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GENERAL PRINCIPLES AND PRACTICE OF LOW-COST HOUSING, BASED ON HUNGARIAN EXPERIENCE[1/]

by

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1/The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO.

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LOW-COST HOUSING - A WORLD-WIDE PROBLEM

According to recent statistics, a thousand million people are living in sub-standard housing on our globe. Slums and squatter settlements that are to be found throughout the world result from the demographic explosion as well as from the increased migration of population to the towns and a consequent overcrowding of available living facilities.

The solution of the housing problem is recognized as one of the most important social and economic challenges in development, and the outstanding task of the building industry. An improvement in the housing situation can not be achieved without a rapid expansion of the building industries. This is true for developed countries also - but even more so for developing countries.

Building industry is one of the largest production sectors in all countries, since it represents usually more than 50 % of all capital investments and its contribution to the Gross National Product is up to 10 %. It plays a very important role in the labour employment situation, since on an average 2 % of the population of developing countries and 7 % of the developed countries is employed by the building industry.

It is remarkable that in spite of its important role in the social and economic situation of the countries, the construction industry is usually much behind other industrial branches, with respect to productivity, capital vs. labour intensivity, cost efficiency, quality, production cycles etc. In fact, the bulk of construction work is still done by traditional, artisanal and do-it-yourself and not by industrial methods.

In developed industrial countries, there has been a great progress in this respect in the last three decades - but very little or no change has been experienced in the developing countries.

The main reasons for the lasting backwardness in the developing countries are as follows:

- Lack of capital, - and particularly the foreign exchange component.

- Lack of co-ordinated large-scale long-range housing and building programs.

- Lack of specialists, skilled workers and systhematic training.

- Lack of satisfactory transport facilities and network.

- Lack of suitable codes, regulations, standards and enforcement resources.

- Lack of knowledge of the requirements.

- Lack of planned research programs and in many cases lack of research and development institutions.

- Above all: lack of proper understanding with regard to the role of construction and housing in the national economy. This sector is usually considered as contributing less to development than other activites. It is not considered that it consumes a large proportion of locally available materials, provides employment and training possibilities for large numbers of unskilled labour and requires relatively modest capital investments. Thus, the potential of the building sector as a most important indigenous industry is overlooked - and other development

programmes get priority in capital allotments, foreign exchange for imported machinery, equipment and professional services.

It is beyond doubt that there is no general solution available regarding the above problems. It is also sure that methods which proved to be successfull in one particular country, may be unsuitable for other countries. Still, the fact that Hungary has achieved rather good results both in the industrialization of its construction sector and on its way towards the solution of the housing problem, gives us a good reason to investigate the development of housing in Hungary, as a case study. In our investigations, we will concentrate to the following questions:

Housing supply and development - in the past 15 years
Development of housing technology
Functional requirement
Standards and regulations
The role of research.

BACKGROUND TO THE DEVELOPMENT OF HOUSING IN HUNGARY

Hungary - until the II world war - has been rather poorly developed country. It's main production profile was the agriculture, the industry was not very significant, and it was concentrated in few towns. The construction industry was also in a rather elementary stage of development. This economic background, together with the social contradictions of a feudalcapitalistic society resulted in a housing situation, which was - above all in the rural sector - in many ways similar to the housing situation of colonies in some parts of the world. The enormous destructions of the II. world war only increased the housing shortage.

The past 25 years were not sufficient to eliminate our backwardness, which was a heritage of many centuries - and to satisfy at the same time the new requirements resulting from the migration to the towns. Right from the beginning, a main problem of our socialist society was housing.

Assessing the great housing needs, the Government decided that between 1961-75 one million flats are to be constructed. This means a large amount of additional investments as well - a whole infrastructure. The majority of the new housing colonies of our towns comes from that time, and we consider them good houses in a healthy environment.

In order to accelerate the rate of filling the gaps, the area of the flats had to be limited. The average area of our flats in 1972 was 62 m². On the other hand, the mass-produced flats built by the Government were only 59 m2 but provided with built in kitchen-furniture, storage place etc.

In the course of the implementation of the Government plan, it appeared that the capacity of the construction industry was not sufficient to build 1 million flats in 15 years. This was so, because at the same time big industrial plants had also to be constructed.

To illustrate the rate of the Hungarian industrialization in the 60-ies, just some figures: Excluding Budapest, the industry of the Hungarian towns consumed in 1960 2700 million kWh. In 1969 this figure was 5500. In 1965 the brutto value of fixed industrial assets was 72 000 million Ft, in 1969 - 149 000 million Ft. But not only the industry was the major client of the construction industry. This was the period, when our agriculture made the decisive shift to large production units - which also necessitated a huge amount of construction capacity. Little was left at that time for housing.

We had problems with labour as well. The large-scale industrialization of the country attracted the labour reserves, and the construction industry could not recruit its needs. Therefore, a complete rearrangement of the organization, technology, and methods of the construction industry was needed in order to meet the requirements of the 15 year housing plan. This process of reorganization started in the early 60-ies and is not yet completed. Anyhow, we are sure now, that by 1975 we will have completed the construction of one million flats.

As a result of the reorganization, we build now more than 9 flats per 1000 inhabitants per year. This is not a bad figure - even internationally seen.

And now, after this brief introduction, let me give you a somewhat more detailed picture about the actual housing situation in Hungary and it's development.

Housing supply and development in the last 25 years

The actual housing situation in Hungary is the resultant of three main components:

- the unbalanced housing situation inherited from the pre-war society, with an obsolete housing stock;
- the destructions of the Second World War;
- housing performances achieved by our socialist society.

According to the first post-war census held in Hungary in 1949, the number of population was 9,205.000. 38,4 % of the population had lived in towns. Housing stock of the country consisted of 2,467.000 homes, 41 % of which was in towns and cities.

70 % of homes were one-room flats with an average of 3,5 persons/flat. /TABLE 1./

The first Five-Year-Plan in the period from 1950 to 1954 had planned a very ambitions housing programme, which exceeded the economic resources of the country. This plan has been fulfilled only in about 2/3 of its goals. In these years the population was growing rapidly. The number of marriages and births increased and village--dwellers migrated to towns. Housing was not able to follow the dynamic growth of demands. For easing the housing shortage also large flats were subdivided, and many further problems created.

The equipment in the building industry was at a low level and its production method was traditional.

There was only insignificant private housing since the would-be builder's possibilities for getting loans were poor. In order to increase the number of dwellings in the public housing sector, construction of low standard dwellings was started /the equipment of flats was reduced/. Wash-cubicles were built instead of bathroom and the quality of the buildings was rather poor.

A considerable change of view came in 1957 in the housing policy of the government. The improvement of the housing situation became a most important task. The funds and limits of building-loans for private builders were radically increased. In the years of 1957-1958 housing production has risen to a level higher than ever. In 1955 and in 1956 only about 6000 dwellings were constructed by private resources and state-loans, but in 1957 already 15.000 dwellings were built, and in 1958 this figure reached 20.000.

TABLE I.

HOUSING SUPPLY IN HUNGARY

I. STOCK DATA

	Unit	Census data 1949	1960	1970	1970/1960
1/ POPULATION		on January 1			%
a/ Number of population	1000 persons	9205	9961	10,316	103,6
Budapest	1000 persons	1590	1805	1,941	107,5
Towns	1000 persons	1941	2343	2,708	115,5
Villages	persons	5674	5813	5,667	97,5
b/ Number of households	1000 households	2340	3079	3358	109,0
Number of persons living in households	1000 persons	9038	9537	9973	104,6
Persons per 100 households	persons	318	310	297	95,8
2/ DWELLINGS					
a/ Number of dwellings					
Budapest	1000 dwellings	462	536	628	117,1
Towns	1000 dwellings	549	644	826	128,2
Villages	1000 dwellings	1456	1578	1696	107,5
b/ Number of living-rooms	rooms	3480	4067	5166	127,0
Living-rooms per 100 dwellings /without kitchen/rooms		141	147	164	111,6
c/ Dwellings equipped with					
- electricity	%	46,2	74,0	91,3	123,4
- piped water	%	17,1	22,5	36,0	160,0
- gas supply	%	7,1	13,5	50,2	371,9
- bathroom	%	10,2	17,5	32,0	182,9
- WC	%	12,4	16,0	27,0	168,8

3/ INDICES OF DEGREE OF SUPPLY	Unit	1949	1960	1970
a/ Number of dwellings per 1000 persons	dwellings	268	277	304
Budapest	dwellings	291	297	324
Towns	dwellings	283	275	305
Villages	dwellings	257	271	299
b/ Number of rooms per 1000 persons /without kitchen/	rooms	378	408	500

I wish to call your attention to one fact, that from 1946 until 1980 altogether 3.0.000 dwellings were built, thus 1,3 million people could move into a new home, nearly 15 % of the whole population of Hungary.

In the introduction, the 15-years housing Plan has already been mentioned. The governing principle of the Plan is that the solution of housing problems is the common interest of the whole society.

The Plan, for the period of 1961 until 1975, set as a goal the construction of one million dwellings and decided that 60 % of them should be located in the capital city, in industrial towns and in other settlements inhabited by workers. It determined the average size and standard of state rental dwellings and co-operative dwellings, prescribed the elimination of backwardness in public utility services and reduction of construction time, and the support of private construction. An objective and condition of the Plan was the introduction of new technologies.

The 15 year plan is subdivided in 5-year perions. The first 5-year period /1961-1965/ set the target of construction of 100.000 public and 150.000 private homes. The targets were exceeded: 132.000 dwellings by public and 180.000 dwellings by private resources were built.

The 5-year Plan period starting in 1966 envisaged the construction of 500.000 dwellings. In fact 527.000 dwellings were built. But the internal proportions of the programme could not be kept, concerning primarily that of housing in towns. Therefore housing situation in villages improved more rapidly than in the towns. As a whole, in the first ten years of the Plan nearly 610.000 dwellings were built. The development appears from the following figures:

year	total construction in 1000 flats	construction per 1000 person in flats
1950	35	2,7
1960	58	5,3
1970	80	7,8

More detailed development data are given in TABLE II.

In 1970 the housing stock of the country was 3,142.000 dwellings, more by 384.000 than in the time of the census in 1960.

For the 5-year period between 1971 and 1975, the total planned figure of flats to be constructed is 400.000. The realization of the programme is going well. In the first three years /1971-73/ 250.000 flats have been completed, and now we are sure that we will be able to hit the target, the construction of 150.000 flats in the period of 1974-75. We expect even to complete the somewhat earlier than planned.

It is worth mentioning, that with the completion of our 15 year plan, by the end of 1975, every third Hungarian family will have moved into a new home.

According to the Plan, 60 % of the new flats was to be built in the capital or in towns. In the realization, this percentage changed to 55 %.

It is noteworthy that 88 % of the new homes is assisted by the state - by loan, credit, investment fund or dotation.

Not only the quantity of the new constructions increased, there is a positive change in the quality as well. In 1960,

TABLE II.

HOUSING SUPPLY IN HUNGARY

II. DEVELOPMENT DATA

	Unit	1960	1965	1970	1971	1972
1. HOUSING CONSTRUCTION						
a/ Number of dwellings constructed	dwellings	58,059	54,597	80,276	75,302	90,19
Dwellings constructed per 1000 persons	dwellings	5,8	5,4	7,8	7,3	8,7
b/ in towns	%	46,6	55,2	55,4	53,9	57,6
in villages	%	53,4	44,8	44,6	46,1	42,4
c/ Average area of dwellings	m²	57,4	60,5	61,5	62,7	62,8
average number of rooms of dwellings /without kitchen/	rooms	1,7	1,9	2,1	2,2	2,2
d/ Dwellings equipped with						
- electricity	%	86,5	97,2	99,5	99,4	99,5
- piped water	%	40,2	56,9	70,2	73,2	79,6
- gas	%	.	28,2	36,5	31,6	37,6
- bathroom	%	52,9	67,3	74,9	77,9	82,4
e/ Housing construction technology						
panel	%	.	2,3	21,3	17,9	24,7
large and medium block	%	.	23,4	12,2	10,4	7,6
cast and other modern	%	.	2,2	1,4	1,5	0,8
traditional	%	.	72,1	65,1	70,2	66,9
Total	%	.	100,0	100,0	100,0	100,0
f/ Forms of housing construction						
- housing construction by the state	%	31,7	39,6	32,1	30,0	32,7
tenement dwellings of councils	%	12,0	17,3	17,3	19,5	18,4
sold by councils	%	8,0	11,2	10,2	8,8	10,5
others constructed by the state	%	11,7	11,1	4,4	1,7	3,8
- private housing construction	%	68,3	60,4	67,9	70,0	67,3
a/ with sate loan	%	32,8	40,5	52,7	56,5	55,3
without state loan	%	35,5	19,9	15,2	13,5	12,0
b/ in aparment houses	%	-	5,4	12,0	16,4	16,5
in family houses	%	68,3	55,0	55,9	53,6	50,8
2. LIQUIDATION OF DWELLINGS						
Number of dwellings liquidated	dwellings	11,695	12,482	21,594	21,648	18,053
liquidated dwellings % of the dwellings stock	%	0,42	0,43	0,68	0,68	0,55
in % of new housing construction	%	20,1	22,9	26,9	28,7	20,0
3. POPULATION CHANGES						
Marriages per 1000 persons	marriage	8,9	8,8	9,3	9,1	9,4
Live births per 1000 persons	persons	14,7	13,1	14,7	14,5	14,7
Mortality per 1000 persons	persons	10,2	10,7	11,6	11,9	11,4
Natural increase per 1000 persons	persons	4,5	2,4	3,1	2,6	3,3

4. DEGREE OF HOUSING SUPPLY	Unit	1960	1965	1970	1971	1972
Number of population /at the end of year/	1000 persons	10,006	10,160	10,354	10,381	10,416
Number of dwellings /at the end of year/	1000 inh.	2,804	2,911	3,201	3,255	3,327
Number of dwellings per 1000 persons	dwellings	280	287	309	314	319

the average room number of the new flats was 1,7, in 1975 it was 2,3.

In the past year, only 8 % of the new flats had 1 room, 62 % had 1,5-2 rooms, and 30 percent had more.

Development of housing technology

That was necessary to mention concerning the quantitative and qualitative results. Now, about the changes in the technology and the reasons for the changes, the following should be mentioned:

Housing sector offers the greatest opportunities in the field of technical development, since among conditions of the planned economy:

- it is the most homogeneous building task and for this reason dimensional co-ordination can be applied here to the greatest extent;

- in our country, housing projects appear permanently. Housing projects can be well planned in advance, and thus, the permanent consumption for the industrialised production is assured.

A basic condition for industrialization and a rapid increase in housing construction was the co-ordinated development of the building materials industry, and particularly the cement and concrete industry. Figures illustrating this development are shown in TABLE III.

Through industrialization a rapid growth in housing became possible on the one hand, and unskilled workers trained in industrialized housing plants could replace skilled workers who could be shifted over to other building tasks.

HUNGARIAN BUILDING MATERIALS INDUSTRY

	Unit	1960	1965	1970	1971	1972
PRODUCTION AND EMPLOYMENT						
Total building materials industry						
- Production at current prices	Mio.Ft	6735	8383	11727	12696	13842
- 1960=100	%	100	137	186	192	198
- as a percentage of the total industrial production	%	3,9	3,4	3,2	3,3	3,4
- Employees	1000	69,6	74,3	80,7	81,9	82,5
- 1960=100	%	100	107	116	118	119
- as a percentage of the total number of industrial employees	%	5,3	5,0	4,7	4,7	4,8
Contribution of the various industrial branches to the production of the building materials industry						
- bricks and tiles	%	30	22	20	23	21
- stone and gravel	%	11	8	7	7	7
- cement and lime	%	21	24	21	19	20
- concrete elements	%	17	16	18	18	18
- fine ceramics	%	7	9	12	12	12
- glass	%	12	18	18	18	19
- insulating materials	%	2	3	4	3	3
Number of employees engaged in the various industrial branches as a percentage of the total number of employees in the building materials industry						
- bricks and tiles	%	37	30	28	28	29
- stone and gravel	%	14	11	9	9	9
- cement and lime	%	12	14	12	12	12
- concrete elements	%	12	14	14	14	13
- fine ceramics	%	10	13	17	18	17
- glass	%	12	15	17	17	18
- insulating materials	%	3	3	3	2	2
PRODUCTION of SELECTED BUILDING MATERIALS						
Index of total production /1960 =100/	%	100	137	186	192	198
Production of cement	1000 tons	1571	2383	2771	2712	2969
-1960 = 100	%	100	152	176	173	189
-per inhabitant	kg	157	235	268	261	285
Production of bricks	Mio.pc	172	176	189	198	197
Production of plate-glass	1000 m²	5169	8266	9249	9182	9571
-1960 = 100	%	100	160	179	178	185
-per inhabitant	m²	0,52	0,81	0,89	0,88	0,92
Production of reinforced concrete products	1000 m³	341	433	591	658	621
- 1960 = 100	%	100	127	173	193	182
- per inhabitant	m³	0,034	0,043	0,057	0,063	0,060

The first step to industrialization in housing was the use of half-storey and full-storey-high wall blocks, in the first years of our 15 year Program, i.e. in the early 1960-s.

At the same time, research was going on to the next step, the large panel type technology, and as a consequence, the establishment of the house-factory network. With regard to the fact that housing in towns is primarily done in concentrated from, the composition of the housing programme ensures favourable conditions for efficient use of large--panel-type house factory methods.

Having carried out a thorough evaluation of the various building systems already developed in both socialist and capitalist countries, a modified version of Camus-licence adapted by the Soviet Union appeared to be the most satisfactory for our conditions. In the years 1963 and 1964 the Government already took a decision to establish the network of large-panel-factories mainly based on this system. In 1966 another large-panel-factory using the Larsen-Nielsen system was also purchased and installed in Budapest.

Real large-scale-housing was made possible through this network of large-panel-factories. In Budapest, three large-panel-factories are in operation, the fourth one is under construction. In addition, large-panel-factories were established in Győr, Miskolc, Debrecen, Szeged to meet regional housing demands. The large-panel-factories of Veszprém and Kecskemét are under construction or being just completed.

Large-panel-plants with a lower technological level than the large-panel-factories have been built in five other towns. These also produce up-to-date components for housing. Tunnel-formwork technology is also increasingly used. The network of large-panel-factories will deliver yearly

components for 30.000 flats, and other panel plants for another 5000 flats. Thus, the large-panel-factories and -plants can produce in a 5-year-plan period components for 175.000 dwellings, which is about 40 % of a full-scale 5-year plan housing programme in towns. Therefore the large-panel-factories can be considered the main technical basis for mass-housing in multi-storied buildings.

Considering the abovementioned development in industrialization, it is interesting to compare the shars of various technologies in the buildings completed by the Construction Companies of the Ministry of Building and Urban Development:

Technology	1965	1970
Medium- and large blocks	56,2 %	31,8 %
Panels	6,3 %	52,6 %
Cast-in-situ	3,8 %	4,2 %
R.C. frame	12,1 %	5,5 %
Hand-manipulated walling units	21,6 %	5,9 %

Some important figures indicating the development of the whole Hungarian building industry are shown in TABLE IV.

In the introduction I mentioned that the goal of our 15 year housing plan is the construction of one million flats. Though we are sure that we can hit this target, housing shortage will not have been eliminated in Hungary. We still need the construction activity of two further five-year plans to have achieved our final goal: that every Hungarian family should have a flat of his own.

TABLE IV.

HUNGARIAN BUILDING INDUSTRY

	Unit	196o	1965	197o	1971	1972
PRODUCTION						
Production of the building industry						
- at current prices	Mrd.Ft	3o,6	36,7	72,6	8o,4	84,[illegible]
- 196o = 1oo	%	1oo,o	125,4	2o8,5	223,7	224,[illegible]
Production of the building organizations as a percentage of the total production of the building industry	%	59,o	63,2	59,3	61,4	63,[illegible]
Contribution of the building industry to the production of the national income	%	11,4	1o,6	11,9	11,9	11,7
INVESTMENTS, ASSETS						
Investments in the building industry						
- as a percentage of gross national investments	%	2,2	2,1	2,7	2,9	2,5
- 196o = 1oo	%	1oo,o	134,1	31o,5	379,1	324,1
Fixed assets in the building industry at the beginning of the year						
- gross value	Mrd.Ft	3,8	6,7	11,7	13,9	17,3
- as a percentage of gross national fixed assets	%	c,5	o,7	1,o	1,1	1,3
Yearly average HP value of machines in the building industry	1ooo HP	331	569	785	91o	1o16
HP value of machines per worker in the building industry	HP	2,23	3,8o	4,25	4,77	5,1
EMPLOYMENT, PRODUCTIVITY						
Employees in the building industry						
- total number	1ooo	374	39o	579	594	6o4
- 196o = 1oo	%	1oo,o	1o4,3	154,8	158,8	161,5
Production per worker in the building industry as a percentage of 196o	%	1oo,o	125,6	139,8	147,9	15o,3
BUILDING ORGANIZATION						
Number of state building enterprises		158	1o6	117	118	117
Average size of state building enterprises /number of employees/		12o1	1876	2125	218o	2293
Number of building co-operatives		246	3o5	371	368	338
Average size of building co-operatives /number of employees/		1o3	138	222	241	254

	Unit	196o	1965	197o	1971	1972
DISTRIBUTION OF THE PRODUCTION OF THE BUILDING INDUSTRY						
Of the total production						
- industrial buildings	%	12,5	1o,8	11,9	11,5	12,5
- agricultural buildings	%	7,9	7,6	1o,3	8,4	6,9
- transport and commercial /storage/ buildings	%	6,o	6,7	6,9	7,3	7,o
- communal buildings	%	9,5	1o,6	1o,o	1o,3	1o,2
- residential buildings	%	29,7	27,2	28,3	27,4	3o,1
- other buildings	%	33,7	35,5	3o,4	32,2	29,5
- technological fitting work	%	o,7	1,6	2,2	2,9	3,8

FUNCTIONAL REQUIREMENTS

An attempt is made to give a very brief survey of functional requirements in housing with regards to settlement /towns, villages/ and the dwellings themselves.

Functional requirements of housing are functions of climatic, social, economic, traditional cultural etc. conditions. These being different in different countries it would make no sense to try to establish functional requirements which would be valid all over the world. By exposing briefly our approach we don't mean to say that these requirements could be applied in any developing country. We only wish to give an example of our methodology which may serve in some way as a basis of comparision.

Hierarchy and sequence

In the Hungarian housing settlement planning practice, regulation of first rank and of the largest scale is the task of the general plan, which provides the locations of residential areas within the settlement. Next comes the preparation of the detailed plan which differentiates the residential areas already allocated according to zoning. The housing pattern is the next, which is based on the differentiation of zoning, and situates the buildings in the residential area.

All after these, architectural design can start.

A given planning phase of a settlement plan should contain the basic restrictions corresponding to their scale, but within these they should leave opportunities for meeting new requirements originated by social, economic and technical changes. Thus the plans must not limit opportunities for optimal development on the one hand, but they should

regulate those basic factors, which could lead to contradictions in settlement development.

Principles for planning residential areas - settlement-size

Villages, small towns, large towns can be established only if the conditions corresponding to the sizes of settlements are given. Economic feature of smaller settlements can be unilaterally specialized /e.g. agriculture, industry/; but economic features of larger settlements are influenced by requirements derived from the role of settlement network. Related to these requirements the composition of population basis is differentiated not only according to employment branches and economic features, but also in the field of requirements of housing and home standards.

Both from planning and location aspect, the size of housing complexes of larger dimensions should be specified within a frame corresponding to the dimensions of the settlement. The larger is a given residential area, the more differentiated its functions and components should be.

Purpose of residential areas

Residential areas should be developed in line with the way of life, economic situation and family set-up of their inhabitants. From the aspect of functions, residential areas mostly vary in importance of lots belonging to dwellings and in importance of open space /green areas/ belonging to housing. Living environment of the agricultural population does not serve only for dwelling functions but it contains on each respective individual piece of ground both farmyards and orchards.

Recreational gardens belonging to family houses are supplementary elements of the dwellings. Their dimensioning shows a varied picture following requirements of housing pattern and isolation. The largest parcel is needed by detached family-houses /about 600-2000 sq.m./, the smallest site is needed by the patio houses /the size of the piece of ground is about 150-700 sq.m./. Housing patterns of detached family houses standing on the boundary line of the respective parcel, and housing patterns of semi-detached and row-houses are somewhere between. In case of residential areas for family houses, performed in organized housing schemes, mainly the use of row-houses, semi-detached houses and patio houses is general. Costs of utilities and access roads are relatively the lowest in case of housing patterns with narrow frontline.

In addition to family houses with courtyards or gardens organized mass housing is mainly the housing with flatted blocks. Up-to-date construction methods can be applied economically mainly on such residential areas. The connection between flats of blocks and green areas belonging to these buildings is mainly indirect. For this reason, it is advisable to provide a close spatial connection between flats of families with children and green areas belonging to these flatted blocks. For meeting these requirements flatted blocks with 2-4 floors are the most suitable ones which are not requiring elevators. Medium high flatted blocks are suitable mainly for singles and families without children. High-rise buildings /with 15 and more floors/ can supplement the differentiated scale of housing requirements only in rare exceptional cases.

A basic principle in planning housing areas is the differentiation of building heights and building types and differentiation of their housing patterns.

Alternatives of residential areas are reflected in figures of density. Density of a net residential area is usually

smaller in case of smaller building heights, and greater when the buildings are higher, following average number of floors of the housing pattern. In case of an average building height of 2-10 floors the density of 300 persons/hectar and 600 persons/hectar respectively can be considered as a maximum.

Soil and topographical characteristics of a potential residential area basically determine the purpose the area is suitable for.

In Hungary locations of plain surface or of a slight slope are usually preferred, where underground water is to be found at least at 2,0 m in depth.

Situation and dimension of the residential area

Dwelling is the primary function of the residential area. Nevertheless it requires certain facilities for community life and for public services also, based on size and number of users of the residential area. The provision of community facilities however is not just a supplementary function, it has an organizing power at the same time. In this context it is reasonable to take into account a hierarchical order of different grades in the course of planning, such as neighbourhood unit and residential district. These grades are differentiated not only on the basis of their number of inhabitants but also on a defined seize of the service district of their components. Between units and their service districts an optimal capacity correlation can be identified, for this reason hierarchical groups of community facilities appear also as approximate expressions of size of the residential area.

Consequently a neighbourhood unit may have 4000-10.000 persons and a residential district 20.000-60.000.

In the neighbourhood units care should be taken to provide community facilities meeting so-called daily demands to a relatively narrow extent. In residential districts the task is to create opportunities for provision of community facilities of medium grade. Categories of residential area sizes have been developed according to the functions of community facilities.

Experiences and concepts in connection with planning of residential areas in villages

Completely new villages are founded or planned not very often. Such taskes may arise, when large-scale plans for the transformation of nature are realized. For instance, in Egypt, the realization of the Assuan dam gave birth to a whole system of new villages. Another example is the development of the Euphrates valley, where the new irrigation system turned huge desert areas into fertile land, and new villages were needed.

Natural disasters, long and cruel wars called for new villages in Bangladesh and Vietnam.

Recently, in Hungary foundation of new villages was made in the framework of project for concentrating scattered farm population into settlement units after the land-reform of 1945. Another occasion was the reconstruction of settlement network in the flood-damaged territories in 1959 and 1969. Assessing the results, we see that only some of the newly founded villages of 1948-1950 became self-contained units, able for independent life, and most of them remained uncompleted. The main reason of this can be found in lack of appropriate preliminary surveys and in negligence towards real demands of the inhabitants. Individual pieces of ground for houses were shaped with a size of 1440 sq.m. which

proved to be not sufficient. Water supply was foreseen by public wells in the streets. This also proved to be unsatisfactory.

The plots of the flood-reconstruction [illegible] shaped of sizes of 1800-2500 sq.m. The villages planned in the framework of reconstruction had already been built and in a part of them watersupply is provied by small water-works. The new villages founded in a definite period on the basis of standardized, up-to-date plans can of course function under more favourable conditions than the demolished former settlements.

Functional requirements of the dwellings

A home meets the requirements by satisfying living functions of its occupants as fully as possible. In defining functional requirements one should consider cultural level and financial conditions of its occupants because demands concerning flats are primarily determined by these factors. Nevertheless, certain basic requirements should always be met:

- Sleeping and resting in simple cases are confined to all the living rooms, thus by putting two persons into one room. It is a flat of higher standard where differentiation of rooms can be done according to family set-up and with special regard to separation of children of different ages and sexes from grown-ups.

- Preparation and consumption of meals can be solved either in a larger living-kitchen or in a smaller kitchen serving only for cooking without separate dining place and with a dining area attached either to the kitchen or to the living room. Built-in-furnitures are preferred in those rooms.

- Washing and cleaning can be solved by a simple wash-basin and shower or by a bathroom, with WC facility in the bathroom or with separate WC in larger flats. Arrangement depends above all on the existence of public utility water supply and sewage network.

- Storage functions in simple cases can be met by mobile equipment, without separate storage rooms and in case of higher demand by different storage rooms /food-store, garderobe, etc./.

Further differentiation of dwelling functions can result due to increased requirements. A change in the way of life and higher living standard creates new demands, such as:

- independent work-places for different household functions;
- living room, for social and family gatherings;
- hobby-room for do-it-yourself work;
- separate studio for work and study.

Obviously, these requirements mean bigger flats - and are in most cases already beyond the limits of the low-cost housing in its original sense.

STANDARDS AND REGULATIONS

Value and objectives of Standards and Technical Regulations

Though we wish to discuss the Hungarian practice with respect to standards, we start by quoting the "Canadian CSA Quarterly Review", which explained the value of standardisation as follows:

" First: it teaches. It sets ideals and quality levels for orientation of the manufacturers and consumer;

Second: it decreases the choice, storage stock, administration and, through these, general costs of manufacture and sale;

Third: it preserves. By establishing large-scale, mass production, it promotes more careful design, development of technology, more efficient control and, through these, it decreases waste;

Fourth: it certifies. The standards brand quality and the manufacturer can refer to this in his advertisements and the consumer can regard it as an accepted trade-mark, when buying."

In order to achieve those values, standards and technical regulations in general should

ensure security of life, health and material property

by quality control, improve quality

safeguard the interest of users

provide uniform technical basis for cooperation

provide technical solutions of economically efficient production tasks

assist technical development by expanding its results.

Further objectives of technical regulations in building and construction

The above objectives are valid for the construction sector as well. Nevertheless, building regulations are in a way different from those in general. Products of the construction industry are of high material and moral value and extended

durability. These circumstances call for special attention.

Further, buildings are parts of the environment of on everyday life. Aesthetical requirements can not be satisfied by regulations, but certain principal points should be included.

Harmonization of design and construction activity is a point we are striving for. Still, there are fundamental contradictions in these two procedures, which can not be overcome by mechanization, typified design and mass production either. This is another important field of regulations.

Construction activity - or at least the assembly process - is bound to the construction site. Unlike in a factory, the site predetermines the variety of contractors, materials, management and work methods - a variety, which calls for the great importance of technical regulations.

Regulation grades and methods

Rules and regulations have been created to advance and help technical development - and not to hamper it. Consequently, with the advancement of science and technology, they also should develop. On the other hand, the basic idea of a regulation must contain the principle of stability. There seems to be a contradiction in these two requirements, and this contradiction can be resolved only in the light of the difference in the grades and levels of regulations. Regulations referring to basic conceptions - and that means the highest grade of regulations - must be as long-lasting as possible and be considered as laws. These contain the most important requirements for safety, for the main functional requirements - both within the building and on a larger scale, etc.

Another important - and relatively permanent - group of regulations are the standards- some standards are compulsory, others may be mandatory. The compulsory ones are valid in all cases, whereas the application of the mandatory ones depends on the agreement of those participating in the building process. Standards refer usually to the quality of materials and components, test methods for the quality and functioning of products, selection and sampling of materials and products, methods of representation on plans and designs, definitions etc.

It is a commonplace that the rate at which technical development is advancing, is becoming faster. Therefore, great care must be taken that regulations should not slow down this process. In other words, over-regulating would be just as big a mistake as not regulating at all. This has lead to the approach of regulating more on the basis of requirements towards the performance of materials, components, buildings etc. then on the basis of codifying and freezing established technical solutions. This has a particular importance in developing countries, where the rate of technical development must be very fast, always new materials and methods have to be sought for, and the regulation should on one hand guarantee that the owner will get full and lasting value for his money, on the other hand there should be no limit to well founded innovations. The methods of the preceding tests and the document containing the necessary information and eliminating the risk of damages is a part of the regulation system.

We wish to give you a brief example, how this building regulation system is working in Hungary.

The highest grade is represented by the OESZ - the National Building Regulations. This contains rules with respect to the fundamental requirements towards buildings, safety

conditions, use of materials within and outside the building.

The Hungarian building laws, by-laws and building standards, also, is the set of specific rules and requirements for materials, products, building operations and procedures etc.

Quality requirements for the site work is laid down in the regulations for building contractors, also. Technical regulations, which are guidelines for the applications of new products and methods. After having gathered sufficient practical experience with them, they may become the basis of standards.

The hard core of the regulations

A technical regulation should always clearly define its purpose, its situation in the regulation hierarchy, the balance between the technical, social and economic requirements and the technical methods satisfying them.

All essential questions should be regulated, which are of importance to the performance of the product, but nothing should be included, that is irrelevant to it, and that would only create difficulties to the industry in achieving the required parameters or performance by a newer, cheaper, better, simpler process.

Some important groups of standards

Product-standards /building materials, building components/ and standards of quality control of products usually contain the following;

- description of the product;
- quality requirements /with regard to ratio of technical efficiency, interchangeability, durability and safety/;

- prescriptions related to quality control testing, prescription of testing methods and classification;
- ways of package, transport and storage, handling and manipulation.

Standards related to structural design of load-bearing structures of buildings contain prescriptions of statical requirements and calculations, limit-stages of structures, /design loads, ultimate loads, failure loads etc./ and peculiarities of structural materials to be taken into account, and dimensioning of structures /design of cross--sections/.

In Hungary a series of standards have recently been issued, with the title of "Statical Design of Load-Bearing Structures of Buildings", containing the following major standards:

- Basic requirements
- Loads and specific requirements of overground constructions
- Reinforced concrete constructions
- Prestressed and post-tensioned reinforced concrete constructions
- Concrete constructions
- Wall structures
- Steel structures.

Standards containing design directives of buildings form another significant group. In Hungary design standards of the building sector have been prepared for about fifty different building types - residential buildings, schools of primary education, schools of secondary education, kindergartens, nurseries, cinemas, restaurants, pharmacies, sport and recreational facilities, etc. - and the elaboration of some more has been started.

In the design standards for residential buildings and flats- among others the following are dealt with:

- size categories of residential buildings and arrangement alternatives of dwellings;
- size categories of flats and the rooms included;
- requirements for placing buildings;
- directives related to design of individual rooms /minimum floor area, main dimensions, ventilation, window area, etc./;
- requirements of building constructions /chimneys, load-bearing and wall structures, windows and doors/;
- requirements for mechanical installations /drinking water supply, sewage, gas-supply, heating, ventilation, electrical installations, built - in equipments/.

The design standards related to other building types have a similar system.

Other regulations related to execution of construction, assembly and installation works - on the basis of which the completed products of different building crafts and trades will be handed over to the owner, are also laid down.

In Hungary these requirements are not standards, but they are similar to them in their system and contents, bearing the name: Regulations for Execution of Construction, Assembly and Installation works.

These contain directives of different building crafts and trades, which in harmony with other authoritive, legal, and economic matters are related to the rights and obligations of partners concerned in their relations in technical matters. These regulations cover practically all trades of construction - their number is 90.

The Regulations order [illegible] of the executed work in [illegible] quality classes. According to these general rules of quality control, a work should be qualified following a [illegible] testing. As a result, the [illegible] should be reduced by 2 % in case of second class quality, and by 5 % in case of third class quality.

There are some further questions to be raised.

Certain new products, components and processes often are more advanced than those in the relevant regulations. Products and processes as novelties are allowed to be taken is use on the basis of special permissions in most countries. Permissions usually are granted for mass-produced industrial products and for processes, the experiences of which in use are favourable. It is the goal of the permission too to inform potential users about technical progress.

The procedure of permission varies in many countries, but its objective is always to protect users from the application of unsuitable or from low quality materials.

The permission document contains evaluated characteristics of the product, proposal for ways of use, and additionally informs about experiences of use, on which the evaluation of quality is based.

Special tasks of standardisation in low-cost housing

In the previous chapter, we have seen already that one of the most important and effective ways towards improving the efficiency of low-cost housing is the industrialization of the building industry. On the other hand, it has become apparent that efficient industrialization of the building industry is unimaginable without some kind of controlled dimensions.

Initially, different countries tried to elaborate modular co-ordination [illegible] own, but exchange of plan [illegible] showed that the work of modular co-ordination [illegible] by international organizations.

The International Organization for Standardization /ISO/ began studying modular co-ordination in the 1940s and circulated a draft proposal, the text of which was modified, based on opinions of member countries.

It is worth noting, that, while the conception of modular co-ordination was supported by every country, almost a decade passed before unanimous understanding was attained in the basic unit of the module. The majority of countries recommended 10 cm as the basic module, but the Anglo-Saxons found the 4 inch, and the inch-foot long measure suitable, and the Germans recommended the octometric module of 12.5 cm. Based on international agreements, the accepted basic module became M = 100 mm.

The Permanent Committee for Building of the Council of Mutual Economic Aid /SOMECON/ has dealt with modular co-ordination in the building industry since 1964 and, as a result of this, several basic recommendations of standardization /RGZ/ have been published. Several working groups of the Technical Commission of ISO, in "Building constructions" /ISO/TC 59/, elaborate recommendations of standardization based on modular co-ordination /ISO/R/.

The technical commissions of both ISO and SOMECON work in understanding with each other and it is owing to this that their jointly collated prescriptions of modular co-ordination were applied to both publications of international organizations /e.g. United Nations Economic Commission for Europe/ and to standards and technical regulations of member countries.

Due to lack of space, there is no possibility for reviewing the topic in details. Only some practical advantages of the system of controlled dimensions based on modular co-ordination are briefly summarized below:

Possibility of designing components with dimensions for universal usability for buildings of different purpose;

International exchange and usability of products and technical designs;

Decrease of the number of components with differing dimensions by the use of selected preferred dimensions;

Possibility of economical manufacture of large series by the decrease of the number of components with differing dimensions;

Economical prefabrication by the manufacture of large series and mass/production at off-site factories;

Greater accuracy of measurements by manufactures at off-site factories;

Less labour consumption, in the total building activity, by reducing on-site work;

Possibility of interchangeability of products made of different materials and having different constructions;

Favourable conditions for specialization in production, for co-operation and for unification of production equipment necessary for the manufacture of components;

More efficient international techno-economic co-operation.

It is obvious, that such special tasks as standardisation and modular co-ordination can be carried out only by institutions where qualified staff of specialists is working.

It is required that we also go to the next stage of our study, dealing with research.

THE CASE OF NATIONAL R-D INSTITUTIONS FOR LOW-COST HOUSING

The fact that a country is in the lower stage of development, means that we are dealing with, in which the building research was to exist has no, or only inadequate institutional systems to deal with the problems. Financing possibilities are also insufficient. The administration is usually obsolete, works slowly, and efficiency is hampered by age-old laws, customs, prejudices, rules. The technological isolation is paralysing the technological development.

On the other hand, there is an explosive need for housing. This need is very hard to satisfy, since the living standard and the earnings of the population are low, hardly sufficient for survival, and saving and capital formation is almost non-existent.

It is understandable, that under such conditions the society can assign very little financial support to research - if any. The importance and possible impact of research on low-cost housing is not seen, as research has no tradition yet, since it emerged only as a very feeble by-product of some University centres. Its human resources are also very meagre, since the financial return of the work done in construction industry is usually considerably higher. An additional problem is, that even this small amount of research is usually not directed towards the most important problems. Post graduate students, young scientists, if and when they return from their studies abroad - and due to the brain-drain, not so many return - and if they decide to work at a University and also to confine themselves to research, they usually prefer

to carry on with the type of work they started abroad, which is usually not the actual need of their country.

In understanding and dealing with this situation of the developing countries, it might be of use to see how building research has developed in Hungary and in other countries.

Research in the construction industry started in Hungary just in most other countries - in different way from the research in other fields of the industry. Though building is the most ancient occupation of mankind, systematic research in this field is one of the youngest - and still very week. Considering e.g. the funds used for research, it appears that in most industrialized countries various other sectors of industries spend more than 10 % of their turnover on research, in the construction industry only less then 1 % is spent. Why is that so? The main reason is that construction industry is much more scattered, than other /e.g. chemical, electronics, steel, etc./ industries. These industries - no matter, if they are private or national - are concentrated, the enterprises are powerfull, and since the market-competition forces them to develop their products by research, they are able to finance and organize that on their own.

In the building sector the majority of the construction activity is done by small local contractors. It is obvious that these contractors can not organize building research on their own. That is why the initiative and the leading role in building research is always taken by the public sector.

This was the case also in Hungary. Before the second world war, there were some laboratories which conducted building research - not on a very large scale, - and they all belonged to the public sector. /Technical University, Material Testing Institute of Budapest Municipality, etc./.

[illegible] Science has been founded, and has grown in the past almost three decades - together with other government sponsored research institutes of Building Economy and Organization, Silicate Industry, etc. - into considerable, well-equipped institutes.

We may say, that if building research is to be organized in developing countries, this can be done only by the Government.

[illegible] question in this respect. Since [illegible] building research institutes all over the world, [illegible] that a country at the very beginning of its development, with dramatically little [illegible] and technical [illegible] to cover the enormous need for housing, [illegible] of its meagre resources into research.

I think [illegible]. We know, that many of the problems existing in a developing country have already been dealt with - or even solved - in some other country. It is also known, that big research establishments of developed countries conduct very often studies which are of no immediate interest for their own conditions, but for the needs of developing countries. BRS in Britain is known to have carried out several such studies, but also other countries took such initiatives. E.g. in Hungary, a non-tectonic, labour-intensive gypsum-based building system has been developed, which is now promoted for developing countries through UNIDO. There is a possibility for the transfer of knowledge - and no need for the repetition of the work. But there is a condition for that: One should know about the work which has been already done, and have the apparatus and qualified people who can apply and adapt the results.

Therefore [illegible] the creation of small group for building research and information is a must for every developing country. The initiative should be taken by the Governments themselves. As for the funds, I think in the initial stage they should be covered by the budget - later maybe there could be a decree which would oblige contractors to pay a certain "Development Tax", which could be 0,5- to 1 % of their turnover, which would also entitle them to use the services of the organisation.

It would make no sense to go further in giving suggestions into the organisation of these groups. In many developing countries they exist already, and some of them do an excellent job. Others are now in the birth-stage. Conditions for their creation and work show a wide variety, and the optimum solution has to be found on the spot.

But I would like to stress once more the importance of developing a system by which all important and relevant information concerning work done in these fields in other parts of the world can be collected, screened, classified and stored for use. This is not a simple job, and the results of international cooperation - through international organisations - can be of great help.

Finally, some additional suggestions for research priorities in the field of low-cost housing.

What most developing countries urgently need in the field of low-cost housing is a minimal /shelter-type/ solution, in the shortest time possible, at a very low cost, with a long term financing, which will give a firm value, and which will satisfy the minimum requirements of quality, safety, durability, function, appearance and flexibility.

In order to achieve these aims, priority should be given to a number of fields, such as:

- Appraisal of <u>actual requirements</u> in order to define the physical and socio-economic environment and to propose the necessary changes.

- Improved construction technology, which makes possible the employment of unskilled labour for building better houses out of local materials and unskilled labour.

- Design of houses with improved <u>functional utility</u>, which ensure better indoor and outdoor hygienic environment.

- Increasing the <u>durability</u> of houses made of mud, reed, bamboo, thatch etc, through increased protection from rain and moisture.

- Research into construction with <u>drastically reduced cost</u> by use of locally available materials and improved traditional techniques, resulting in semi - permanent houses.

- Research into <u>thermal comfort</u>, resulting in the application of climatology to building design, taking into consideration local climatic conditions.

- Increasing the <u>speed of erecting</u> the houses, by adopting system building, modular coordination, standardization and partial prefabrication.

- <u>Country-wide survey</u> of natural, industrial and agricultural resources, which could serve for the production on local building materials.

- Develop technology for the use of <u>local building materials</u>, from natural resources /mud, laterite, reed, thatch etc./ industrial - and agricultural wastes, /fly-ash, blast furnace slag; etc/ to reduce material costs and improve parameters.

Conclusions

Summing up the results of our case study on the development of housing in Hungary, we attempt to compile some recommendations for developing countries:

- Housing needs of developing countries can be met only by working out and implementing a long-range plan.

- This work can and should be done by the proper institution of the developing country - no other developed country or international organization can do it on its behalf. Nevertheless, if the country does not have the institution yet, international help can be provided in establishing it.

- The institution has to assess all components which are to be considered in working out the long-range plan.

- Major components of the study which should get priority are the building material resources, labour resources, present stage of technology, financial resources, geographical conditions, required performances.

- When assessing the potential building materials, locally available mineral resources /volcanic and sedimentary/, agricultural by-products, and industrial wastes should be given high priority, and imported building materials should possibly be excluded.

- It should be considered, whether the potential building material resources can be used in their original form or they need to be processed. Investment requirements for the processing, energy consumption and labour requirements are to be assessed.

- Production /and transport/ costs of the materials should be considered versus technical parameters /strength,

thermal properties, stability, water absorption, frost resistance, compressive strength etc/.

- In studying the local resources, statistical data, demographical trends, overall economical plans, present and forecasted employment situation and availability of skilled labour should be considered.

- It should be assessed, how far traditional technologies, conventional technologies, rational technologies and /if any/ industrialized technologies are actually used both in urban and rural areas.

- Geographical regions of the country should be determined, in order to establish required performances for the houses, with respect to such parameters as thermal insulation, resistance to rain, storm, seizmic effects, frost resistance etc.

- The geography, road network and transport facilities of the country should be assessed, together with the location of building material resources.

- Considering the above mentioned and several other local conditions, the long-range plan for the gradual industrialization should be worked out.

- Each successive step of this development process should be supported by technical-economical analysis, and should be coordinated with corresponding development stages of the whole national economy and in particular with those of the related industrial branches.

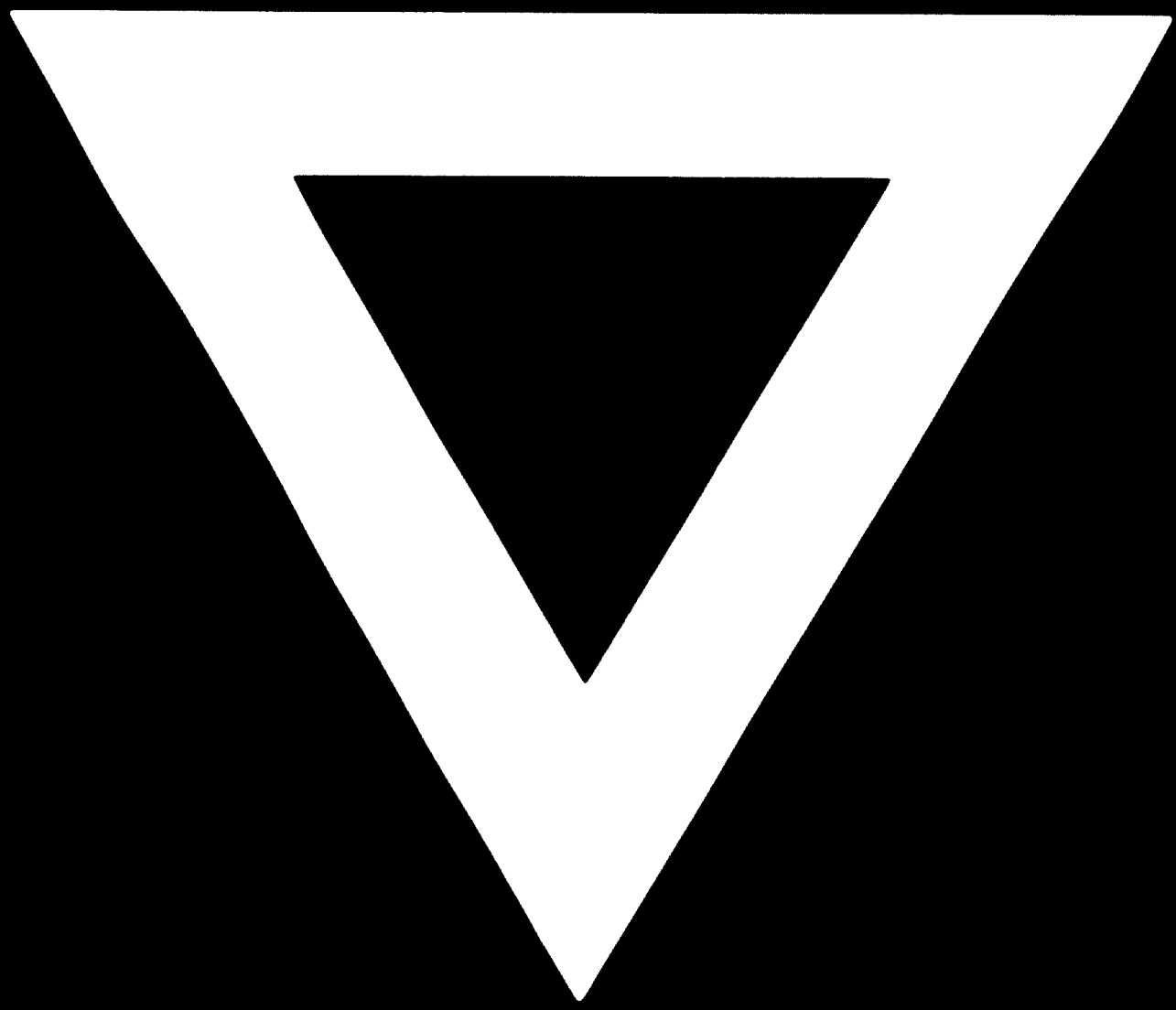
- There are good chances for the transfer of certain technologies already developed in other countries. In order to benefit from these possibilities, the institution dealing with housing should be able to collect and analyse

all relevant information concerning such technologies, and prepare its recommendations for the transfer.

- Industrialization involves an increasing use of mechanical equipment - starting from the simplest tools, - and progressing gradually towards the application of more developped machinery. Right from the beginning, the regular servicing and maintenance of those should be taken care of.

- The long-range housing plan should have its built - in training component, providing sufficient training facilities at all levels - starting from managerial skill down to the level of training unskilled labourers.

- The long-range plan should be subdivided into shorter /5-5 years/ housing development plans, and co-ordinated with the general planning system of the national economy.



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