 L.L. package which corresponds to alternative 10 at a zero cost of land, to alternative 6 at a land price of 25 L.L. per m^2, to alternative 4 at a land price of 50 L.L. per m^2, but not even the land at a land price of 100 L.L. per m^2.

Incidentally, the cost of the non-private land increases also with the increase of the price of land (see the lower section of the graph). For instance, at the land price of 50 L.L. per m^2, the non-private lands, including the semi-private, semi-public and public lands*** cost the housing agency or the cooperative 3,000 L.L. per lot, while 4,000 L.L. are estimated for the housing utilities and facilities.

Often at the government end of the process, the tendency is to make "beautiful" projects mainly for propaganda purposes. These projects are elitist because, as they are very expensive, they can only help a priviledge group among the lower income groups, due to the scarcity of resources.

For instance, if dwelling alternative 8 is believed to be the minimum standard into which the government should get involved and the cheaper available land at 75 L.L. per m^2, then the total dwelling package is at 16,500 L.L. cost. This is obtained from the horizontal line through the intersection of the alternative 8 oblique line with the vertical line through the 75 L.L. price of land.

This horizontal line hits the four financing heavy vertical lines at four different points.

The verticals through each of them indicates the incomes of the household that can afford the proposed dwelling-land package of 16,500 L.L.

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* *See pages 132-133*
** *See pages 202-203*
*** *See pages 102-104*

But they require different subsidies from the government. These subsidies can be read from the graph as mentioned above.

At the market conditions, only households with incomes above 1,750 L.L. per month can afford it. Following the three levels of subsidy, the incomes can be reduced to 900 L.L., 650 L.L. and 575 L.L. respectively.

These illustrations among others show the many possible informations that can be quickly comprehended by a potential user or a decision maker.

A further step is however necessary, beyond the information given by this chart. The need is for the national housing agency to find out how to distribute the subsidies to the number of households that can not get the housing facilities in the private market.

This problem is approached in the following section.

* *See pages 66-67*
** *See pages 47-50*

distribution of subsidies

As a remainder, the average housing budget of the government has been estimated at 50 million L.L. yearly from 1975 to 1985.* For the sake of simplicity it has been assumed that this amount will be devoted to the housing construction exclusively and that the utilities facilities lands will be covered by the other ministries.

On the other hand 25,000 households per year from 1975 to 1985 have been estimated to need the help of the government to be able to get a house, because they are below the market's supply level.**

If the estimated 25,000 households per year can get their house with government help than by 1985 the lag of housing supply would have been more or less canceled.**

In order to achieve this objective, the housing budget of the government should be best distributed to the households that can not get their housing facilities otherwise.

If the 50 million L.L. are equally distributed among the 25,000 households, each one will get only 2,000 L.L. This amount will help insignificantly both the lowest income groups and the medium-low ones.

To understand the levels of a significant impact, given the defined situation, the adjacent table has been formulated. It describes the previously made estimations about the 25,000 households in the left columns and the present value of their possible payments as well as the equivalent housing values which are represented on the right columns.

In more details, the left columns are based on the conclusions of the first two chapters* of this study. The first two columns represent the income categories of the households.

The next two columns represent the location of these households. It has been assumed, for the sake of this illustration that the rural site is at a price of 20 L.L. per m^2, while the urban site costs 70 L.L. per m^2.

The proportion of people in the rural areas is about 60% of the total number of households. This ratio corresponds to the proportion of the Lebanese rural population. The assumption that the lowest income groups are in the rural areas reflects a general observed fact, although exceptions are often encountered. But this study is not detailed enough to take them into consideration. This could be done through computerized methods in a real case study.

The fifth column indicates the density configuration which corresponds in this first case to a one dwelling per lot (layout alternative 1).

Given these "fair" assumptions, the next four pairs of columns indicate for the different financing conditions the present worth of the households payments and the equivalent dwelling package that they can get.

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* *See summary on pages 47-50*

The first pair of columns indicates what the household can get at the market conditions (i = 10%, n = 5 years) the next columns indicates the extra amount they can get at the three different levels of subsidy.

The left graph shows the different present worths of the different income groups following the financing criteria. The curve varies proportionally to the incomes of the households.

The right graph indicates the dwelling packages that the households can get in the four different cases.

This curve shows a break at the point where the lands increase in price (the urban land). Obviously at this point, the households can get less dwelling because they have to pay more for the land.

The table shows that without subsidies none of the defined households can get more than the land. With the first level of subsidy (i = 5%, n = 10 years), 7,000 households can not get more than the land, while 1,000 households get alternatives 9 or 10. The situation is slightly better for the two other sets of subsidies.

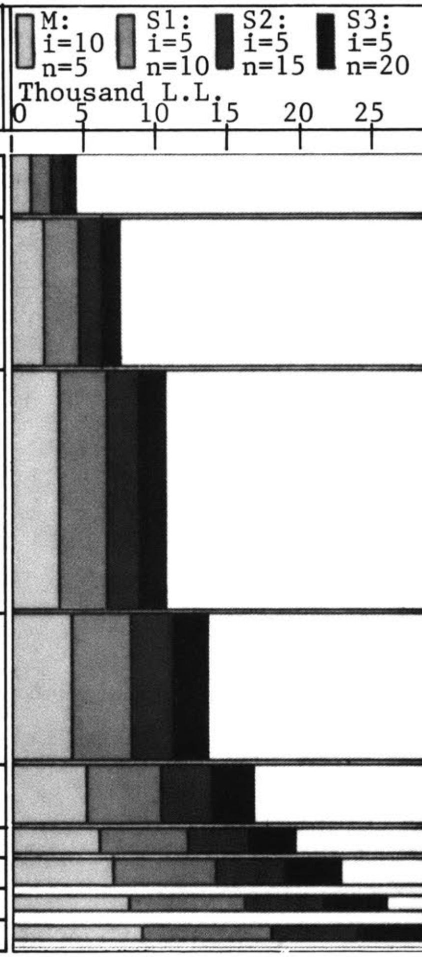
The lowest row indicates the total present worths of the above monthly payments.

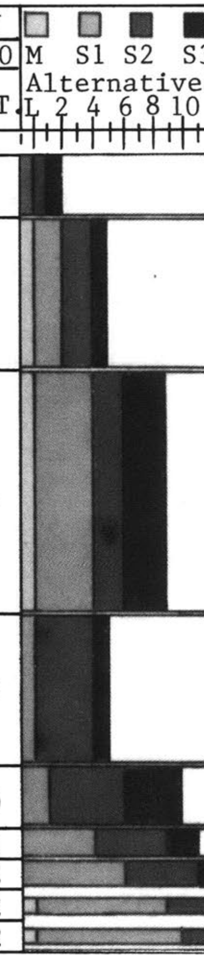
The left column (between the graphs) indicates that the present worth of the household payments is 94.13 million L.L. The next column shows that at the first level of subsidy, i.e., if all households have interest rates of 5% for a period of 10 years, the present worth of the government subsidy reaches 94.43 million L.L. And for the two higher levels of subsidies it reaches respectively 158.78 and 208.92 million L.L.

Unfortunately, the limit of the budget has been assumed to be 50 million L.L., so none of these solutions can work within the assumed estimations.

DWELLING ALTERNATIVES FOR THE PROJECTED UNHOUSED LOW INCOME GROUPS GIVEN DIFFERENT LAND & FINANCING CONDITIONS

NUMBER OF HOUSE-HOLDS	AVERAGE MONTHLY INCOME (L.L.)	LAND: ZONE	LAND: PRICE LL/M^2	DWEL. PER LOT	MARKET i=10, n=5: PRES. VALUE	ALT.	INCREASING LEVELS OF SUBSIDY i=5, n=10: EXTRA VALUE	ALT.	i=5, n=15: EXTRA VALUE	ALT.	i=5, n=20: EXTRA VALUE	ALT.
2,000	150	RURAL	20	1	1,412	0	1,416	L	2,382	1	3,314	2
5,000	250	RURAL	20	1	2,353	L	2,361	2	3,970	4	5,223	5
8,000	350	RURAL	20	1	3,295	L	3,305	4	5,557	6	7,312	9
5,000	450	URBAN	70	1	4,236	0	4,249	L	7,145	4	9,401	5
2,000	550	URBAN	70	1	5,177	0	5,194	2	8,733	6	11,491	10
1,000	650	URBAN	70	1	6,118	0	6,139	4	10,321	9	13,580	11
1,000	750	URBAN	70	1	7,060	0	7,082	6	11,908	11	15,669	12
500	850	URBAN	70	1	8,001	L	8,027	9	13,496	12	17,758	12
500	950	URBAN	70	1	8,942	L	8,971	10	15,084	12	19,848	12
25,000	400	60 % RURAL		LAYOUT TYPE 1	94.13		94.43		158.78		208.92	MILLION L.L.





On the other hand, different levels of subsidies should be available depending on the income groups of the households, their sizes, and their locations.

Such decisions are political decisions that can not be made in the abstract and depend on the long-term policies of the country of the region.

These decisions are much beyond the framework of this study. But the next tables will illustrate a framework within which different options can be represented and their consequences estimated.

STRATEGY ONE

Given the situation presented in the precedent table, many options can be simulated. The first one is presented in the adjacent table.

The objective of this table is to show how much subsidy is given per category of household and in total if every household should get at least alternative 4.

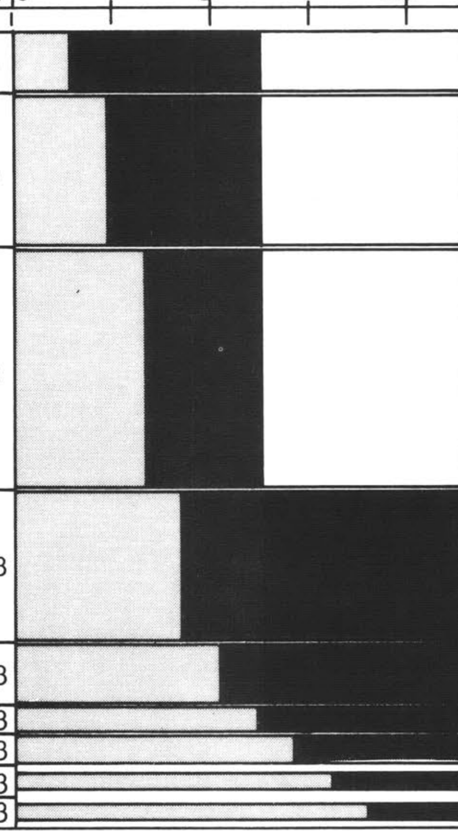
Due to the difference in the price of land, the same dwelling alternative 4 costs 6,243 L.L. in the rural area while it costs 11,373 L.L. in the considered urban area. This means, as can be seen on the graph, that the government has to give much more subsidy per household which settles in the city.

This policy therefore might increase the urban migration and should be used with caution.

For instance, the present worth of the subsidy given to the rural household that earns an average income of 350 L.L. is 2,948 L.L. per household, while it jumps to 7,137 L.L. per urban household of an average 450 L.L. income per month.

On the other hand, the government can not afford to pay the above subsidies which amount to 113. 25 million L.L. It is far above its 50 million capability. So for practical purposes this strategy is not feasible as such.

DISTRIBUTION STRATEGY: ONE												
NUMBER OF HOUSE-HOLDS	AVERAGE MONTHLY INCOME (L.L.)	AVERAGE MONTHLY PAYMENT (L.L.)	LAND		DWEL. PER LOT	PROPOSED ALTERNATIVE		Households payments / Government subsidies Thousand L.L. (0, 5, 10)	PAYMENTS MARKET PRESENT VALUE(LL)	NEEDED SUBSIDY		AT i=5% PAYMENT NUMBER OF YEARS
			ZONE	PRICE LL/M^2		NUM-BER	COST (L.L.)			PER HOUSE-HOLD(LL)	PER CATEGORY MILLION	
2,000	150	30	RURAL	20	1	4	6,243		1,412	4,831	9.66	30
5,000	250	50	RURAL	20	1	4	6,243		2,353	3,890	19.45	15
8,000	350	70	RURAL	20	1	4	6,243		3,295	2,948	23.58	9
5,000	450	90	URBAN	70	1	4	11,373		4,236	7,137	35.69	15
2,000	550	110	URBAN	70	1	4	11,373		5,177	6,196	12.39	11
1,000	650	130	URBAN	70	1	4	11,373		6,118	5,255	5.26	9
1,000	750	150	URBAN	70	1	4	11,373		7,060	4,313	4.31	8
500	850	170	URBAN	70	1	4	11,373		8,001	3,372	1.69	7
500	950	190	URBAN	70	1	4	11,373		8,942	2,431	1.22	6
25,000	400	80	60 % RURAL		LAYOUT TYPE 1		207.38	MILLION L.L.	94.13		113.25	



STRATEGY TWO

The adjacent table illustrates a possible improvement of the precedent conditions. It consists in increasing the density of the urban unit to diminish the relative cost of land.

As described in a previous chapter,* two double floor dwellings will be combined vertically on the same lot and the cost of land will therefore be divided by two.

The table shows the household that would share a single lot. The proportion of "upper" dwellings is different in the two cases.

In the rural area, only 23% of the dwellings are "upper" dwellings. This corresponds to the urban layout alternative 2.** While in the urban area where higher densities are suggested due to the more scarce land, the proportion of "upper" dwellings reaches 35%. This corresponds to layout alternative 4.

It is interesting to note here that the amount of the subsidies (dark area on the graph) is more proportional to the relative income levels of the households (light grey area) than in the previous strategies.

But still, the households that receive the most important subsidies are given to the highest (bottom) four income groups.

The reason is that they are in the same time in the urban area and yet have a single lot for each.

But even with this more economical layout system, the government has still to pay more than it can afford, namely 84.13 million L.L., while its upper limit is assumed to be 50 million L.L.

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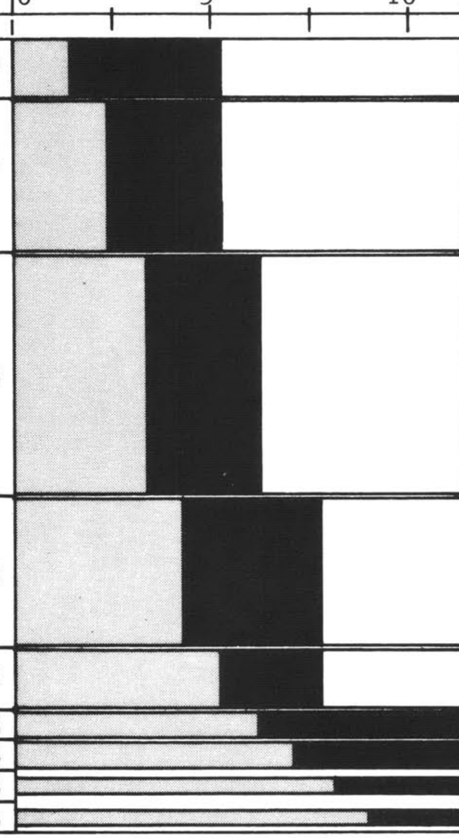
* *See pages 113-138*

** *See pages 114-117*

DISTRIBUTION STRATEGY: TWO												
NUMBER OF HOUSE-HOLDS	AVERAGE MONTHLY INCOME (L.L.)	AVERAGE MONTHLY PAYMENT (L.L.)	LAND		DWEL. PER LOT	PROPOSED ALTERNATIVE		Households payment / Government subsidies — Thousand L.L. 0 5 10	PAYMENTS MARKET PRESENT VALUE (LL)	NEEDED SUBSIDY		AT i=5% PAYMENT NUMBER OF YEARS
			ZONE	PRICE LL/M²		NUM-BER	COST (L.L.)			PER HOUSE-HOLD (LL)	PER CATEGORY MILLION L.L.	
2,000	150	30	RURAL	10	1	4	5,217		1,412	3,805	7.61	26
5,000	250	50	RURAL	10	1	4	5,217		2,353	2,864	14.32	12
8,000	350	70	RURAL	20	1	4	6,243		3,295	2,948	23.58	9
5,000	450	90	URBAN	35	1	4	7,782		4,236	3,546	17.73	9
2,000	550	110	URBAN	35	1	4	7,782		5,177	2,605	5.21	7
1,000	650	130	URBAN	70	1	4	11,373		6,118	5,255	5.26	9
1,000	750	150	URBAN	70	1	4	11,373		7,060	4,313	4.37	8
500	850	170	URBAN	70	1	4	11,373		8,001	3,372	1.69	7
500	950	190	URBAN	70	1	4	11,373		8,942	2,431	1.22	6
25,000	400	80	60 % RURAL		LAYOUT TYPE 1		175.12	MILLION L.L.	94.13		80.99	

STRATEGY THREE

Just for the sake of comparison, this strategy proposes that all dwellings be built in the rural areas where the price of land is cheaper.

Also, 30% of the dwellings are upper dwellings to further reduce the cost of land of the lowest income groups.

This corresponds to the urban alternative 3,* which is already quite packed for a rural situation.

The dwelling alternative 4 is still proposed, as it is the smaller unit where a household can immediately live.**

The graph shows that, in this case, the upper income groups do not need the subsidies, and they can afford more than the proposed dwelling alternative 4.

The total amount of subsidies is now practically acceptable, it amounts to 52.18 million L.L. But this solution seems more theoretical than practical because one of the most important priorities of the lower income groups is their proximity to their jobs. This is due to the fact that given their tight resources they can not afford much for transportation purposes and, on the other hand, they have to be very close to the jobs locations to grasp the occasions as they come.

So this strategy is very unlikely to work socially and was only presented here for the sake of comparison with the rest of the possibilities.

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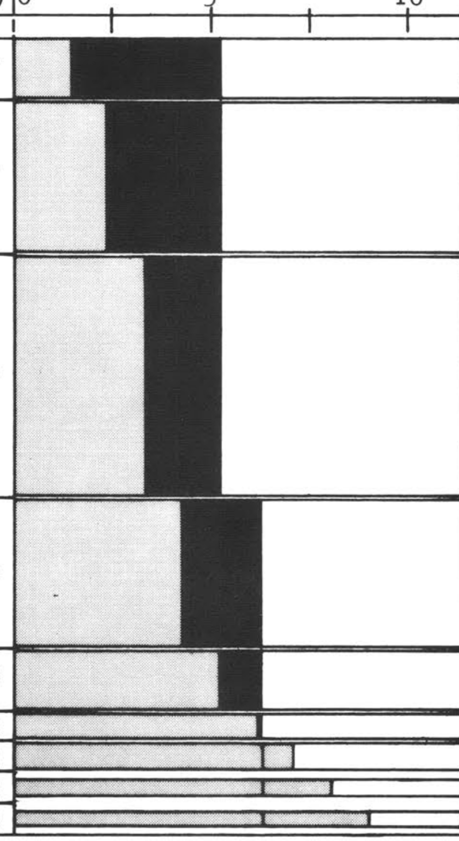
* *See pages 114-117*

** *Alternative 4 should be modified for the ground dwellings which have a second dwelling above. The bearing walls should be completely built, which increases the cost of this alternative. But as foundations, ground floor and insulation are reduced in such a combination, the total costs may still remain the same.*

As a result, and for the sake of a clear illustration, alternative 4 will be represented here as a reference for ground and top dwellings of this (and the following strategies). In real case studies the details should be more precisely represented.

DISTRIBUTION STRATEGY: THREE

NUMBER OF HOUSE-HOLDS	AVERAGE MONTHLY INCOME (L.L.)	AVERAGE MONTHLY PAYMENT (L.L.)	LAND: ZONE	LAND: PRICE LL/M^2	DWEL. PER LOT	PROPOSED ALTERNATIVE: NUMBER	PROPOSED ALTERNATIVE: COST (L.L.)	Households payment / Government subsidies, Thousand L.L. (0 – 5 – 10)	PAYMENTS MARKET PRESENT VALUE (LL)	NEEDED SUBSIDY: PER HOUSE-HOLD (LL)	NEEDED SUBSIDY: PER CATEGORY MILLION L	AT i=5% PAYMENT NUMBER OF YEARS
2,000	150	30	RURAL	10	2	4	5,217		1,412	3,805	9.51	26
5,000	250	50	RURAL	10	2	4	5,217		2,353	2,864	14.32	11
8,000	350	70	RURAL	10	2	4	5,217		3,295	1,922	15.38	7
5,000	450	90	RURAL	20	1	4	6,243		4,236	2,007	10.04	7
2,000	550	110	RURAL	20	1	4	6,243		5,177	1,066	2.82	5
1,000	650	130	RURAL	20	1	4	6,243		6,118	125	0.13	4
1,000	750	150	RURAL	20	1	4	6,243		7,060	-	-	4
500	850	170	RURAL	20	1	4	6,243		8,001	-	-	3
500	950	190	RURAL	20	1	4	6,243		8,942	-	-	3
25,000	400	80	RURAL		LAYOUT TYPE 3		140.69	MILLION L.L.	94.13		52.20	



STRATEGY FOUR

Given the actual tight resources compared to the importance of the needs and cost of their fulfillments, only compromise solutions can be reached.

This last strategy offers one of the possible compromise solutions. It consists in keeping the same densities as in the previous strategies but building the dwellings in further-apart locations than the ones proposed in the first strategies, yet not as far out as in the last solution.

The adjacent table shows the effects of a 10 L.L. per m^2 price for a rural site and a 40 L.L. for an urban site. These prices should be studied given real case studies. But it seems that they are in a realistic range. A 40 L.L. land price could be situated at a half hour car or bus drive from the center of Beirut, the capital, which has a limited size,* fortunately.

The details are in the adjacent table. Given the lower price of land, the higher two income groups do not even need the subsidy to get alternative 12. And the total required governmental subsidy is 51.63 million L.L. which can be considered quite acceptable.

This strategy is not presented here as the ideal solution for Lebanon. The choice of a strategy depends on political and economical long-term policies that are not discussed here because they are beyond the scope of this study.

Also more detailed alternatives should be considered in more complete studies to fit more precisely the different groups of people.

The purpose of the presented strategies is only to illustrate how one can use the present model or a similar frame work to understand the implications of the different aspects of housing construction to make better immediate decisions taking into consideration the immediate means available for the urgent needs, while keeping in mind the long-term objectives of the housing agency.

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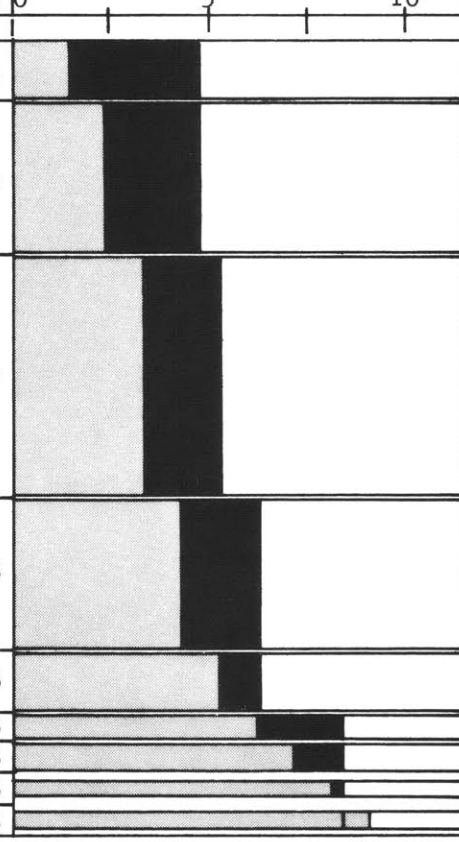
* *See pages 62-63*

DISTRIBUTION STRATEGY: FOUR												
NUMBER OF HOUSE-HOLDS	AVERAGE MONTHLY INCOM (L.L.)	AVERAGE MONTHLY PAYMENT (L.L.)	LAND		DWEL. PER LOT	PROPOSED ALTERNATIVE		Households payment / Government subsidies, Thousand L.L. (0, 5, 10)	PAYMENTS MARKET PRESENT VALUE (LL)	NEEDED SUBSIDY		AT i=5% PAYMENT NUMBER OF YEARS
			ZONE	PRICE LL/M^2		NUM-BER	COST (L.L.)			PER HOUSE-HOLD (LL)	PER CATEGORY MILLION	
2,000	150	30	RURAL	5	2	4	4,704		1,412	3,292	6.58	21
5,000	250	50	RURAL	5	2	4	4,704		2,353	2,351	11.76	10
8,000	350	70	RURAL	10	1	4	5,217		3,295	1,922	15.38	7
5,000	450	90	URBAN	20	2	4	6,243		4,236	2,077	10.04	7
2,000	550	110	URBAN	20	2	4	6,243		5,177	1,066	2.13	5
1,000	650	130	URBAN	40	1	4	8,295		6,118	2,177	2.18	6
1,000	750	150	URBAN	40	1	4	8,295		7,060	1,235	1.24	5
500	850	170	URBAN	40	1	4	8,295		8,001	294	0.15	5
500	950	190	URBAN	40	1	4	8,295		8,942	-		4
25,000	400	80	60 % RURAL		LAYOUT TYPE 3		143.59	MILLION L.L.	94.13		49.46	

CONCLUSION

This study could be summarized as a series of interrelated questions about the construction of low-income housing. Most of the illustrations are not solved in their details and should not be perceived as unique possible solutions. Their aim is to illustrate the feasibility of a set of concepts, a way of approaching the problem of housing in Third World countries.

Some major concepts can be deduced from the different chapters of this study. They will be mentioned here to summarize the intentions of this study.

1. The search for a low-income housing construction solution can not be done through the study of a building system alone, but through a comprehensive approach related to the field of housing as defined by the study of the housing needs. This is especially due to the scarcity of the resources compared to the importance of the needs. Small streams make big rivers.

2. The trap of the "models" should be avoided. This trap is refered to the tendency of some governments to build expensive housing schemes to serve as "models" for future schemes. These expensive models are built for propaganda purposes and they are so expensive that they can serve a few people, while more humble solutions could help the lives of many more needy people.

3. Given the actual tight resources and the immense needs, the concept of "immediate solutions with long-term potentialities" is introduced, whereby immediate actions are made with the immediate means but open to future incremental developments to answer the long-term needs of the people. Thus less is given to many more people.

4. As a result, the concept of infrastructure and suprastructure is used. The infrastructure is the part of the dwelling that is built by the government or its agent before the dwelling is delivered to the household.

It is the minimum first package that the household gets. It corresponds to the immediate combined means of the household and the government. And is a monitoring physical system that simultaneously provides an organization to the urban texture and shows the limits of private action (the suprastructure).

The suprastructure is the part of the dwelling that is built by the user incrementally to correspond to the long-term needs and means of the household.

5. To make the best out of the dual concept of infrastructure and suprastructure, the concept of self-help is introduced. A building system is designed to take into consideration all the country's resources (materials, technology, industrialization, etc.) and adapt to the limited skills of the self-help workers in labour intensive systems.

6. To decentralize the decisions from the housing agency, to monitor and help the households in their incremental suprastructure self-help work and to offer to the loaning agencies an organized group rather than a fluid low income individual, cooperatives or similar housing organization are suggested. They are called "urban unit cooperatives" because they belong to a geographically formed area which is at the same time a social nucleus. This cooperative could handle a "bank of tools and materials" for the use of the self-helpers.

These concepts are the backbone of this study that tries to show that only with similar measures can the problem of low-income housing be alleviated in most countries of the world.

These concepts are illustrated with a case study of Lebanon to clarify the concept and illustrate their feasibility.

This study tries to show a spirit of action rather than a precise methodology. The simple and therefore imprecise illustrations should not be taken literally, their only purpose is to illustrate the approach in most of its aspects.

The inherent superficiality of certain sections could therefore not be avoided. Given the time and scope of the studies, it was part of the objective to present an approach that touches all the aspects of a problem, rather than dealing deeply with one section without any feedback from the others.

This study is only a starting point to relate, as said before, a set of questions around the issue of low-income housing. But the questions can only be answered in the field, depending on each different case study.

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