The neighbourhood as a basic unit in planning new towns and town extensions

Thesis presented to
The Swiss Federal Institute of Technology, Zürich,
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Accepted on the Recommendation of Prof. Dr. W. M. Moser
and Prof. W. Custer

Akerets Erben AG, Dielsdorf, October 1963
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Acknowledgment

The author is happy to take this opportunity of expressing his sincere thanks to Prof. Dr. Werner M. Moser, under whose guidance the work was carried out. Thanks are also due to Prof. Walter Custer for his helpful instruction.
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Introduction

The subject of this thesis is the addition of a further step to the analysis and the study of the neighbourhood unit principles. The aim is to discover the main guiding lines, concepts and data which could be recommended for use in planning an integrated residential neighbourhood taking into account the influencing factors and the relation of such a neighbourhood to the city pattern and to the regional pattern.

Problem

People always like to live in groups. Being social by nature, they usually seek the company of their fel lows by meeting in public places or religious or cultural buildings. The communal activities that they organize make of them a unified human community where each individual plays a part as a member of the community, and cooperates in favourable conditions for the benefit of all.

This natural instinct, the human need to live in groups, has been thwarted by the influence of the machine, the growth of populations and the sprawl of towns. Nowadays the individual has almost lost his relation with his fellow men and has become unknown in his community. Also lost to him are the communal, social and recreational activities which were natural, customary and common practice in old communities such as those in the middle ages. The individual has to a large extent become somewhat desolate, unhappy, dissatisfied and unrelated to his immediate environment.

Reformers such as Patrick Geddes and Lewis Mumford recognized (at the beginning of the 20th century) the physical and the social problems of the community. They pointed out that the dwelling is a unit in the community whose inhabitants need a social and recreational life beside their work. They also stated that the problem of overcrowding and unhealthy cities could only be alleviated when cities are considered in relation to the whole regional surroundings.

The neighbourhood unit principles emerged from the studies and concepts of these early reformers. The planning concept of the neighbourhood unit is different from the "Siedlung" in the German sense. The difference between the neighbourhood unit and the "Siedlung" is that the "Siedlung" contains dwellings without a proportionate annex of the necessities of collective life. The neighbourhood unit comprises all individual and collective activities which a number of the population, say 1500 to 3500, can afford, whereas a "Siedlung" is only a housing scheme. Principally such a unit has a repetitive integrated character. It should be applied to the reorganization and the improvement of the city as well as its new extension.

Many discussions about the social and the physical character and the scale of the neighbourhood unit have taken place in various countries in the last forty years. It is essential to analyse the aspects of the neighbourhood unit of pioneers such as Perry in the U.S.A., Reichow and May in Germany, Steiger and Egli in Switzerland, Syrkus in Poland and Bakema in Holland - before recommending the main lines for providing a healthy living environment. It is also essential to analyse the new contributions to neighbourhood planning such as 'The Hook Town' planning principle and that of the 'Dynapolis' of C.A.Doxiadis.

In treating the problem of our residential neighbourhoods the following points should be kept in mind:

1. The neighbourhood unit (being considered as the immediate living environment), affects the development of the human being physically, mentally and socially.
2. Planning and architecture of the neighbourhood reflect the contemporary social and economic systems. The character and extent of such reflection should affect the planning and the architecture of the neighbourhood in two ways:
   a) general universal human progress,
b) local, having a certain colour characterising the environment itself, i.e. with regard to tradition, local habits, natural influences, standard of living, materials and local constructional methods.

3. The study should proceed in two directions:
   a) analysis of the general human needs in the evolution of contemporary life,
   b) analysis of the detailed needs of the individual in the local environment.

4. The planning process is a complex team operation and requires intimate collaboration between the sociologist, economist, financial authorities, planner and local architect.

5. Analytical planning of the neighbourhood should be done from different points of view, considering the neighbourhood as a social unit as well as a functional unit:
   a) as a social unit, aiming to form social groups within the residential area,
   b) as a functional unit, where activities and communal institutions are provided to serve the inhabitants as educational, cultural, municipal, commercial and recreational amenities.

   (It should be stated that any residential area of a size determined by the communal institutions cannot be considered as a neighbourhood unit unless this area has the character of a social unit where the inhabitants consider themselves as neighbours and where community feeling can be observed.)

6. To assure a workable whole, the residential neighbourhood should be planned as a basic unit of which the organism of the town and its extension is constituted. This means that the elements of the neighbourhood unit must be planned with respect to the requirements of the town and the region; it should be integrated with the regional plan and the master plan.

7. Solutions for neighbourhood planning should be dynamic and not static, i.e. the time factor should be taken into consideration and the solution should be such that it can develop itself naturally without serious problems.

Method

The thesis is presented following an analytical method in three parts.

Part I includes an analytical study of theoretical neighbourhood planning, classified in two categories:
   a) the neighbourhood as a unit of a community related to a city, Here we analyse the neighbourhood planning aspect and standards derived from the project of a community unit at Dessau, Germany, studied by R. Steiger and the CIAM group of Switzerland, 1953. The community was planned within a certain hierarchy and system of units based on the relation of the number of children of school age to the total number of inhabitants of the community. The CIAM group of Switzerland fought for this concept against the other residential schemes at that time which were usually planned without a clear system.
   b) the second category is the neighbourhood as a unit of a community largely self-contained, not directly related to the city but considered to be its future extension. Here the two projects of Alexanderpolder, Rotterdam, Holland, are analysed. They show a development of neighbourhood planning ideas (1953 to 1956). The two ideas presented are mainly based on consideration of the neighbourhood as a basic unit in planning.

Comparing the two planning systems of the two categories, we find that the project at Dessau is characterized by the integration of the units with each other, while the projects of Alexanderpolder are characterized by the clear separation between the neighbourhood units.

Part II includes an analytical study of actual schemes based on neighbourhood planning classified in two categories:
   a) the first category is the neighbourhood as a unit of a metropolis of more than one million inhabitants. The general zoning plan of Warsaw, 1949 to 1950, is analyzed. It is based on a system of neighbourhood units of a number of inhabitants who can support two primary schools. Kolo neighbourhood, designed by Profs. Helena and Szymon Syrkus, 1947 to 1950, is taken as an example of the post-war development. The views of Prof. Syrkus 10 years after the experiment at Kolo are also discussed as applied to a project (Mlociny neighbourhood) worked out at the Warsaw Institute of Technology under his guidance.
   b) This chapter includes an analysis of the neighbourhood standards recommended in Poland, 1961 to 1965, which are compared with the standards deduced from Kolo and Mlociny neighbourhoods.
The second category is the neighbourhood as a unit for the extension of a district including a number of towns of total population about 100000. Here the extension scheme of ‘Noord-Kennemerland’ is provided as an example. The extension plans were studied (1959) by Van den Broek and J.B. Bakema who were commissioned by the municipalities of the towns at ‘Noord-Kennemerland’ in 1957. The scheme shows one of the latest developments of neighbourhood planning worked out by the designers and is compared with the earlier schemes analyzed in Part I. The general conception of the plan which is discussed in this chapter is based on the idea of the ‘living unit’. We select here the community south of Alkmaar (about 50000 people) to be studied analytically. It is based on a system of neighbourhood units of 7000 to 10000 people. The units are sub-divided into 2 or 3 living units. The general plan of the community is characterized by a ribbon system with more compact grouping of neighbourhoods about a longitudinal centre.

Part III includes two planning principles. The first is the planning principle of the ‘Dynapolis’, ‘the city of the future’ – a theoretical study of the city by a Greek planner, C.A. Doxiadis, 1958, ‘who put out some basic principles for the city of the future – unity of purpose, hierarchy of functions, freedom to develop dynamically, building of the city in various different scales’ – which are discussed in detail in this part. An interesting application of the theory of Doxiadis is presented. This is the general plan of Baghdad, Iraq, (plans finished 1958) with analysis of sector No. 10. (Population about 6000 people). The second planning principle is that of Hook Town, the new satellite town proposition south-west of London (plans finished 1960), providing for 100000 inhabitants. Such planning is a contribution to the neighbourhood unit principles. It is based on the results of twenty years of practice in neighbourhood planning in England. Such an example is provided in this part because it also sheds light on the considerations and recommendations which should be kept in mind when planning our communities.

In the aforementioned three parts stress is laid on:
1. Discussing and comparing the different aspects in solving neighbourhood problems.
2. The different functions and component factors of the neighbourhood are analyzed – residential, social, cultural, commercial, recreational, public greens and circulation.
3. Analysis of neighbourhood standards, densities, etc.
4. Critical comparison and contrasting of the different planning concepts and schemes.

In the conclusion to the analytical study a proposition by the author is made for the reconstruction and the future extension of Cairo (3350000 people according to 1960 census), based on community and neighbourhood planning. A hierarchical structure for the city is proposed which underlies the design.

The material and aspects discussed in this thesis have been mostly collected by means of direct contacts and personal interviews with the personalities and authorities who studied such schemes and to whom I am very grateful:
Mr. Werner Aebli, Zürich,
Mr. Bakema, Rotterdam,
Dr. Lucius Burckhardt, Basel,
Dr. C. A. Doxiadis and associates, Athens,
Prof. E. Egli, Zürich,
Prof. Fred Forbat, Stockholm,
Prof. Ernst May, Hamburg,
Dr. R. Steiger, Zürich,
Prof. Sulikowsky, Warsaw,
Prof. Helena and Szymon Syrkus, Warsaw.

<table>
<thead>
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<th>English terms and definitions</th>
<th>German terms</th>
<th>French terms</th>
<th>Arabic terms</th>
</tr>
</thead>
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<tr>
<td>1. Floor area per person = Area of floors Number of inhabitants</td>
<td>Die Wohnfläche pro Person</td>
<td>Surface habitable par personne</td>
<td>الساحة السكنية للفرد الواحد</td>
</tr>
<tr>
<td>2. Number of inhabitants per flat = Number of inhabitants Number of flats</td>
<td>Die Bewohnungsziffer</td>
<td>Nombre des habitants par appartement</td>
<td>عدد السكان لكل مسكن</td>
</tr>
<tr>
<td>3. Total area</td>
<td>Grundstückfläche total</td>
<td>Grandeur totale</td>
<td>مساحة الأندية الكلية</td>
</tr>
<tr>
<td>4. Total gross area of floors = Floor area per person × Number of inhabitants per flat (dwelling) × Number of flats</td>
<td>Die Bruttowohnfläche</td>
<td>Surface habitable brute</td>
<td>مساحة الأندية الكلية</td>
</tr>
<tr>
<td>5. Lodging coefficient = Number of inhabitants per house</td>
<td>Die Behausungsziffer</td>
<td>Nombre des habitants par maison</td>
<td>عدد السكان لكل منزل</td>
</tr>
<tr>
<td>6. Percent number of tenants (in each type)</td>
<td>Prozentzahl der Mieter</td>
<td>Pourcentage des habitants (par type)</td>
<td>عدد السكان لكل نوع</td>
</tr>
<tr>
<td>7. Floor area per unit</td>
<td>Bruttowohnfläche pro Wohnung</td>
<td>Surface habitable brute par maison</td>
<td>مساحة الوحدة السكنية</td>
</tr>
<tr>
<td>8. Occupancy ratio = Number of inhabitants Number of rooms</td>
<td>Wohnraumdichte</td>
<td>Nombre des personnes par chambre</td>
<td>كثافة السكان في الغرفة</td>
</tr>
<tr>
<td>9. Exploitation coefficient</td>
<td>Ausnutzungsziffer</td>
<td>Coefficient d'utilisation</td>
<td>نسبة استخدام الركز في البناء</td>
</tr>
<tr>
<td>10. Density = Number of inhabitants per hectare</td>
<td>Wohndichte</td>
<td>Nombre des habitants par ha</td>
<td>كثافة السكان لكل هكتار</td>
</tr>
</tbody>
</table>
Part I

Analysis of theoretical studies of the neighbourhood unit
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Chapter 1 The neighbourhood as a unit of a community related to a city

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Analytical study of a project of a residential community at Dessau, Germany, studied by the CIAM group of Switzerland, R. Steiger, 1933

1. Aim of project

The aim of this project was to find a system in planning the new residential communities. At that time, around the thirties, the residential communities were usually neither planned on a clear planning system nor complete enough to meet the necessary human needs. At the third meeting of CIAM (Congrès Internationaux d'Architecture Moderne, founded in 1928), in Brussels, 1930, there arose the question of how to organize whole groups of dwellings into neighbourhood units in such a way that human needs could be satisfied. In 1933 the CIAM group of Switzerland proposed a design of a project of a residential community at Dessau, Germany, breaking up the whole area into residential units, each with its own basic needs and services.

2. Relation of the residential community to the city of Dessau

The site was chosen between two important highways connecting the residential community to the city (about 2 1/2 km) and to the industrial zone (about 5 km) to the east. A main intention was to isolate dwellings from factories by means of the river Elbe and the wood east to the city as well to provide easy and direct access to places of work, fig. 1.

3. System of units, sizes and controlling elements

(see diagram and table page 14, fig. 2)

The system of units is mainly based on the relation between the number of children of school age to the total number of inhabitants. This relation is analyzed as follows:

a) 'For 3000 inhabitants: one kindergarten class, 35 children and a play-lot (6 m² per child = 210 m²)'.

This means that one kindergarten class of 35 children (1.15%) represents 3000 inhabitants who support the kindergarten and compose the residential unit population.

b) 'For 3800 to 4000 inhabitants: a primary school, average 10 classes, 35 to 40 pupils per class and a playground (total area = 10000–12000 m²)'.

The primary school pupils (9%–10%) represent 3800 to 4000 inhabitants who support about 10 classes of the school and compose the neighbourhood unit population.

c) 'For 7000 inhabitants: a secondary school, average 10 classes and a playground (total area = 10000–12000 m²)'.

The secondary school pupils represent 7000 inhabitants who support about 10 classes of such school and compose the secondary school neighbourhood population.

d) 'For 15000 inhabitants: one public building (Volkshaus) with bath, restaurant, cinema and meeting halls (area 20000–30000 m²)'.

This number of inhabitants also supports a sports field (30000 m²) and the public building and composes the community population.

Remarks

This classification of the residential area into units according to the size of population that can support the different school divisions, although it cannot be taken as a definite scale to determine the sizes of the units, gives basic data to start with in planning according to a certain system.
The conception of hierarchy is applied as shown in the diagram (fig. 2), each two residential units as well as each two neighbourhood units being integrated with each other. This conception makes it possible to:
1. increase density within the units,
2. give more chance for the inhabitants to benefit from a number of neighbourhood services of the same kind within walking distance, i.e. providing freedom in choice and circulation which is a basic instinctive need of the free human-being.

<table>
<thead>
<tr>
<th>Divisions and sub-divisions</th>
<th>Elements controlling</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 The residential unit</td>
<td>Kindergarten 1 class Play-lot</td>
<td>3000 inhabitants</td>
</tr>
<tr>
<td>2 The neighbourhood 'The basic unit'</td>
<td>Primary school 10 classes Playground</td>
<td>3800-4000 inhabitants</td>
</tr>
<tr>
<td>3 The secondary school neighbourhood</td>
<td>Secondary school 10 classes Playground</td>
<td>7000 inhabitants</td>
</tr>
<tr>
<td>4 The community</td>
<td>Sports field Public building (Volkshaus)</td>
<td>15000 inhabitants</td>
</tr>
</tbody>
</table>
4. Roads system

Roads (not including footpaths) = 11%.

Fig. 3 A diagram showing the principle of the roads system in the project of the residential community at Dessau, Germany, 1933, designed by R. Steiger and the CIAM group of Switzerland.

The main considerations which governed the layout of the traffic system are:

a) Keeping the whole residential area as a closed community, not allowing highways to cut through.

b) No interference between motor traffic and pedestrian traffic.

c) A main artery of circulation 10 metres wide passing through the unit connecting the two highways north and south in two connections on one level.

d) A driveway 7 metres wide forms with the main artery a loop shape surrounding the central area keeping it free from motor traffic.

e) Two driveways 7 metres wide branch from the loop shape, one serving the north zone and the other the south zone.

f) Access roads 5.50 metres wide branching from the driveways serving the residential units.

g) Parking areas (1%) are provided along the highways, artery and driveways, but not along the access ways. This makes it possible for cars to park along the peripheries of the central area and the residential units and to keep such area free from motor traffic.

h) Footpaths are of two kinds
1) footpaths leading to the housing units and branching off from the access ways,
2) footpaths laid out freely penetrating the green area leading to the kindergarten, primary and secondary schools, sports field, public building (Volkshaus) and shops.
(See the diagram showing the principle of roads and traffic system, fig. 3.)

5. Zoning

The community was meant as a residential zone functioning only as a dormitory unit whose inhabitants ought to work at the city of Dessau and its industrial zones. The zoning pattern is an expression of the idea of hierarchy (fig. 2). The whole area consists of divisions and sub-divisions — neighbourhood units and residential units — focused on the primary schools and kindergartens; all are grouped about a centre zone serving the whole community.

* Calculations of neighbourhood parking are mentioned in page 19.
a) Centre zone (7.55%):

1) Layout: The centre zone is a preserved area kept free from motor traffic, surrounded by the loop formed by the main artery of circulation and the drive-way branching from it. A special parking area (4, fig. 5) is meant to serve the centre zone provided for about 140 cars (3500 m²).\(^7\)

\(^7\) Each car needs 25 m\(^2\) parking area including area of turning.
2) Functions:

<table>
<thead>
<tr>
<th>Gross area</th>
<th>Percent</th>
<th>Built-up area</th>
</tr>
</thead>
<tbody>
<tr>
<td>30000 m²</td>
<td>41%</td>
<td>—</td>
</tr>
<tr>
<td>2 Public building, cinema, assembly hall, restaurant, bath</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12000 m²</td>
<td>16%</td>
<td>3500 m²</td>
</tr>
<tr>
<td>3500 m²</td>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>

75000 m² 100% 5900 m² 8%

Remarks:

The centre zone, being without a main shopping centre, workshops etc., does not give enough possibilities for developing a social core. Shopping in a centre zone brings life into it and helps for social contact among the inhabitants. Also, when shopping, central and communal activities are combined together so as always to benefit from each other.

b) The residential zone (92.45%, including neighbourhood greens and services):

The community consists of four neighbourhood units. The size of the community was meant to be 15000 inhabitants, and with area of 100 ha, overall density 150 p/ha, with average 2488 dwellings, i.e. of overall density 25 dwellings/ha.

Grouping and general layout: The main factors which governed the zoning, types and grouping of dwellings are:

1) The relation of the number of unmarried people to the married. According to the analysis of Dr. Steiger, 1933, 70% of the population should live in horizontal flats (1 to 4 floors) while the other 30%, being unmarried, may live in vertical point blocks of 10 floors. Accordingly the zoning and layout plan (fig. 4 and fig. 7) express the following relation:

a) Horizontal rows of dwellings (1 to 4 floors) (330 p/ha net housing area covering 31.8 ha, i.e. about 70% of the total net housing area, 0.66 plot ratio, 53 p/house lodging coefficient) are grouped together provided for families, who form the majority of the population, being merely grouped about the kindergartens, the play-lots and the primary schools and the playgrounds.

b) Vertical point blocks of 10 floors are provided forming together a special zone around the centre. The point blocks cover an area of about 11.15 ha, i.e. about 30% of the total net housing area, of density 400 p/ha and 1 20 exploitation coefficient. Both horizontal and vertical blocks are laid out having a uniform orientation east west providing sun the whole day which is preferable especially in north Europe. It is to be generally noted that this layout was meant only to be a schematic expression of the planning analysis and not a developed architectural solution applied to the analytical research.

2) The second factor governing such grouping of dwellings is to provide a high density around the centre – a conception which is recommended from the social and economical point of view. This conception is now adopted in planning Hook, the satellite town of London (primary studies, 1960) for 100000 inhabitants, where 250 p/ha overall density is provided at the direct zone around the main centre, 175 p/ha at the next zone, and 100 pp/ha at the outskirts fig. 6.

(See also the detailed study of Hook Town principle in Part III.)

6. The neighbourhood unit

Neighbourhood standards. The neighbourhood unit standards derived from the project are as follows:

1. Size: The numerical population of the neighbourhood – the basic unit in planning the community – has been stated to range from 3800 to 4000, which as already mentioned (see page 13) is the number that can populate a primary school of 10 classes.

2. Area: The neighbourhood unit area is the primary school catchment area, which ranges between 20 and 25 ha.

3. Density: The neighbourhood unit density ranges between 160 and 190 p/ha – which expresses the zoning and layout plan of mixed development of horizontal and vertical grouping and the integration between the neighbourhood units.

4. Exploitation coefficient: According to the average area per person, which is 23 m², we get an exploitation coefficient (overall) ranging between 0.38 and 0.44.
Neighbourhood services. The standards deduced from the project are as follows:

a) Schools

<table>
<thead>
<tr>
<th></th>
<th>Number of children</th>
<th>Number of classes</th>
<th>Percent to population</th>
<th>Total area in m²</th>
<th>Area per child in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten</td>
<td>46</td>
<td>2</td>
<td>1.15 %</td>
<td>2000</td>
<td>43</td>
</tr>
<tr>
<td>Primary school</td>
<td>400</td>
<td>10</td>
<td>10 %</td>
<td>12000</td>
<td>30</td>
</tr>
</tbody>
</table>

The number of kindergarten children mentioned above is calculated according to the figure given by Dr. Steiger in his analysis (see page 13) in which he states that each 3000 inhabitants supports a kindergarten class of 35 children—a number which is not recommended by education authorities. The size recommended for a kindergarten class is 24 children according to the new regulations.

b) Shopping centre

<table>
<thead>
<tr>
<th>Gross sales area in m²</th>
<th>Number of families served</th>
<th>Gross sales area per family in m² (G)</th>
<th>Net sales area per family in m² (G)/1.25 = (N)</th>
<th>Gross sales area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400</td>
<td>1143</td>
<td>1.22</td>
<td>0.97</td>
<td>0.35</td>
</tr>
</tbody>
</table>

The gross sales area per family (1.22 m²) is not to be recommended now when compared to 2 m²/family according to the average European standards.9

* Parking areas for the neighbourhood shopping centre are not included in the calculation because it is within walking distance.
c) Neighbourhood traffic. Neighbourhood parking areas: Excluding the 3500 m² parking area serving the centre zone we can deduce the following standards for one neighbourhood unit.

### Parking areas

<table>
<thead>
<tr>
<th>Population served</th>
<th>Parking areas in m²</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
<th>Number of persons per one car</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000</td>
<td>1625</td>
<td>1.4</td>
<td>0.4</td>
<td>60</td>
</tr>
</tbody>
</table>

From the above table we see that considerations for parking areas are not to be recommended. In Germany it is recommended to calculate parking areas for residential neighbourhoods on a basis of four inhabitants to every motor car.¹⁰

### 7. Social and human aspects

1. Location of work places:

   Although no provision for work has been made within the community, the relation between the community and work places has been mainly observed and considered to be within close, easy and direct reach, as shown in the site plan (page 13). By such provision the inhabitants gain social, human and also economical advantages. We may list such advantages as follows:

   a) Saving of time and effort in the journey to work which takes only a few minutes, because the community is directly linked with work places by means of the two encircling highways (see page 15). People can benefit from the time thus saved in sports, social, cultural and recreational activities – if facilities for these are carefully provided within the neighbourhood or community environment.

   b) Social relations could naturally develop among the inhabitants if they meet each other on the way to and from work.

2. The neighbourhood core and sub-cores and communal activities with respect to ages:

   a) The neighbourhood primary school and its playground (12000 m², 30 m² per child) form the social core of the neighbourhood unit, the unit which could be recognized by the primary school child. Both are provided within 10 minutes walking distance for children. The playground (6000 m², 15 m² per child) is provided to serve children from 6 to 14 years old. Both the primary school and the playground can be reached without crossing the main artery of circulation – a principle which is considered to be applied to the four neighbourhood units.

   b) The neighbourhood kindergarten and its play-lot form the social core of the residential unit, the unit which could be recognized by the kindergarten children. Both are sited within 5 minutes walking distance (100–150 m) usually located centrally in the residential unit so as to be within the mother’s purview and within sight of the dwellings. The play-lot is provided to serve children less than 6 years old (210 m², 6 m²/child). In locating the kindergartens and the play-lots also, a principle has been respected in all the residential units: to eliminate the need to cross any motor traffic way.

   c) The neighbourhood shopping centre (see standards page 17): The four co-op shops which form the neighbourhood shopping centre are each planned to serve 1000 inhabitants.¹¹ The shopping centres are in principle intended to be distributed along the two highways north and south of the community. This is preferable for the delivery of goods, as well as for avoiding the penetration of trucks through the residential areas. Each neighbourhood shopping centre is within 5 minutes walking distance (400 m) – a distance which is usually recommended in planning. This neighbourhood shopping centre, not being located as one of the elements of the core beside the primary school, playgrounds and kindergarten, reduces the social quality of the core. Being isolated from the other elements and not being in the physical neighbourhood centre reduces also its economic value.
8. List of standards derived and method of calculation

1. Community areas

Community areas, in percent, per family and per person

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Residential (Net)</td>
<td>43</td>
<td>43 %</td>
<td>100</td>
<td>28.6</td>
</tr>
<tr>
<td>b) Public greens, recreation and open spaces</td>
<td>37.2</td>
<td>37.2 %</td>
<td>86.8</td>
<td>24.8</td>
</tr>
<tr>
<td>2 Greens</td>
<td>30.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Play-lots</td>
<td>0.105</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Playgrounds</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Sports field</td>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Community services</td>
<td>8.8</td>
<td>8.8 %</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>6 Kindergartens</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Primary schools</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Secondary schools</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Public building</td>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Shopping</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 11 Parking</td>
<td>1</td>
<td>1 %</td>
<td>2.21</td>
<td>0.66</td>
</tr>
<tr>
<td>e) 12 Roads</td>
<td>10</td>
<td>10 %</td>
<td>22.1</td>
<td>6.6</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100 %</td>
<td>232.11</td>
<td>66.66</td>
</tr>
</tbody>
</table>

Contents:
The residential community at Dessau, Germany, Dr. R. Steiger, 1933.

1. Community areas
2. Total gross area and net housing area
3. Number of inhabitants per dwelling
4. Number of persons per room
5. Lodging coefficient
6. Total gross area of floors
7. Floor area per person
8. Percent number of tenants
9. Percent of built areas
10. Density
11. Exploitation coefficient

Note: The whole community is studied analytically, being considered as one big neighbourhood unit (15000 inhabitants).
2. Total gross area and net housing area

a) Total gross area = community area excluding wood and highways

- Each square = 1 ha
- Total gross area = 100 ha

1. Kindergarten
2. Primary school
3. Secondary school
4. Sports field
5. Public building
6. Shopping

b) Net housing area = area of plots

- Net housing area (zone of vertical grouping) = 11.15 ha
- Net housing area (zone of horizontal grouping) = 31.81 ha
- Total net housing area = 42.96 ha
3. Number of inhabitants per dwelling

\[
\text{Number of inhabitants per dwelling} = \frac{\text{total number of inhabitants}}{\text{total number of dwellings}}
\]

Overall, both horizontal and vertical groupings

Total number of dwellings = 4,286 (density = 42 dwellings per ha)

\[
\begin{align*}
&\text{3.5 p/dwelling} \\
\end{align*}
\]

4. Number of persons per room

\[
\text{Number of persons per room} = \frac{\text{number of inhabitants}}{\text{number of rooms}}
\]

Overall, both horizontal and vertical groupings

\[
\begin{align*}
&\text{1.0 p/room} \\
\end{align*}
\]

5. Lodging coefficient

\[
\text{Lodging coefficient} = \frac{\text{number of inhabitants}}{\text{number of houses}} \quad \text{Number of inhabitants/house}
\]

<table>
<thead>
<tr>
<th>Blocks of flats</th>
<th>Point blocks</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of flats</td>
<td>10500</td>
<td>Number of flats</td>
</tr>
<tr>
<td>Number of blocks</td>
<td>199</td>
<td>Number of blocks</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
&\text{53 p/block} \\
&\text{145 p/block} \\
&\text{65 p/block} \\
\end{align*}
\]

Each figure = 10 persons
6. Total gross area of floors

Total gross area of floors = \( \text{floor area per person} \times \text{number of inhabitants per dwelling} \times \text{number of dwellings} \)

Overall, both horizontal and vertical grouping

\[ 345000 \text{ m}^2 \]

Check:

Total gross area of floors = \( \text{floor area per person in each type} \times \text{number of inhabitants in each type} \)

7. Floor area per person

Floor area per person = \( \frac{\text{total gross area of floors}}{\text{number of inhabitants}} \)

1. Horizontal
2. Vertical
3. Overall

\[ 20 \text{ m}^2 \text{ per person} \quad 30 \text{ m}^2 \text{ per person} \quad 23 \text{ m}^2 \text{ per person} \]

8. Percent number of tenants

Percent number of tenants in each type of grouping related to the total number of inhabitants

Horizontal grouping
Blocks of flats

Vertical grouping
Point blocks

70 \% \quad 30 \%
9. Percent of built-up areas

a) At density 150 p/ha (a comparison between horizontal and vertical grouping)

<table>
<thead>
<tr>
<th>Horizontal grouping</th>
<th>Vertical grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built-up area</td>
<td>15%</td>
</tr>
<tr>
<td>Roads</td>
<td>11%</td>
</tr>
<tr>
<td>Greens</td>
<td>74%</td>
</tr>
<tr>
<td></td>
<td>Built-up area</td>
</tr>
<tr>
<td></td>
<td>Roads</td>
</tr>
<tr>
<td></td>
<td>Greens</td>
</tr>
</tbody>
</table>

b) Net built-up areas = area of ground floors (housing, of each type)

1. Horizontal: at density 330 per ha
2. Vertical: at density 400 per ha

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Built-up area</td>
<td>33%</td>
</tr>
<tr>
<td>Greens</td>
<td>67%</td>
</tr>
<tr>
<td>Built-up area</td>
<td>12%</td>
</tr>
<tr>
<td>Greens</td>
<td>88%</td>
</tr>
</tbody>
</table>

c) Net built-up areas = area of ground floors (housing, types 1 and 2)

At density 350 p/ha

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Built-up area</td>
</tr>
<tr>
<td>Greens (plots)</td>
</tr>
</tbody>
</table>

Each square : 1 ha
10. Density

a) Gross density = \(\frac{\text{number of inhabitants}}{\text{total gross area}}\)

Mixed grouping, vertical and horizontal

Number of inhabitants = 15000
Total gross area = 100 ha

\[150 \text{ persons per ha}\]

b) Net density = \(\frac{\text{number of inhabitants (for each type of grouping)}}{\text{net housing area of the type of grouping}}\)

1. Zone of horizontal grouping
   Number of inhabitants = 10500
   Net housing area = 31.81 ha

\[330 \text{ persons per ha}\]

2. Zone of vertical grouping
   Number of inhabitants = 4500
   Net housing area = 11.15 ha

\[400 \text{ persons per ha}\]

c) Net density = \(\frac{\text{number of inhabitants (of the mixed grouping)}}{\text{net housing area (total 1. and 2.)}}\)

Zones of horizontal and vertical grouping

Net housing area (1. and 2.) = 42.86 ha

\[350 \text{ persons per ha}\]

Each figure = 50 persons  Each square = 1 ha

Total gross area = area excluding highways and wood
11. Exploitation coefficient

a) At density 150 p/ha (a comparison between horizontal and vertical grouping)

<table>
<thead>
<tr>
<th>Horizontal grouping</th>
<th>Vertical grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.30</td>
<td>0.45</td>
</tr>
</tbody>
</table>

b) Exploitation coefficient: gross floor area (each type) / plots (each type)

1. Horizontal: at density 30 p/ha
2. Vertical: at density 400 p/ha

<table>
<thead>
<tr>
<th>1. Horizontal: at density 30 p/ha</th>
<th>2. Vertical: at density 400 p/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.66</td>
<td>1.20</td>
</tr>
</tbody>
</table>

c) Exploitation coefficient: gross floor area (both types) / plots (both types)

At density 350 p/ha

<table>
<thead>
<tr>
<th>At density 350 p/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.805</td>
</tr>
</tbody>
</table>

Each square = 1 ha
Chapter 2

The neighbourhood as a unit of a self-contained community considered as a future extension to a city

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Analysis of community schemes at Alexanderpolder, Rotterdam, Holland, 1953–1956. A development of neighbourhood planning principles

1. Problem and aim

After the Second World War, the CIAM group (opbouw), Rotterdam, were engaged with the problem of the residential extensions of the city of Rotterdam. The group studied theoretical schemes which were developed and discussed through successive meetings. First a site was chosen in South Rotterdam, where Pendrecht schemes were planned (1948–1951) (fig. 11) and where the scheme studied by the city planning office of Rotterdam was executed (1954) – based on the experimental projects of the opbouw group. Later on another site was chosen, in the Alexanderpolder area where two schemes were studied (1953 and 1956) showing a further development on the former studies at Pendrecht. The schemes provided for (1948–1956) are mainly based on neighbourhood planning principles, handling – through such schemes – the different social conditions and the different physiological ways of living and visualizing the community as a living body in relation to the city.

Fig. 10. Rotterdam and its surroundings. The situation of the city of Rotterdam, Holland, being in direct relation to the North Sea, to Germany, Belgium and England, is a main factor for its life and its growth. The figure shows also the site of the Alexanderpolder projects 1953–1956.
The architectural and spatial grouping conceptions developed through such schemes are conceived as a means for providing a way of life in which the different needs of the human being are considered. In this chapter stress is laid on analyzing and comparing the two Alexanderpolder schemes of 1953 and 1956.

2. Site location and characteristics

a) Location
The chosen site is situated east of Rotterdam, about 12 km from the city centre, at the connections of the future highways Amsterdam–Belgium and England–Germany. According to the general plan and extension program of the city of Rotterdam the site chosen is among the areas reserved for the new residential extensions (fig. 11).

b) Characteristics of site
The Alexanderpolder area lies on the lowest Polder in Holland, six metres below sea level. Therefore there must be provision for keeping the area dry by means of pumps. The site chosen is flat, this being a general characteristic of Holland. Such a characteristic influences the architectural character and the spatial grouping as shown in the schemes provided, where roads as well as the housing blocks are always laid out uniformly as discussed in the next pages.

3. System of units, sizes and elements controlling (see diagram and table page 29)

The conception of the system of units proposed by the CIAM group (opbouw) is generally the same in the project of Pendrecht (fig. 16) and that at Alexanderpolder of 1953. The conception changed slightly in the project of 1956 in another aspect, as mentioned later on page 49).

Alexanderpolder 1953
The community is preplanned for 36500 inhabitants, i.e. 10000 families – a size which is generally determined for each community in Holland since the Town Planning Act of 1901. It includes 8 neighbourhood units of 4000 inhabitants each and 3 vertical units each of about 1500 inhabitants.

The size of the neighbourhood is determined by the number of kindergarten children and primary school pupils who together compose about 10% of the neighbourhood population.

The kindergarten includes two classes of about 24 children each and the primary school includes fourteen classes of about 35 pupils. To the neighbourhood unit are also related the daily use shops and work-shops.
Fig. 12 System of units, Alexanderpolder project of 1953. Idea of articulation is by the opbouw group, Rotterdam, transformed into a diagram by the author.

<table>
<thead>
<tr>
<th>Divisions and sub-divisions</th>
<th>Elements controlling</th>
<th>Number of inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  The residential unit</td>
<td>Play-lot Contact zone</td>
<td>400 to 600</td>
</tr>
<tr>
<td>2  Neighbourhood unit '6-10 residential units'</td>
<td>Prep and primary school Shopping centre, daily and weekly demands, workshops</td>
<td>4000</td>
</tr>
<tr>
<td>2' The vertical unit</td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td>3  The community '8 neighbourhood units and 3 vertical units'</td>
<td>Schools centre Culture centre Main shopping centre, periodical demands Stadium Light industry</td>
<td>36500</td>
</tr>
</tbody>
</table>

Each neighbourhood is divided into 6 to 10 smaller units of 400 to 600 inhabitants. To the residential unit are related its garden and a play-lot for children.

Remarks

The neighbourhood units - as shown in the diagram fig. 12 - are clearly separated from each other, i.e. not integrated as in the project of Dessau discussed in the preceding chapter.

Such separation was meant to give a definite neighbourhood having a defined boundary. Besides, the neighbourhood centres are laid out in such a way that they could be integrated with each other as discussed on page 32.
The residential units are also clearly separated in the Pendrecht schemes, while in the Alexanderpolder scheme of 1953 the units are generally integrated and only partly not integrated.

The three vertical units are provided linking the neighbourhood units and giving the community a united character.

4. Traffic system (Community roads = 0.5%, Parking = 0.5%)

The traffic system (fig. 13) is classified as follows:

a) An express highway (to Amsterdam) connected on two levels with the main artery serving the community. The highway is also designed to serve other future successive repeatable communities as shown in the site plan (fig. 11).

b) Main arteries of circulation 7.50 metres wide usually encircling the neighbourhood unit and defining its boundaries.

c) Driveways 5.50 metres wide encircling one or more residential units.

d) Cul-de-sacs 3.00 metres wide branching from the main arteries or driveways serving the residential units.

e) Access ways branching from driveways or the culs-de-sac serving the different housing blocks.
Fig. 14 Bird's-eye view of a model of Alexander-polder project 1953 showing the main centre and its relation to the neighbourhood units.

f) Parking areas are mainly distributed to serve the main community centre and the neighbourhood centres. The principle of providing garages on the ground floors of the housing blocks and under trees is taken into consideration. A garage for one car is provided for each single-family house.

g) A heliport covering about 1.5 ha is provided (h, fig. 13) mainly for security in case of overflow, laid out on the same level as the express highway.

Remarks

The main artery passes through the main centre of the community, dividing the cultural, shopping and schools centre zones. This is a draw-back, it being better to group all centres together in one zone, instead of such divisions, which reduce the social and economical quality of the community centre.

The large parking areas central to the centre zone are not happily located for parking, since they use up a large lost area in an important zone. Besides, cars lying like empty boxes in the central area are also a visual draw-back.

Footpaths are generally separated from heavy traffic in the neighbourhoods, but school-children in the neighbourhoods are obliged to cross the main artery of circulation – which is not a happy solution in the general layout.

5. Zoning

The community is meant to be a largely self-contained residential extension to the city of Rotterdam, providing possibilities for work within the community and provisions for daily and periodic demands.

Fig. 15 View from north showing the neighbourhood units and the vertical units of 15-storey at the central area.
a) Centre zone (16.3%, of total area)

i) Layout: The main principles which governed the location and layout conception of the centre zone as shown in fig. 17 are:

To be near the express highway, so as to be directly connected with the city – since it includes elements of city functions such as industry, administration, offices, hotels, a stadium and a bath, which are all meant to serve Rotterdam as well as Alexanderpolder district.

The industrial zone, the main shopping centre, the sports and recreation zone, the cultural and the schools centre zones are grouped together, forming the centre zone of the community. Such grouping of the zones of different centre functions is a good way of providing a busy living community core.

In the general layout conception, the neighbourhood centres are connected with each other and with the main centre of the community – forming all together one general whole as shown in sketch A. This idea gives the neighbourhood centres an urban quality besides creating an intimate neighbourhood core. This could be further developed and recommended in neighbourhood planning.

ii) Functions

<table>
<thead>
<tr>
<th></th>
<th>Area in ha</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>Schools centre</td>
<td>5.0</td>
</tr>
<tr>
<td>17.4%</td>
<td>Cultural centre</td>
<td>3.0</td>
</tr>
<tr>
<td>22.6%</td>
<td>Shopping centre</td>
<td>4.28</td>
</tr>
<tr>
<td>30%</td>
<td>Light industry</td>
<td>5.0</td>
</tr>
<tr>
<td>100%</td>
<td>Sports centre</td>
<td>21.65</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>38.93</td>
</tr>
</tbody>
</table>

Diagram shows the relationship between the areas of the different functions at the community's centre-zone.

The areas of the neighbourhood units services and the community services compose together about 17% of the total community area. The neighbourhood units account for 56% of such services, the community centre zone for 44%, as shown in the diagram below.

<table>
<thead>
<tr>
<th></th>
<th>Area in ha</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Community services at centre zone</td>
<td>17.28</td>
</tr>
<tr>
<td></td>
<td>Neighbourhood units services</td>
<td>21.20</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>38.48</td>
</tr>
</tbody>
</table>

The diagram shows the relationship between the community services and the neighbourhood units services.

From the above data we find that in this project about 38.48 m² has been reserved for community services for each family, i.e. about 10.6 m² for each person¹⁵.

¹⁵ See pages 41, 64, and comparative list page 178.
b) The residential zones

62% (including neighbourhood services and greens)
40% (net housing areas).

The 8 neighbourhood units and the 3 vertical units compose the residential zones of the community, about 62% of the whole area. The net residential zones, i.e. the net housing area, compose 40% of the whole community, while the remaining 22% are reserved for neighbourhood greens, roads and services.

The community population ought to be – as already mentioned – 36500, i.e. 10000 families, of overall density about 160 p/ha, i.e. of about 43 dwellings/ha.

Fig. 16 (1:15000) Pendrecht scheme, the second experimental project of 1951, opbouw group, Rotterdam. The community has been planned for about 16000 population, including four neighbourhood units clearly separated from each other, each including 6 to 8 residential units which are typically repeated causing monotony.

a) Horizontal housing unit of 10 storeys for single persons
b) Apartments with offices and consulting rooms for doctors, dentists, architects, etc.
c) Small enterprises (motor- and bicycle repair shops, etc.)
d) Kindergarten
f) Neighbourhood park and gardens
g) Neighbourhood park and gardens
h) Playground
k) Core
A) Community shopping centre
B) Large industrial buildings
C) Rentable factory premises
D) Industrial buildings
E) Offices, library, auditorium
F) Kindergarten
G) Primary school
H) Vocational schools
K) Green belts
L) Public gardens
M) Core
N) Youth centre
O) Churches
Q) Access road to the district

Grouping and general layout

The community includes a mixed development of different-sized dwellings (ranging from one to five rooms) grouped in horizontal and vertical blocks. The neighbourhood units include 3- to 5-room dwellings grouped in single-family houses, 1- or 2-storey and 3- or 4-storey blocks, 3 x 2-storey maisonnettes, and 10-storey blocks, while the 3 vertical units of 15 floors which are located at the central area include 1- to 3-room dwellings.

The 1- or 2-storey single-family houses are either detached or attached in rows as shown in table 1, page 36; 9% of the community population ought to live in these houses, which cover an area of about 17.1% of the net housing area.

The 3- to 6-storey blocks cover about 67.2% of the net housing area and ought to include about 70% of the community population.

The 10- to 15-storey blocks cover about 15.7% of the net housing area; the sixteen 10-storey blocks ought to include about 8.7% of the population while the three 15-storey blocks ought to include about 12.3%.

The main aim in planning this community has been the forming of an organism for the residential zones without falling into monotony – as happened with the Pendrecht experimental schemes (1946 to 1951, fig. 16) where the monotony caused by the repetition of the residential units is a visual draw-back.

Here the monotony – as regard the community as a whole – is generally less, but in the individual neighbourhoods the monotony still exists especially neighbourhood II, III and VIII, fig. 17.

The different layouts of the neighbourhood units are designed to give each a special architectural character. In addition, providing similar blocks distributed all over the neighbourhoods generally gives the whole community a united character.

From the layout plan we also see that 3 neighbourhood units are typically repeated; the planners were led to this because of the system based on the clear separation of the basic units of the neighbourhoods from each other.
6. The neighbourhood unit

Neighbourhood standards

Here we derive the standards from neighbourhood number VII (page 34), which is selected for analytical study.

1. Size: The population is about 4000; this number is proposed because it provides a unit to which schools, shops and workshops can be related.

2. Neighbourhood areas: The neighbourhood area is about 16 ha surrounded by wide greens defining its limits. The area contains 50.6% net housing area; 24.5% is reserved for neighbourhood greens, 13.6% for neighbourhood services, 3.3% for parking and 8.0% for roads. Each family is allocated about 159.1 m² from the total neighbourhood area, i.e., about 44.1 m² belongs to each person (see table III).

3. Densities: The overall neighbourhood density is about 250 pp/ha, i.e., about 65 dwellings/ha, while the net density, i.e., over the net housing area, is about 123 dwellings/ha. Comparing the horizontal and the vertical groupings we find that the former includes 435 pp/ha, i.e., about 120 dwellings/ha, while the latter includes about 555 pp/ha, i.e., about 150 dwellings/ha.

18 The area calculated does not include the surrounding greens because these belong to the community greens.
4. Exploitation coefficient: According to the average area per person, which is about 23 m², the plot ratio at an overall density of 250 pp/ha is about 0.57. According to the average area per person in horizontal grouping (22 m² floor area per person) the plot ratio is about 0.95, and 1.88 in the vertical grouping (34 m² floor area per person), while at an overall net density of 445 pp/ha the plot ratio is about 1.02.

Comparing the above data with those derived from the project of the community at Dessau (page 13) we find that because of the high percentage of dwellings grouped in blocks of 3- to 6-storey flats (77.5%) and 10-storey flats (16%) the density and the plot ratio are comparatively high. This is also due to the neighbourhood area of 16 ha compared to 20 ha at Dessau supporting the same population (4000).

Fig. 18 Zoning plan of Alexanderpolder project of 1953.

Neighbourhood services
The standards derived from neighbourhood VII

a) Schools

The area reserved for the neighbourhood kindergarten is about 3600 m² which is attached to the primary school area of about 12000 m². As the kindergarten and primary school pupils compose about 10% of the neighbourhood population, i.e. about 400, we find that about 34 m² belongs to each.
<table>
<thead>
<tr>
<th>Alexanderpolder project 1953</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighbourhood unit number 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Table 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Single-family houses</td>
<td>2-storey single-family houses</td>
<td>4-storey blocks of flats</td>
</tr>
<tr>
<td>Grouping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plan of dwelling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale 1:4200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of rooms per dwelling</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Number of persons per room in each type</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Net area of dwelling in m²</td>
<td>59.50</td>
<td>64.50</td>
<td>75.00</td>
</tr>
<tr>
<td>108 incl. garage and terrace</td>
<td>108 incl. garage and terrace</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of tenants in each type</td>
<td>60</td>
<td>270</td>
<td>788</td>
</tr>
<tr>
<td>Number of dwellings in each type</td>
<td>12</td>
<td>54</td>
<td>256</td>
</tr>
<tr>
<td>Percent number of tenants</td>
<td>1.6%</td>
<td>7.4%</td>
<td>21.1%</td>
</tr>
<tr>
<td>Percent number of dwelling types</td>
<td>1.2%</td>
<td>5.3%</td>
<td>12.75%</td>
</tr>
</tbody>
</table>
The neighbourhood analysed includes a mixed development of dwellings of 3, 4 and 5 rooms as shown in the table. Studying the three types of dwellings we find that the number of rooms could be exceeded when the need arises in case of increase in the family. For example, types D and F with a living-dining room (24 m²). This conception of providing dwellings with a variable number of rooms is applied to all types in the whole community.

Planning flexibility with such different types of dwellings is a successful means of providing a neighbourhood planned to meet the different housing needs of the inhabitants, who can find different sizes of dwellings within their own neighbourhood without moving from it – which helps in developing a community.

In designing the dwellings one principle is applied to all types. The provision of a living-dining room with a corner for cooking instead of a separate kitchen. This principle – which is an American influence – gives the mother the chance to supervise her children and be among the family members or guests while cooking. It also leaves more room for the living quarter.

From the data derived from the neighbourhood analysed we find out that the majority of the dwellings are of the three-room type, which composes about 60.4% of the total number of dwellings. This type is grouped in 3- or 4-storey blocks (D, D', D'') and 10-storey blocks. The families who ought to live in such type compose 41.5% of the population, while the families who ought to live in the 5-room type compose 21.1%; the remaining 37.4% ought to live in 4-room dwellings. The 5-room dwellings compose 12.75% and the 4-room dwellings compose 26.95% of the total number of dwellings.

It is to be remarked that the neighbourhoods do not include small-sized dwellings of 1 or 2 rooms, which are grouped in the 15-storey blocks in the central area of the community.
b) Shopping centre

<table>
<thead>
<tr>
<th>Gross sales area in m²</th>
<th>Number of families served</th>
<th>Gross sales area/family in m² (G)</th>
<th>Net sales area/family in m² (G)/1.25 = (N)</th>
<th>Gross sales area/person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400</td>
<td>1110</td>
<td>2.16</td>
<td>1.72</td>
<td>0.60</td>
</tr>
</tbody>
</table>

The gross sales area/family (the planning coefficient) is about 2.16 m², which is about the figure recommended in Europe generally.\(^{17}\) (The area recommended per family is about two m².)

\(^{17}\) Revue Française No 62-63.

---

**Fig. 19.**
- a) The residential unit of radius about 75 m
- b) The neighbourhood unit VII of radius 250 m
  1. Kindergarten
  2. Primary school
  3. Neighbourhood shopping centre
  4. Play-lot
  5. Allotments
  6. Water course
  A. Single-family houses (4 rooms)
  B. Single-family houses, attached 2-storey (4 rooms)
  C. Blocks of flats 3- or 4-storey (4 or 5 rooms)
  D. D’ Blocks of flats 3- or 4-storey (3 rooms)
  E. Maisonettes 3 × 2-storey (4 rooms)
  F. Blocks of flats 10-storey

The figure shows a neighbourhood unit (VII) in the Alexanderpolder project of 1953. The neighbourhood core lies within maximum distance 450 m.

---

**Fig. 20.** Bird's-eye view from the east of a model of Alexanderpolder project, 1953.
Fig. 21 View (a) of neighbourhood number VII showing the mixed development of horizontal and vertical groupings.

Fig. 22 Types of neighbourhood roads
a ring road
b driveway
c cul-de-sac
e access way

7. Social and human aspects

1. Location of work places in relation to the community:
The community is connected with the city of Rotterdam and its industrial zone by the Germany–England highway and the railway to Hook of Holland (fig. 11), which leads directly to the industrial zone. As already mentioned, the city centre is about 12 km from the community, the industrial zone about 24 to 30 km. Therefore the percentage of the population who might work in the industrial zone of the city of Rotterdam would not have the chance to have their lunch at home or stay in the community long enough to benefit from and develop sports and the communal activities within the community and the neighbourhoods.18
2. Work provided within the community:
The provision of light industry within the community and the workshops within the neigh-
bourhood is a social aspect as well as an economic factor.
a) It leads the population, especially the women and children, to accept work as a daily
responsibility.
b) It gives the community as a whole an urban character and life, besides giving it better
economic conditions.
c) The percentage of population working in the community will generally reduce the
traffic load to the city.

3. The neighbourhood cores and the communal activities with respect to age-groups:
The neighbourhood core here does not lie in its physical centre. This is according to the
conception of laying out the centres with possible connections between them. The ben¬
efits of such location are:
a) It is possible for people going to their daily work to pass by the centre.
b) It creates an urban quality – being connected to the other neighbourhood centres and
the main community centre – as already discussed on page 32.
c) Encirclement by the 10-storey blocks, which we generally supposed to include young
people, who may give more activity to the neighbourhood centre.
d) The neighbourhood cores are located in such a way that the maximum number of pop¬
ulation would pass by it, especially on their way to work. This is to bring social and eco¬
nomical activity to the cores, and it helps to bring about natural contact between the
inhabitants, who are usually expected to take the same ways daily either to school, to the
shopping centre or to work (sketch A). This conception is applied better to the southern
neighbourhoods of the community than to the northern, where it is not carefully respected,
especially in neighbourhood VIII.

The disadvantages of such an arrangement in this project are:
a) that the school children – especially the kindergarten children – would not be within
the purview of the mothers;
b) children are obliged to cross the main artery of motor traffic;
c) the walking distance for the children is about 450 metres from the farthest dwellings –
such a distance could not be recommended for kindergarten children.

4. The residential unit is considered to be the intimate environment for its inhabitants.
It includes a common or garden meant as a contact zone which sometimes includes a
play-lot for children.

5. The mixed development of dwellings, being planned to include more rooms when the
need arises is a favourable solution to meet increases in family sizes. This fulfils the
housing needs of the neighbourhood's inhabitants and they are not obliged to move out
in search of new dwellings in another neighbourhood. This helps to provide a happy
social unit. (See remarks tables 3 and 4.)
### 8. List of standards derived and method of calculation

#### 1. Community areas

**Divisions of community areas in percent, per family and per person**

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area (incl. inner roads)</td>
<td>92.4</td>
<td>40%</td>
<td>92.4</td>
<td>26.0</td>
</tr>
<tr>
<td>b) Greens and open spaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Public greens 42.62 ha (incl. water courses)</td>
<td>78.27</td>
<td>34%</td>
<td>78.27</td>
<td>20.2</td>
</tr>
<tr>
<td>3 Stadium 8.0 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Sport fields 10.65 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Bath 3.0 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Allotments 14.0 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Community services</td>
<td>38.48</td>
<td>17%</td>
<td>38.48</td>
<td>10.6</td>
</tr>
<tr>
<td>7 Kindergartens 2.88 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Primary schools 13.2 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Schools centre 5.0 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Cultural centre 3.0 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Shopping centre 4.28 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Neighbourhood shopping 5.12 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Industry 5.0 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 14 Parking (excl. garages)</td>
<td>3.65</td>
<td>1.5%</td>
<td>3.65</td>
<td>1.1</td>
</tr>
<tr>
<td>e) 15 Roads (main arteries)</td>
<td>17.2</td>
<td>7.5%</td>
<td>17.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Total</td>
<td>230.00</td>
<td>100%</td>
<td>230.00</td>
<td>62.7</td>
</tr>
</tbody>
</table>
2. Neighbourhood areas
Divisions of neighbourhood areas in percent, per family and per person

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area</td>
<td>8.12</td>
<td>50.6%</td>
<td>80.8</td>
<td>22.4</td>
</tr>
<tr>
<td>b) 2 Neighbourhood greens and open spaces (including allotments 0.7 ha)</td>
<td>3.92</td>
<td>24.5%</td>
<td>39.0</td>
<td>10.8</td>
</tr>
<tr>
<td>c) Neighbourhood unit services</td>
<td>2.20</td>
<td>13.6%</td>
<td>21.8</td>
<td>6.0</td>
</tr>
<tr>
<td>3 Kindergarten 0.36 ha</td>
<td>4 Primary school 1.2 ha</td>
<td>5 Shopping centre 0.64 ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 6 Parking (excl. garages)</td>
<td>0.535</td>
<td>3.4%</td>
<td>5.3</td>
<td>1.5</td>
</tr>
<tr>
<td>e) 7 Roads</td>
<td>1.226</td>
<td>8.0%</td>
<td>12.2</td>
<td>3.4</td>
</tr>
<tr>
<td>Total</td>
<td>16.00</td>
<td>100%</td>
<td>159.1</td>
<td>44.1</td>
</tr>
</tbody>
</table>
3. Total gross area and net housing area

a) Total gross area = area of neighbourhood excluding wood 16 ha

b) Net housing area = area of plots 8.12 ha = 50.6%

1 Kindergarten  2 Primary school  3 Shopping  4 Wood

- 21% Single-family (1- or 2-storey)
- 70% Blocks of flats (3- to 6-storey)
- 9% Vertical blocks (10-storey)
4. Number of inhabitants per dwelling

Number of inhabitants per dwelling = \(\frac{\text{total number of inhabitants}}{\text{total number of dwellings}}\)

Overall, both horizontal and vertical groupings

Total number of dwellings = about 1004, density = 65–70 dwellings/ha

\[3.6 \text{ p/dwelling}\]

5. Number of persons per room

Number of persons per room = \(\frac{\text{number of inhabitants}}{\text{number of rooms}}\)

Overall, both horizontal and vertical groupings

Number of inhabitants = about 3640 (4000 is the average number proposed)

Number of rooms = 3550

\[1-1.1 \text{ p/room}\]

6. Lodging coefficient

Lodging coefficient = \(\frac{\text{number of inhabitants}}{\text{number of blocks}}\) = Number of inhabitants/block

Overall, both horizontal and vertical groupings

Number of blocks = 51 (including single-family and terrace houses)

\[80 \text{ p/block}\]

Each figure = 10 persons
7. Total gross area of floors

Total gross area of floors = the sum of gross area of floors in all types

Total net area of dwellings

Net area of dwellings in horizontal grouping = about 5.2091 ha
Net area of dwellings in vertical grouping = about 0.8400 ha
Total = 6.0491 ha

Net/gross = about 70%

Total gross area of floors

Gross area of dwellings in horizontal grouping = about 7.1958 ha
Gross area of dwellings in vertical grouping = about 1.3860 ha
Total = 8.5818 ha

8. Net and gross floor area per person

(Net, (gross) floor area per person = total (net), (gross) area of floors / number of inhabitants)

Net horizontal = 16 m²
Net vertical = 21 m²
Gross vertical = 34 m²
Gross horizontal = 22 m²
Net overall = 17 m²
Gross overall = 23 m²

9. Percentage of tenants

Percentage of tenants in each type of grouping and in each type of dwelling related to the total number of inhabitants

<table>
<thead>
<tr>
<th></th>
<th>1-2 floors</th>
<th>3-6 floors</th>
<th>10 floors</th>
<th>3 rooms</th>
<th>4 rooms</th>
<th>5 rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5%</td>
<td>77.5%</td>
<td>16%</td>
<td>60%</td>
<td>27%</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td></td>
</tr>
</tbody>
</table>
10. Percentage of built-up areas

a) At overall density 250 per ha
Both horizontal and vertical groupings

- Built-up areas (housing) = 12.5%
- Built-up areas (public buildings) = 2.2%
- Roads = 8.0%
- Greens and open spaces = 77.3%

b) Net built-up areas = total area of ground floors / net housing area
Horizontal at density 435 per ha
Vertical at density 555 per ha

- Built area = 25%
- Greens (plots) = 75%

- Built area = 19%
- Greens (plots) = 81%

c) Net built-up area at density 445 per ha
Overall, both horizontal and vertical grouping

- Built-up area = 24%
- Greens (plots) = 76%
11. Density

a) Gross (overall) density = \( \frac{\text{number of inhabitants}}{\text{total gross area}} \)

Mixed grouping, vertical and horizontal

Number of inhabitants = about 4000
Total gross area = 16 ha

250 persons per ha

b) Net density = \( \frac{\text{number of inhabitants (for each type of grouping)}}{\text{net housing area of the type of grouping}} \)

1. Zone of horizontal grouping 2. Zone of vertical grouping

435 persons per ha 555 persons per ha

c) Net density = \( \frac{\text{number of inhabitants (of the mixed grouping)}}{\text{net housing area (total 1. and 2.)}} \)

Zones of horizontal and vertical grouping

445 persons per ha

\( \uparrow = 50 \text{ persons} \) Each square = 1 ha
12. Exploitation coefficient

a) At density 250 per ha
Overall, horizontal and vertical grouping

b) Exploitation coefficient
\[ \text{Exploitation coefficient} = \frac{\text{gross floor area (each type)}}{\text{plots (each type)}} \]
1. Horizontal: at density 435 per ha
2. Vertical: at density 555 per ha

Each square = 1 ha
Black = built-up area
Hatched = total gross area of floors

1.02
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---

**Fig. 23** System of units. Alexanderpolder project of 1956, slight integration of neighbourhood units. Idea of system of units is by the opbouw group, Rotterdam, transformed into a diagram by the author.

<table>
<thead>
<tr>
<th>Divisions and sub-divisions</th>
<th>Elements controlling</th>
<th>Number of inhabitants²⁰</th>
</tr>
</thead>
</table>
| 1. The residential unit    | 1. Prep and primary school  
  2–3 play-lots  
  1. unit shops  
  2–3 contact zones | 3500 |
| 2. Neighbourhood unit      | 2. prep and primary schools  
  Shopping centre (daily and weekly demands), workshops | 7000 |
|   ‘2 residential units’    |                     |                         |
| 3. The community           | Schools centre  
  Cultural centre  
  Main shopping centre, periodical demands  
  Stadium  
  Light industry | 28000 |
|   ‘4 neighbourhood units’  |                     |                         |

² Theoretical maximum numbers according to 4.5 p/dwelling (see table page 55). According to 3.6 p/dwelling, which is the actual condition, the total number of inhabitants: 22500.
The project of 1956 came out with a structural distribution different from those of the former projects in the sizes of the units.

The basic unit is the neighbourhood, which is of about 7000 population instead of 4000 as in the project of 1953. This population of 7000 is grouped in two units to which are related one integrated centre, as shown in sketch A, including two kindergartens and primary schools, shopping centre and workshops. In the general arrangement of the units the neighbourhoods are also separated from each other, with slight integration by means of the single-family houses, which are grouped together forming a continuous zone along the central axis of the community.

To understand the system of units of the two projects of 1953 and 1956 we compare them as in sketches B and C.

**Traffic system** (Community roads = 4.1%)

The clear separation between motor traffic and pedestrian traffic is here one of the main characteristics of the project. The conception is:

a) that the ring road surrounding the community is meant to be the main road for motor traffic circulation of the community;

b) that it feeds the neighbourhood units from the north and south sides only, while the whole of the neighbourhood areas are kept mainly for pedestrian traffic;

c) that the major areas for parking and garages are sited at the outer neighbourhood limits, i.e. at the connections to the ring road (the motor traffic zone), in order to keep the cars from penetrating the community and the neighbourhood units.

d) The loop-shaped road branches from the highway surrounding and feeds the main shopping centre. From the loop there branches in turn an axial road central to the community, meant mainly for pedestrian traffic, passing through the neighbourhood unit centres. At the same time this axial road also forms a loop around the neighbourhood shopping centres, keeping such areas free even from bicycle traffic (fig. 24).
5. Zoning

The experiments of the opbouw group at the project of 1953 led them to work out a new zoning pattern conception as explained later on.

a) Centre zone (9.7%)

i) Location and layout: The centre zone is situated generally as in the former project, being at the connection of the highway to the community. The sports zone and the light industry are located here on the west side of the highway, and both are connected to the...
other centre zones by means of under-passes. The intention is to keep the shopping centre, cultural centre and schools centre – forming together a compact centre zone – nearer to the community than the sports and industrial zone.

Fig. 25 Zoning of Alexanderpolder project, Rotterdam, 1956.
The relation of the centre zone to the neighbourhood centres is here different from that in the project of 1953. All the neighbourhood centres, as well as the main centre of the community, are laid out on one central axis; such an arrangement is — in general conception — more effective than the arrangement in the project of 1953.

### ii) Functions

<table>
<thead>
<tr>
<th>Area in ha</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.72</td>
<td>25%</td>
</tr>
<tr>
<td>3.0</td>
<td>10%</td>
</tr>
<tr>
<td>4.28</td>
<td>14%</td>
</tr>
<tr>
<td>5.0</td>
<td>16%</td>
</tr>
<tr>
<td>11.0</td>
<td>35%</td>
</tr>
<tr>
<td><strong>31.0</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Diagram shows the relationship between the areas of the different functions at community centre zone.

The services at the centre zone and at the neighbourhood unit centres form together about 9.8% of the total community area. To the neighbourhood units are related 32% of such services, to the community centre zone the remaining 68%, as shown at diagram below.

<table>
<thead>
<tr>
<th>Area in ha</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.0</td>
<td>68%</td>
</tr>
<tr>
<td>8.0</td>
<td>32%</td>
</tr>
<tr>
<td><strong>28.0</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Diagram shows the relationship between the community services and the neighbourhood unit services.

To each family is allotted 43.8 m² of the total community services, for each person 12 m².

### b) The residential zones

(24.1% net housing area, 55.1% including neighbourhood greens and services)

The idea of the zoning pattern affected the overall density of the community as a whole, and also the neighbourhood units, as explained further on. The community is planned for about 6250 families, i.e. for about 22500 inhabitants. The total gross area including the agricultural land is about 290 ha, while excluding the agricultural land it is about 220 ha. The neighbourhood units cover about 55.1% of the total gross area, while excluding the area of the agricultural land they cover about 70% of the area, where the overall density is about 30 dwellings per ha.
Grouping and general layout

The four neighbourhood units are laid out according to the following system:

a) To be slightly integrated with each other – without losing the unity of each.

b) To be integrated with the agricultural land – this being designed as a solution for the monotonous and inactive relation between the neighbourhood units in the project of 1953 that was caused by the sharp separation between the units by the green belts (fig. 26).

c) To include mixed development of 1- to 5-room dwellings grouped in single-family houses – either detached or attached in rows, 3- or 4-storey blocks of flats, 3×2-storey maisonettes and 15-storey blocks. Here we see that the neighbourhoods also include small-sized dwellings of 1 and 2 rooms – as shown in table 2, compared to 1953 where only 3- to 5-room dwellings were provided while the 1- or 2-room dwellings were related to the vertical blocks at the central area.

*Fig. 26 (1:15000) General layout plan of Alexander-polder project, 1956, CIAM (opbouw) group of Rotterdam.*

1. Polder zone
2. Wood
3. Express highway
4. Ring road
5. Light industry
6. Sports centre
7. Cultural centre
8. Commercial centre
9. School centre
10. Neighbourhood centre
11. Multi-family houses
12. Single-family houses

I, II, III and IV are neighbourhood numbers, IV is studied analytically page 43.
d) All over the community, the percentage of single-family houses became smaller than the project of 1953, as explained on pages 45 and 68.
e) The general silhouette of the community, i.e. the zoning pattern of the heights of the dwelling blocks, is the opposite of that of the 1953 project. The provision of the vertical blocks on the outer community limits – instead of being grouped at the central area as at 1953 – aiming to define the limits of the community as a whole and the neighbourhood units as shown in sketches A and B. This idea is further developed and applied at Kenne-
merland scheme which is discussed on page 101, Part II.

6. The neighbourhood unit

Neighbourhood standards
(Neighbourhood number IV, page 52, is here selected to be studied analytically)

1. Size

The neighbourhood unit here forms the basic unit and also the major unit of the com-

munity. According to existing conditions, 3.6 p/family, the population is about 5650 to
6000. The residential unit – the sub-division of the neighbourhood unit – has about
2825 inhabitants, i.e. is 1/2 the size of the neighbourhood unit.

Considering the number of beds (4.5/dwelling), the size of the neighbourhood is about
7000 inhabitants, and the size of the residential unit about 3500 inhabitants. Accord-

ingly we can deduce that the size recommended for the neighbourhood unit would
range from 6000 to 7000 inhabitants. This is considerably larger than the former size re-
commended by the opbouw group, which was usually about 4000 inhabitants, as already
mentioned, page 28. (This size is further recommended and applied to Kennemerland
schemes, page 101, where it ranges between 7000 to 10000 inhabitants in 2 or 3 ‘living-
units’, each with about 3325 inhabitants, i.e. 950 dwellings, and considered to be the basic
unit of the community while the neighbourhood is considered to be the major unit.)

2. Neighbourhood area

The area provided for the size mentioned above is about 40 ha if we exclude the agricul-
tural land (6 ha). The net housing area covers about 15.5 ha (37.4%); greens and open
spaces including five play-lots (1125 m²) and contact zones (10000 m²) cover about
21.25 ha (54.1%); the neighbourhood services cover about 1.75 ha (4.7%) (which is con-
siderably smaller than the project of 1953, owing to the small area reserved for the neigh-
bourhood schools as discussed further on); while the roads cover only 1.5 ha, i.e. 3.8%
(which is here smaller than at 1953, being affected by the idea of layout, see pages 42
and 65).

The neighbourhood area per family is here recommended to be about 263 m², i.e.
72.8 m² per person according to existing condition (3.6 p/dwelling) while according
to the theoretical number of beds it is about 57.9 ha (see page 42), which is more
than the area recommended at Alexanderpolder project 1953. This is generally due to the
 provision of more open spaces within the neighbourhood area (31.9 m² per person com-
pared to 10.8 m² per person).

3. Densities

On the basis of the aforementioned data the overall density is about 40 dwellings per
ha, i.e. about 140 persons per ha; while theoretically (according to the number of beds
4.5/dwelling) it is 177 persons per ha as deduced from Neighbourhood IV, page 70.

Comparing the overall density with that in the 1953 project we find that it is less in the
earlier one owing to the large open spaces provided within the neighbourhood unit area.

But we find also that the net density in the 1953 project is higher than in this 1956 project
(128 dwellings per ha as compared with 100 dwellings per ha). This is owing to the in-
crease of the net housing area per family (98.8 m² per family for 1956 compared to
80.8 m² per family for 1953); also, accordingly, the net housing area per person is
27.4 m² and 22.4 m² respectively.

It should be noticed that when applying the zoning and layout conception, after a further
development, to the Kennemerland scheme (page 101) the net housing area recommended
per person is 21.0 m², which is about the same area as that recommended per person
for 1953 – therefore the net density also increases to 155 dwellings per ha, i.e. about
555 persons per ha, table 70.

4. Exploitation coefficient

According to the densities discussed above we find that the plot ratios are affected
relatively.

The overall plot ratio is here 0.41, which is about five times the built-up area (8.4%).
We notice here that the gross floor area per person has increased as compared with the project of 1953 (29.8 m² per person as compared with 23.0 m² per person). At the same time the gross floor area per person recommended according to the theoretical number of beds is 23.3 m², i.e. about the same area recommended for the existing condition of 3.6 p/dwelling.

Also the net floor area per person, on the basis of 4.5 p/dwelling, is here 17.0 m², which is the same area as that recommended at 1953 on the basis of 3.6 p/dwelling; while here for 1966 the net floor area increases to 21.0 m² per person, which is also recommended at the Kennemerland scheme discussed further on page 101.

Neighbourhood services
The standards derived from neighbourhood IV
a) Schools
The area reserved for the two neighbourhood schools is only about 10,000 m², i.e. 5,000 m² for each, which includes a kindergarten and a primary school. Considering that the number of children of such school-ages is about 10 to 12% of the neighbourhood population, we find only about 12 m² is reserved for each child, which is rather small.

b) Shopping centre

<table>
<thead>
<tr>
<th>Gross sales area in m²</th>
<th>Number of families served</th>
<th>Gross sales area per family in m² (G)</th>
<th>Net sales area per family in m² (G)/1.25 = (N)</th>
<th>Gross sales area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>2800</td>
<td>1568</td>
<td>1.78</td>
<td>1.42</td>
<td>0.31</td>
</tr>
</tbody>
</table>

The gross sales area per family (1.78 m²) is generally around that recommended in planning, but considering that the theoretical number of persons per family is 4.5, such area appears to be rather small.

7. Social and human aspects
1. The relation of the community to the city and places of work is already discussed in page 40.
   The provision of agriculture integrated with the neighbourhoods brings closer contact between the population and the countryside, which is here also considered as a recreational area besides being a place of work. The agricultural land could also supply the neighbourhoods with daily food requirements at cheaper prices, since transportation costs would reach the minimum.
   The provision of light industry and workshops within the community and the neighbourhoods is also considered – as in the former project of 1953 – as a social means of leading the population to accept work as a daily responsibility.

2. The neighbourhood cores and the communal activities with respect to ages:
   Here the cores are central to the unit, including two kindergartens and primary schools distributed in two areas, each serving one residential unit. The shopping centre is laid out midway between the school areas serving the whole neighbourhood unit.
   Studying the location of such neighbourhood core we find that:
   a) its central location to the unit also lies on the central axis of the community for contact with the other neighbourhoods and their cores forming together a living line along this axis.
   b) Studying its relation to the dwelling groupings we see that as shown in sketch A: the walking distance from the outer limit, i.e. from the vertical blocks is about 600 m which is rather far.
   The walking distance from the maisonnettes is about 400 m – a distance which is usually recommended by the planning authorities to neighbourhood shopping.
   Both distances – 600 m and 400 m – are long for children at prep-schools, and especially kindergarten children.
   The 3- or 4-storey blocks and the single-family houses are about 150 to 200 m from schools and shopping centre. This distance is recommended especially because such types of dwellings include generally the maximum number of kindergarten and school children.
c) The residential unit core: Two or three cores are provided for each residential unit, meant as contact zones for the cluster of dwellings grouped about each. The play-lots provided for the children one to eight years old are located at a far distance from such cores. By such location they (i.e. the children) are not under close enough supervision within reach and view of most of the dwellings.

It would have been better located as in sketch A, so as to be within sight of the dwellings and at the same time far enough away to avoid noise. (Neighbourhood play-grounds are not indicated in this project, but they are generally considered to be located between the neighbourhood units near the schools, as further studied at Kennemerland schemes, which are generally applications to the project of 1956.)

d) For the adults provisions for culture, amusements and sports activities are located at the main centre of the community, at about 15 minutes walking distance.

3. The neighbourhood unit includes here more differentiated sizes of dwellings, 1 to 5 rooms (compared to 3 to 5 rooms for 1953), which is more help in providing a non-monotonous social unit – including mixed age groups.

4. The mixing of classes within the neighbourhood units is recommended for both projects of 1953 and 1966, as expressed by the different types of dwellings (tables 3 and 4).
Alexanderpolder project 1966  Neighbourhood unit number 4

Type  Single-family houses

Grouping

Plan of dwelling

<table>
<thead>
<tr>
<th>Number of rooms per dwelling</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of persons per room in each type</td>
<td>1.2</td>
</tr>
<tr>
<td>Net area of dwelling in m²</td>
<td>324 including garage and terrace 79</td>
</tr>
<tr>
<td>Number of tenants in each type</td>
<td>84</td>
</tr>
<tr>
<td>Number of dwellings in each type</td>
<td>14</td>
</tr>
<tr>
<td>Percent number of tenants</td>
<td>1.2%</td>
</tr>
<tr>
<td>Percent number of dwelling types</td>
<td>0.8%</td>
</tr>
</tbody>
</table>
### Alexanderpolder project 1956  Neighbourhood unit number 4

#### Type
2-storey single-family houses (attached)

#### Grouping

<table>
<thead>
<tr>
<th>Plan of dwelling</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image.png" alt="Plan of dwelling" /></td>
</tr>
</tbody>
</table>

#### Number of rooms per dwelling
5

#### Number of persons per room in each type
1.2–1.6

#### Net area of dwelling in m²
113

#### Number of tenants in each type
400

#### Number of dwellings in each type
50

#### Percent number of tenants
5.7%

#### Percent number of dwelling types
3.2%
### Alexanderpolder project 1956 Neighbourhood unit number 4

**Type** 2x3-storey maisonettes

#### Grouping

![Grouping Diagram](image1)

#### Plan of dwelling

![Plan Diagram](image2)

#### Table

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of rooms per dwelling</td>
<td>4</td>
</tr>
<tr>
<td>Number of persons per room in each type</td>
<td>1.2</td>
</tr>
<tr>
<td>Net area of dwelling in m²</td>
<td>88</td>
</tr>
<tr>
<td>Number of tenants in each type</td>
<td>2610</td>
</tr>
<tr>
<td>Number of dwellings in each type</td>
<td>522</td>
</tr>
<tr>
<td>Percent number of tenants</td>
<td>37.22%</td>
</tr>
<tr>
<td>Percent number of dwelling types</td>
<td>33.3%</td>
</tr>
</tbody>
</table>
### Alexanderpolder project 1956 Neighbourhood unit number 4

<table>
<thead>
<tr>
<th>Type</th>
<th>4-storey blocks of flats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grouping</td>
<td><img src="image" alt="Grouping Diagram" /></td>
</tr>
</tbody>
</table>

**Plan of dwelling**

![Plan of Dwelling](image)

<table>
<thead>
<tr>
<th>Number of rooms per dwelling</th>
<th>4</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of persons per room in each type</td>
<td>1.2</td>
<td>1</td>
</tr>
<tr>
<td>Net area of dwelling in m²</td>
<td>70</td>
<td>58</td>
</tr>
<tr>
<td>Number of tenants in each type</td>
<td>1810</td>
<td>1086</td>
</tr>
<tr>
<td>Number of dwellings in each type</td>
<td>362</td>
<td>362</td>
</tr>
<tr>
<td>Percent number of tenants</td>
<td>25.81%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Percent number of dwelling types</td>
<td>23.0%</td>
<td>23.1%</td>
</tr>
</tbody>
</table>
Alexanderpolder project 1956  Neighbourhood unit number 4

Type  15-storey point blocks

Grouping

Plan of dwelling

<table>
<thead>
<tr>
<th>Number of rooms per dwelling</th>
<th>2-storey</th>
<th>3</th>
<th>2-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of persons per room in each type</td>
<td>1.2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Net area of dwelling in m²</td>
<td>83</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Number of tenants in each type</td>
<td>240</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Number of dwellings in each type</td>
<td>48</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Percent number of tenants</td>
<td>3.42%</td>
<td>0.34%</td>
<td></td>
</tr>
<tr>
<td>Percent number of dwelling types</td>
<td>3.1%</td>
<td>0.8%</td>
<td></td>
</tr>
</tbody>
</table>
**Alexanderpolder project 1956 Neighbourhood unit number 4**

**Type**: 15-storey vertical blocks

<table>
<thead>
<tr>
<th>Grouping</th>
<th>Plan of dwelling</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>The mixed development of dwellings in the neighbourhood unit To understand the conception which governed the design of the dwelling types of the Alexanderpolder project of 1956 we should look at table 1 which includes the dwelling types of a neighbourhood in the 1953 project. In the 1953 project the number of rooms was meant to increase as the need arose in case of increase in the size of the family. In the 1956 project, the conception is developed to provide enough rooms and beds to meet the increase of the number of persons per family. Therefore the theoretical number of persons per family is 4.5 instead of the given density 3.6 as in the 1953 project (see tables III and IV); keeping at the same time the number of persons per room at a humanly suitable density condition (1.1 to 1.2 p/room). The data derived from the neighbourhood analysed show that:</td>
</tr>
<tr>
<td>a) The percentage of single-family houses is here less than in the 1953 project (4% instead of 6.5%), the 2.5% being added to the blocks of flats.</td>
</tr>
<tr>
<td>b) The percentage of 4-room dwellings has increased to 56.3% from 27% in the 1953 project.</td>
</tr>
<tr>
<td>c) The percentage of 3-room dwellings has decreased to 37% (instead of 60% in the 1953 project).</td>
</tr>
<tr>
<td>d) The percentage of 5-room dwellings has decreased to 4% (instead of 13% in the 1953 project).</td>
</tr>
<tr>
<td>e) The neighbourhood includes here (1956) 0.4% single-room dwellings, 2.3% two-room dwellings which were not provided at the neighbourhoods of 1953.</td>
</tr>
<tr>
<td>f) Accordingly the percentage of population for the 4-room dwellings ought to be theoretically 63.12% (instead of 27%), i.e. the majority of the neighbourhood population, while the population for 3-room dwellings becomes 28.8%; for 5-room dwellings 6.9%, for 2-room dwellings 1.1% and for 1-room dwellings 0.08%.</td>
</tr>
<tr>
<td>From the above we can clearly understand the conception to meet the increase of population within the community as well as the neighbourhood, which is, as explained, more constructive in the 1956 project than in that of 1953.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of rooms per dwelling</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of persons per room in each type</td>
<td>1.2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Net area of dwelling in m²</td>
<td>98</td>
<td>50</td>
<td>27</td>
</tr>
<tr>
<td>Number of tenants in each type</td>
<td>780</td>
<td>72</td>
<td>6</td>
</tr>
<tr>
<td>Number of dwellings in each type</td>
<td>156</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td>Percent number of tenants</td>
<td>11.12%</td>
<td>1.11%</td>
<td>0.08%</td>
</tr>
<tr>
<td>Percent number of dwelling types</td>
<td>10%</td>
<td>2.3%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>
8. List of standards derived and method of calculation

1. Community areas

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
<th>TH</th>
<th>EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area (incl. inner NB roads)</td>
<td>70</td>
<td>24.1%</td>
<td>109.8</td>
<td>24.4</td>
<td>109</td>
<td>30.5</td>
</tr>
<tr>
<td>b) 2 Agricultural land</td>
<td>70</td>
<td>24.1%</td>
<td>109.8</td>
<td>24.4</td>
<td>109</td>
<td>30.5</td>
</tr>
<tr>
<td>c) Greens</td>
<td>106</td>
<td>37.2%</td>
<td>97.2</td>
<td>21.6</td>
<td>26.0</td>
<td></td>
</tr>
<tr>
<td>3 Open spaces including playgrounds and water courses</td>
<td>97 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Stadium</td>
<td>8 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Bath</td>
<td>3 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Community services</td>
<td>28</td>
<td>9.8%</td>
<td>43.8</td>
<td>9.7</td>
<td>12.1</td>
<td></td>
</tr>
<tr>
<td>6 Kindergartens and primary schools</td>
<td>4 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Schools centre</td>
<td>7.72 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Cultural centre</td>
<td>3 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Shopping centre</td>
<td>4.28 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Neighbourhood shops</td>
<td>4 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Industry</td>
<td>5 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) 12 Parking (excl. garages)</td>
<td>2</td>
<td>0.7%</td>
<td>3.1</td>
<td>0.7</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>f) 13 Roads (main only)</td>
<td>12</td>
<td>4.1%</td>
<td>18.8</td>
<td>4.1</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Total (incl. agricultural land)</td>
<td>290</td>
<td>100%</td>
<td>382.5</td>
<td>80.9</td>
<td>106.0</td>
<td></td>
</tr>
<tr>
<td>Total (excl. agricultural land)</td>
<td>220</td>
<td></td>
<td>272.7</td>
<td>60.5</td>
<td>73.7</td>
<td></td>
</tr>
</tbody>
</table>

TH = Theoretical, 4.5 per dwelling  EC = Existing condition, 3.6 per dwelling
2. Neighbourhood areas
Divisions of neighbourhood areas in percent, per family and per person

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
<th>TH</th>
<th>EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area</td>
<td>15.5</td>
<td>37.4 %</td>
<td>98.8</td>
<td>21.7</td>
<td>27.4</td>
<td></td>
</tr>
<tr>
<td>b) 2 Greens and open spaces</td>
<td>21.25</td>
<td>54.1 %</td>
<td>145.0</td>
<td>31.9</td>
<td>40.0</td>
<td></td>
</tr>
<tr>
<td>(including 5 play-lots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of total area = 1125 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and contact zones within</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the residential units of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total area = 10000 m²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Neighbourhood unit services</td>
<td>1.75</td>
<td>4.7 %</td>
<td>11.1</td>
<td>2.4</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>3 Kindergarten and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>primary school 10000 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Neighbourhood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shopping centre 7500 m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 5 Roads</td>
<td>1.5</td>
<td>3.8 %</td>
<td>8.9</td>
<td>1.9</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>40.00</td>
<td>100 %</td>
<td>263.8</td>
<td>57.9</td>
<td>72.8</td>
<td></td>
</tr>
</tbody>
</table>

TH = Theoretical number of beds, 4.5 per dwelling
EC = Existing condition, 3.6 per dwelling
3. Total gross area and net housing area

a) Total gross area = area of neighbourhood excluding agricultural land

40 ha

1 Kindergarten and primary school
2 Neighbourhood shopping centre
3 Agricultural land

b) Net housing area = area of plots

15.5 ha
37.4%

- 16% Single-family houses 1- or 2-storey
- 71% Blocks of flats 3- to 6-storey
- 13% Vertical blocks 15-storey
4. Number of inhabitants per dwelling

\[
\text{Number of inhabitants per dwelling} = \frac{\text{total number of inhabitants}}{\text{total number of dwellings}}
\]

Overall, both horizontal and vertical groupings

Total number of inhabitants = 7112 (theoretical, according to number of beds)\(^2\)
Total number of dwellings = 1568

4.5 per dwelling

Existing condition = 3.6 per dwelling

5. Number of persons per room

\[
\text{number of persons per room} = \frac{\text{number of inhabitants}}{\text{number of rooms}}
\]

Overall, both horizontal and vertical groupings

Number of rooms = 6064

1.17 per room

Existing condition = 0.9 per room

6. Lodging coefficient

\[
\text{Lodging coefficient} = \frac{\text{number of inhabitants}}{\text{number of blocks}} = \frac{\text{number of inhabitants per block}}{}
\]

Overall, both horizontal and vertical groupings

Number of blocks = 45

\(7\) Single-family houses

\(2\)-storey

3- or 4-storey

3×2-storey

Theoretical = 158 p/block
Existing condition = 125 p/block
Each figure = 10 persons

\(^2\) See remarks page 63.
7. Total gross area of floors and total net area of dwellings

<table>
<thead>
<tr>
<th></th>
<th>Total net area of dwellings</th>
<th>Total gross area of floors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net area of dwellings in</td>
<td>about 10.0700 ha</td>
<td>13.6782 ha</td>
</tr>
<tr>
<td>horizontal grouping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net area of dwellings in</td>
<td>2.0300 ha</td>
<td>2.7008 ha</td>
</tr>
<tr>
<td>vertical grouping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12.1 ha</td>
<td>16.3790 ha</td>
</tr>
<tr>
<td>Net/gross</td>
<td>about 74%</td>
<td></td>
</tr>
</tbody>
</table>

8. Net and gross floor area per person

(Net), (gross) floor area per person = \frac{\text{total (net), (gross) area of floors}}{\text{number of inhabitants}}

<table>
<thead>
<tr>
<th></th>
<th>Net horizontal</th>
<th>Net vertical</th>
<th>Net overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>TH</td>
<td>16.8 m²</td>
<td>18.1 m²</td>
<td>17.0 m²</td>
</tr>
<tr>
<td>EC</td>
<td></td>
<td></td>
<td>21.0 m²</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Gross horizontal</th>
<th>Gross vertical</th>
<th>Gross overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>TH</td>
<td>22.7 m²</td>
<td>24.7 m²</td>
<td>23.3 m²</td>
</tr>
<tr>
<td>EC</td>
<td></td>
<td></td>
<td>29.8 m²</td>
</tr>
</tbody>
</table>

TH = according to 4.5 per dwelling (theoretical number of beds)
EC = according to 3.6 per dwelling (existing condition)

9. Percent number of tenants, grouping and dwellings types

Percent number of tenants in each type of grouping and in each type of dwelling related to the total number of inhabitants

<table>
<thead>
<tr>
<th></th>
<th>Pop. 6.9%</th>
<th>Dwl. 4.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 or</td>
<td>3 to 15</td>
</tr>
<tr>
<td></td>
<td>80.4%</td>
<td>12.7%</td>
</tr>
<tr>
<td></td>
<td>79.4%</td>
<td>16.6%</td>
</tr>
</tbody>
</table>

a b c d e

Pop. = population
Dwl. = dwellings
10. Percent of built-up areas

(a) At overall density 177 p/ha
Both horizontal and vertical groupings

Built-up areas (housing) = 8.4%
Built-up areas (public buildings) = 1.0%
Roads = 3.8%
Greens and open spaces = 86.8%

(b) Net built-up areas = total area of ground floors / net housing area
Horizontal at density 444 p/ha
Built-up areas = 22.2%
Greens = 77.8%
Vertical at density 560 p/ha
Built-up areas = 8.3%
Greens = 91.7%

(c) Net built-up areas at density 458 p/ha
Overall, both horizontal and vertical grouping
Built-up areas = 20.6%
Greens = 79.4%
11. Density

a) Gross (overall) density = \[ \frac{\text{number of inhabitants}}{\text{total gross area}} \]

Mixed grouping, vertical and horizontal

Number of inhabitants = 7112 (according to number of beds)
Total gross area = 40 ha

40 dwellings per ha

177 persons per ha

Existing condition 3.6 p/dwelling = 140 persons per ha

b) Net density = \[ \frac{\text{number of inhabitants (for each type of grouping)}}{\text{net housing area of the type of grouping}} \]

1. Zone of horizontal grouping
2. Zone of vertical grouping

444 persons per ha

560 persons per ha

c) Net density = \[ \frac{\text{number of inhabitants (of the mixed grouping)}}{\text{net housing area (total 1. and 2.)}} \]

Zones of horizontal and vertical grouping

100 dwellings per ha

458 persons per ha

Existing condition = 360 persons per ha
Each figure = 50 persons
Each square = 1 ha
12. Exploitation coefficient

a) At density 177 p/ha

Overall, horizontal and vertical grouping

\[
\text{0.41}
\]

b) Exploitation coefficient = \( \frac{\text{gross floor area (each type)}}{\text{plots (each type)}} \)

1. Horizontal: at density 444 per ha
2. Vertical: at density 560 per ha

\[
\begin{align*}
&1.00 \\
&1.38
\end{align*}
\]

c) Exploitation coefficient = \( \frac{\text{gross floor area (both types)}}{\text{plots (both types)}} \)

At density 458 per ha

\[
\text{1.06}
\]

Each square = 1 ha
Black = built-up area
Hatched = total gross area of floors
Leer - Vide - Empty
Part II

Analytical study of actual schemes based on neighbourhood planning
Leer - Vide - Empty
Chapter 3

The neighbourhood as a unit of a metropolis of population greater than one million

The neighbourhood as a basic unit of the general plan of Warsaw.
Analysis of the development of neighbourhood unit principles, 1945-1965

A. Introduction

a) The interwar period, 1922-1937

Neighbourhood planning in Warsaw passed through a long experiment after the foundation of W.S.M., "The Warsaw Housing Cooperatives" (Warszawska Spolodziena Mieszkanowa), 1922. The W.S.M. was started by a group of people prominent in cooperative activities, supported by a trade union. The main problem which they began to study was to find solutions for the housing problem, especially for the workers. Zoliborz, Grochow, Rakowiec and Kolo residential schemes were the first neighbourhoods constructed in the interwar period, fig. 29. They included such community facilities as laundries, baths, boiler rooms for central heating, cinemas, primary schools, kindergartens, libraries and clubs - facilities which are essential for the development of community life.

The concept of planning the aforementioned neighbourhoods was a turning point in Polish housing, in treating town planning and architectural problems in connection with housing. Since then the need for large areas of land for the building of residential neighbourhoods, not only for dwellings but - and mainly - for the development of social, cultural, educational and recreational functions, developed in Poland.

b) Post war period after 1945

Before 1945, i.e. during the Nazi occupation, theoretical studies on neighbourhood planning were developed by the Community Building Undertaking (Spoleczne Przedsiębiorstwo Budowlane) and the W.S.M., which included a team of architects, sociologists and doctors.

After the liberation of Warsaw at the beginning of 1945, the building activities of W.S.M. started again after being arrested during the war, with the rebuilding of the Zoliborz and Rakowiec neighbourhoods. Living conditions at that time were poor; for example, only 9.7 m² net floor area belonged to each inhabitant in such neighbourhoods, compared to 12 m² before the war.

Later on the town planning and architectural offices of the W.S.M. worked out projects for the extension of the existing settlements and for the erection of new ones in order to meet the immediate need for dwellings in Warsaw at that time. The projects were made possible by the enactment in January 1946 of:
- The increase of the communal ownership of whole residential areas.
- Providing within such areas spaces for the development of community activities.

The main principle which also emerged was the dividing of the residential areas into divisions and subdivisions - neighbourhood units and residential units (called communities).

The neighbourhood unit population is determined by the capacity of the primary school. The normal size of a primary school in Warsaw is about 640 children which is the size corresponding to about 5000 inhabitants. The recommended size of the neighbourhood units in Warsaw is about 10000 inhabitants, i.e. about 2500 families, which is the number who can support two primary schools. The recommended area to be occupied by a neighbourhood unit of 10000 inhabitants should not exceed 40 ha; i.e. of overall density 250 p/ha. (The recommended density in the regulations of 1961 to 1965 ranges between 300 and 380 p/ha at the outer city area, see page 94.)
The main factor controlling such an area is the walking distance from the dwellings to the schools and the other communal services. It should not be more than 500 metres, a convenient distance for both primary school pupils and adults. Considering that 500 metres would be too far for a prep-school child, the neighbourhood is divided into four residential units, known as communities, providing for each a kindergarten of radius of influence 250 metres from dwellings.

<table>
<thead>
<tr>
<th>Divisions and sub-divisions</th>
<th>Elements controlling</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  The residential unit</td>
<td>Kindergarten</td>
<td>1000–1200</td>
</tr>
<tr>
<td>2  The neighbourhood unit</td>
<td>One primary school</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>(640 pupils)</td>
<td></td>
</tr>
<tr>
<td>3  The neighbourhood, the basic unit</td>
<td>Two primary schools</td>
<td>10000</td>
</tr>
<tr>
<td>4  The district, 5–10 neighbourhood units</td>
<td>Social, medical and cultural centre</td>
<td>50000–100000</td>
</tr>
</tbody>
</table>

The size of each unit is determined by the number who can support a kindergarten. This size is considered in Poland to be about 1000 to 1200 inhabitants.

The basic unit in the general plan of Warsaw, as well as the newly planned towns, is the residential neighbourhood unit. The district size is about 50000 to 100000 inhabitants. The area is divided into 5 to 10 neighbourhoods, generally defined by the main thoroughfares or other zones, industrial or green areas. To each district is allocated a main social, medical and cultural centre, fig. 29.

Fig. 28 System of units of a district, Warsaw, Poland.

30 The elements mentioned are the main hypothetical ones, see the regulations concerning community facilities, 1961–1965, page 94.

31 After Architetti No. 10, 1961.

32 As examples: Nowa Huta and Nowe Tychy, see Wydana Staraniem Miejskiej Rady Narodowej W Tychach, Nowe Tychy 1960.
Remarks

This system of units is mainly influenced by the child and the mother. They are the symbols characterising and influencing the general system of town planning in Poland. Both as factors largely determine the size and area of the small as well as the large units.

The percentage of mothers working in Poland, in order to raise the family income, is increasing: it ranges between 30% and 60%. Accordingly there is an increasing number of nurseries and kindergartens where the mothers can leave their children when going to work. The hierarchy developed is thus largely determined by this fact; the hierarchy starts from the small residential unit, whose number of inhabitants is determined by both the number of the children of the kindergarten and the nursery – and the percentage of women working.

In the neighbourhood units, where 30 to 60% of women go to work, 10 to 20% of children are of the nursery age, and 40 to 60% are of the kindergarten age, while the percentage of pupils who ought to go to the primary school varies in relation to the number of women working.

Relating the number of the children to the total number of the neighbourhood population we find that in Poland generally 7 to 9% of the inhabitants are of the nursery age, 8 to 10% are of the kindergarten age and 12 to 16% are of the primary school age (7 to 13 years old).

Fig. 29 Location of Kolo and the other residential neighbourhood units in relation to the general zoning plan of Warsaw, 1949–1950.

The plan shows distribution of industry (hatched) into four main zones merely radiating from the city centre to be as near as possible to the neighbourhoods and at the same time be (more or less) isolated from them by green areas (dotted) and open spaces. Crosses are the social, medical and cultural centres of the districts.

(After Architetti No. 10, 1951.)

B. Kolo neighbourhood, Warsaw, Poland, 1947–1950
(Helena and Szymon Syrkus)

1. Site location and characteristics

Kolo neighbourhood is located in the west part of Warsaw, about 4 km from the city centre, fig. 29. It is one of the neighbourhood units forming the residential district including Meynow and Wola. According to the general plan of Warsaw, 1949, the new residential districts are connected to the city centre and the industrial areas by means of rapid means of communication: metro, railway and tramways, fig. 50.
The industrial areas are meant to be as near as possible to the residential areas, being distributed into four main zones – north, south, east and west – integrated with the city area. Thus, according to the general plan, to the south of Kolo is the western industrial zone of Wola containing light electrified industry. The site is flat, and was shown by geological survey to be suitable for housing development.

![Site location of Kolo and surroundings.](image)

2. Problem and aims, ownership, kind of inhabitants, financing and relation of rents to tenants' income

Helena and Szymon Syrkus, the architects who planned the scheme, had to solve social, economical, architectural and planning problems of a special nature owing to the living conditions in Poland. Their ideas which developed during the Second World War were here applied to the second residential unit of Kolo executed in 1947–1950, fig. 31.

The unit was to comprise 600 dwellings, built for the Warsaw Housing Cooperative Society; based on the principle of non-individual ownership. The land is within the communalised city area in Warsaw, which helped to meet the immediate need for large-scale dwellings after the war.

The kind of inhabitants are low-income class workers. The architects aimed, within the possibilities available, to create a rich town planning expression of social community, as described and discussed further on.

Financing: (costs in Zloty)\(^{33}\) (600 dwellings, 2400 inhabitants)

1. Cost breakdown:

<table>
<thead>
<tr>
<th>Item</th>
<th>Overall cost</th>
<th>per m(^3)</th>
<th>per m(^2)</th>
<th>% cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>51120000</td>
<td>375</td>
<td>1917</td>
<td>71</td>
</tr>
<tr>
<td>Installations</td>
<td>10080000</td>
<td>75</td>
<td>378</td>
<td>14</td>
</tr>
<tr>
<td>Lawns, etc.</td>
<td>10800000</td>
<td>80</td>
<td>405</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>72000000</td>
<td>530</td>
<td>2700</td>
<td>100</td>
</tr>
</tbody>
</table>

\(^{33}\) According to the statistics of 1956, Polen, Zahlen und Fakten.
2. Cost per person and per dwelling:

<table>
<thead>
<tr>
<th>Per person</th>
<th>37 m²</th>
<th>45 m²</th>
<th>56 m²</th>
<th>61 m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000</td>
<td>100,000</td>
<td>110,000</td>
<td>150,000</td>
<td>165,000</td>
</tr>
</tbody>
</table>

Rents in relation to tenants' incomes:
The average monthly income is 872 Zloty, i.e. about Swiss fr. 110.— per person in Poland generally. The average rent per person engaged in industry is about 6.2% of his monthly income.33

The percentages of rents to tenant's incomes range as follows:34

<table>
<thead>
<tr>
<th>Monthly income per person in Zloty</th>
<th>% of rents</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>3.8</td>
</tr>
<tr>
<td>401 - 600</td>
<td>4.8</td>
</tr>
<tr>
<td>601 - 800</td>
<td>5.5</td>
</tr>
<tr>
<td>801 - 1000</td>
<td>7.5</td>
</tr>
<tr>
<td>1001 - 1500</td>
<td>6.7</td>
</tr>
<tr>
<td>1501 and more</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Fig. 31 Layout plan of Kolo neighbourhood, Warsaw.
(I) The first scheme, 1934-1937
(II) The second scheme, 1947-1950
1 Nursery
2 Kindergarten
3 Existing primary school
4 Public building
5 Shops
6 Workshops
7 Existing church
P Parking
A 3-storey blocks of flats (1½ or 2 rooms)
A' 4-storey blocks of flats (1½ or 2 rooms)
A'' 6-storey blocks of flats (1½ or 2 rooms)
B 3-storey blocks of flats (3 rooms)
B' 4-storey blocks of flats (3 rooms)
B'' 6-storey blocks of flats (3 rooms)
C 2-storey single-family houses (4 rooms)
C' 2-storey single-family houses (such block changed to 4-storey blocks of flats)
D 10-storey point block for single people and childless couples.

3. Traffic system

Roads 10.00% Parking 3.75%

The road layout plan of the second residential unit of Kolo (1947-1950) is different from what has been usually applied to the residential areas in Warsaw. The new principle is to classify and separate the fast motor traffic, the neighbourhood motor traffic and the pedestrian traffic by:

keeping the neighbourhood area as a closed city block, surrounded by the thoroughfares (12 m), not allowing any to cut through;
introducing the cul-de-sac (6 m) branching off from the thoroughfares reaching the housing blocks, with the parking areas at their dead ends which are at the outer limits of the area;
reserving the open space including the school and kindergarten for pedestrians, and barring motor traffic;
the footpaths inside the area are laid out so carefully that none of them intersect even with any cul-de-sac; this is to assure complete security especially for the children.

4. Zoning and layout conception

The residential unit (II) fig. 31, executed in 1947–1950, is one of the four residential units forming the Kolo neighbourhood unit which covers about 40 ha, provided for 8000 to 10000 inhabitants. The residential unit (I) and (II) show a development of the zoning pattern and layout conception; each expresses a certain period of a time.

The north residential unit (I) which has been executed in the interwar period (1934 to 1937), shows the method of grouping dwellings at that time. The comb-shape layout (Zeilenbau) was then a revolutionary step in planning the residential neighbourhoods; but usually it neither helped the development of a social community nor was a happy solution spatially. The area reserved for housing blocks including the spaces between is about 90% and the other 10% are roads! The second residential unit (II) built 10 years later expresses new ideas in zoning pattern treatment layout of dwelling agglomerations.

The area is of about 10 ha, divided into net housing area (4 ha) 40%, greens and open spaces (4.04 ha) 40.4% including play-lots for children, community services 9.6% (0.96 ha), roads and parking areas 10% (1 ha).

The arrangement of the housing blocks forms a new shape for the residential grouping. The housing blocks are grouped to form a visual overlooked core, which the comb-shape grouping did not offer in the first unit where the spaces between the blocks merely functioned as back yards. This transformation became general in planning the district and the town as well as the neighbourhoods.

Prof. Syrkus points out: 'We strive in our work to create the richest possible scale of spatial values for the benefit of the inhabitants of the neighbourhood during their daily walks in the districts. The democratisation of life should be accompanied by the democratisation of space which means not only offering free access to it to the masses, but also the “equality of rights and duties” of every strip of land.'
Fig. 34 Kolo neighbourhood, Warsaw, 1947–1950. A view of a neighbourhood garden with a play-lot for the
children, well overlooked from the dwellings and kept from motor traffic.

Fig. 35 Kolo neighbourhood, Warsaw, 1947–1950. A view showing the space including the kindergarten
surrounded by the residential blocks. Notice the paths which are specially laid out for the pedestrians; also the
area reserved for refuse to the right of the picture.

5. Grouping and layout of dwellings

The unit was to comprise 600 dwellings grouped in 3- to 6-storey blocks (about 544
dwellings, i.e. 90.8%), one 10-storey point block (about 40 dwellings, i.e. 6.6%) and
attached single-family houses (16 dwellings, i.e. 2.6%).

The adopted plans of dwellings correspond to the living conditions of the inhabitants
and are more developed than the former dwellings planned before the war.

Types of dwellings

Type A: 3- to 6-storey corridor type blocks of flats directed east-west. This type includes
1 1/2-room dwellings of area 37 m² (a) provided for 2 or 3 persons, and 2-room dwellings
of area 44 m² (b) provided for 3 or 4 persons, fig. 37.

We compare a 1 1/2-room flat at Kolo executed in 1947 and a flat of the same size at the
Rakowiec neighbourhood executed in 1934, fig. 36, to show by example a development
in design and the increase of the area of the same size of flat.

The 1 1/2-room flats at Rakowiec are distributed on both sides of an inner corridor, pro-
viding either east or west orientation. Each flat consists of a living room (14 m²) with a
specially-arranged two-bed recess (6.40 m²), a kitchenette (6 m², two meters wide), a
hall (4.60 m²) with a built-in wardrobe, an entrance lobby (1 m²) and a separate artifi-
cially-ventilated lavatory (1 m²).

The floor area of this type covers 33 m² which included the maximum accommodation
attainable for the Warsaw workers who lived in the Rakowiec neighbourhood.

The 1 1/2-room flat at Kolo: According to the norms established by the Ministry of Recon-
struction, the floor area of this type reached 36 m². For the working and studying citizens
10 m² living area is provided and 5 m² for non-working family members, while the top
limit is 25 m² living area, and 11 m² for kitchenette, bathroom and hall; i.e. the total
floor area is 36 m² which is 10% more than the floor area of the Rakowiec type.
Instead of the inner corridor, there is an access balcony providing thorough ventilation and direct daylight. The halls, kitchens and bathrooms (instead of only lavatories) have north face, opened to the access balcony (windows are square, horizontal, pivoted and placed high to avoid overlooking and to give more wall space to the kitchen).
In front of every pair of flats there is a recess off which the front door opens. Such arrangement provides privacy and gives space for people entering the flats without disturbing or being disturbed by other people passing by, besides providing protection from wind and rain. All these are visual advantages and a development if compared with the arrangement at the Rakowiec type.

Also, the sleeping recess (7.9 m²), which can be separated from the living room, is lighted and ventilated by a special window opening on the balcony on the west side, while in the Rakowiec type there is only artificial ventilation.

In both types we see that the living rooms are used at night for sleeping. Conditions in Poland generally until 1947 did not allow for providing special living rooms not used for sleeping.

The 2-room flat (b), fig. 38, is arranged similarly to the 1½-room flat (a). It is provided for 3 or 4 persons, and has an area of 43.60 m². It includes a double bedroom of 9.90 m², a living room of 19.10 m² and utilities, kitchen, etc. of 14.60 m².

Type B: 3- or 4-storey blocks of flats directed north-south with staircases each serving two flats, including larger dwellings for 5 and 6 persons.
The 3-room flats (c), fig. 39, which is provided for 5 persons (55 m²) consists of a living room (17.15 m²), facing west, a double bedroom (13.60 m²) and a single bedroom (7.20 m²), both facing east.

The 3-room flat (d), fig. 40, which is provided for 6 persons (60 m²), consists of a living room (17.60 m²) also facing west, a double bedroom – for parents – (13.75 m²) and another bedroom (10.20 m²) with 2 beds, both also facing east.

The floor area of the utilities, kitchen, etc. is 15.85 m² at (c) and 17.10 m² at (d).

Types (c) and (d) are both designed according to a module of 30 cm which is a later development worked out by Prof. Syrkus. The first module of 50 cm was found uneconomical, especially as regards the staircase (the new width c. L. – c. L. is 2.40 m in stead of 3.00 m) and also as regards the utilities.

We give in fig. 41 the old design of the 3-room flats which is based on the module of 50 cm.

In this design we see also that the kitchen and the bathroom are not combined; this is not economical. Also it does not include a separate lavatory as do the later designs.

Another later development of the design of the 2-room flat is that in fig. 43, which is the same in conception as (b).

Type E: 4-storey block of flats including one- and two-room flats. This type is outside the residential unit II analysed; it is discussed here as being a new type in arranging and grouping of the small flats, fig. 44.

Each staircase serves 3 flats, the single-room flat (e) of area 22 m² facing east, is provided for a single person. The 2-room flats of area 45 m² are provided for 3 persons; the living room facing west and the double bedroom east (f).

In the 2-room flat (g) (44 m²) lying at the end of the block, both the living room and the bedroom face south.
Fig. 44 A west façade (Type E), Kolo neighbourhood, Warsaw.

Fig. 45 Type E: (a) Single-room flat 22 m²
(f) 2-room flat 45 m²
(g) 2-room flat 44 m²
### 6. Standards derived and method of calculation

1. Residential unit areas

Divisions of residential unit areas in %, per family and per person

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area</td>
<td>4.00</td>
<td>40 %</td>
<td>66.66</td>
<td>16.66</td>
</tr>
<tr>
<td>b) 2 Greens and open spaces</td>
<td>4.04</td>
<td>40.4 %</td>
<td>67.33</td>
<td>16.84</td>
</tr>
<tr>
<td>(including play-lots for children)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Residential unit services</td>
<td>0.96</td>
<td>9.6 %</td>
<td>16.00</td>
<td>4.00</td>
</tr>
<tr>
<td>3 Nursery</td>
<td>0.35 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Kindergarten</td>
<td>0.48 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Shops</td>
<td>0.13 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 6 Roads</td>
<td>1.00</td>
<td>10.0 %</td>
<td>16.64</td>
<td>4.16</td>
</tr>
<tr>
<td>Total</td>
<td>10.00</td>
<td>100 %</td>
<td>166.64</td>
<td>41.66</td>
</tr>
</tbody>
</table>
2. Total gross area and net housing area

a) Total gross area = area of residential unit (II) 10 ha

b) Net housing area = area of plots 4 ha \(\ldots\) 40%
3. Number of inhabitants per dwelling

Number of inhabitants per dwelling = \( \frac{\text{total number of inhabitants}}{\text{total number of dwellings}} \)

Total number of inhabitants = 2400 (according to the number of beds which is still the existing condition)

Total number of dwellings = 600 (as provided in the project of 1947)

4. Number of persons per room

Number of persons per room = \( \frac{\text{number of inhabitants}}{\text{number of rooms}} \)

1.7–1.8 p/room

5. Lodging coefficient

Lodging coefficient = \( \frac{\text{number of inhabitants}}{\text{number of blocks}} \) = number of inhabitants/block

Number of blocks = 19

126 p/block

Each figure = 10 persons
6. Total gross area of floors and total net area of dwellings

<table>
<thead>
<tr>
<th>Total net area of dwellings</th>
<th>Total gross area of floors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net area of dwellings, overall horizontal and vertical groupings =</td>
<td>Gross area of dwellings, overall horizontal and vertical groupings =</td>
</tr>
<tr>
<td>about 26400 m²</td>
<td>about 42832 m²</td>
</tr>
</tbody>
</table>

Net/Gross = about 62%

7. Net and gross floor area per person

<table>
<thead>
<tr>
<th>Net floor area per person</th>
<th>Gross floor area per person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing condition</td>
<td>Normal should be</td>
</tr>
<tr>
<td>Existence condition</td>
<td>Normal should be</td>
</tr>
</tbody>
</table>

11 m²  14 m²  17 m²  23 m²

8. Percentage number of tenants, groupings and dwelling types

Percentage number of tenants in each type of grouping and in each type of dwelling related to the total number of inhabitants

<table>
<thead>
<tr>
<th></th>
<th>SF houses</th>
<th>3-6-storey</th>
<th>10-storey</th>
<th>1½</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop.</td>
<td>5%</td>
<td>90%</td>
<td>5%</td>
<td>30%</td>
<td>32%</td>
<td>33%</td>
<td>5%</td>
</tr>
<tr>
<td>Dwl.</td>
<td>2.6%</td>
<td>90.8%</td>
<td>6.6%</td>
<td>41.5%</td>
<td>33.3%</td>
<td>22.6%</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

\[\begin{array}{cccc}
\text{a} & \text{b} & \text{c} & \text{d} \\
\end{array}\]

\[\begin{array}{cc}
\text{a + b} & \text{c} \\
\text{d} & \\
\end{array}\]
9. Built-up area, density and exploitation coefficient

a) Built-up area

At overall density 240 p/ha

- Built-up area (housing) 10.2%
- Built-up area (public buildings) 1.8%
- Roads and parking 10.0%
- Greens and open spaces 78.0%

At net density 600 p/ha

- Built-up area = 25.5%
- Greens = 74.5%

b) Density

<table>
<thead>
<tr>
<th>Overall</th>
<th>Net</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 p/ha</td>
<td>600 p/ha</td>
</tr>
</tbody>
</table>


c) Exploitation coefficient

At overall density 240 p/ha

- Exploitation coefficient = 0.42

At net density 600 p/ha

- Exploitation coefficient = 1.07

Built-up area : Gross floor area = 1:4
C. Concepts of Prof. Syrkus and others in neighbourhood planning
10 years after the experiments at Kolo

Planning, social, economic and human aspects applied to Mlociny neighbourhood
project, TH, Warsaw, 1957, under the guidance of Prof. S. Syrkus.37

a) Outlook

The neighbourhood project of Mlociny was studied at the TH Warsaw by the last
semester students in 1957. The project is based on actual development of neighbour¬
hood planning since the Second World War and could be considered as a development
of the experiments of Prof. Syrkus at Kolo. It is not studied as an isolated unit example
but according to the conception of dividing the residential areas into neighbourhood
units and into smaller units, being all related and integrated with the general organism
of the city and the region.

b) Site location

The site is at the northwest part of the city of Warsaw about 5 km from the city centre.
West of the district area is the industrial zone of 'Huta Warzawa' and east of it is a
recreational green area bounded by the river Wisla.

c) The general idea

The neighbourhood area is about 32 ha, provided for about 11000 inhabitants, i.e. the
overall density is 350 p/ha, which is considerably higher than at Kolo (240 p/ha), page 90.
The main aspects developed and expressed by the general layout may be stated as
follows:

1. The neighbourhood is divided into 10 residential units grouped about a common,
including the three main dominants: the schools, the shopping centre and the cultural
facilities.

a) The two primary schools (2.5 ha) together form one zone centered by a playground
(0.4 ha) reached within maximal 400 m, located focussing and dominating the neigh¬
bourhood area.

b) The main shopping centre (PDT), fig. 47 (0.5 ha), is located at the neighbourhood
unit corner on economic grounds:
It is meant also to serve the neighbouring neighbourhood;
to be close to the industrial area of Huta Warzawa; and
to be on the way to work and back for the inhabitants.
The sub-shopping-centre includes small shops and workshops – shoemaker, tailor, etc. – which are located as pavilions lining the road between the two adjacent neighbourhoods, also in order to serve them both. A service road accessible for cars is laid out to serve the shops from the back. This grouping together of the shops is a change from the idea at Kolo, where shops were distributed in isolation at the outer corners of the unit, which was found uneconomical, because their being grouped together gives better economical results.

Fig. 47 Miociny neighbourhood project, TH, Warsaw 1957.

SZ Primary school
P Kindergarten
Z Nursery
PDT Shopping centre
S Shops and workshops
K Cultural centre
G Garages

(After Architektura, 7/57.)

c) The third dominant is the cultural facilities which are distributed in two sites:
Centering the neighbourhood core is a place for the youth organizations of boy scouts and the like, workshops for cultural activities such as painting and sculpture – activities which are essential for the intellected culture of children and young people. These help also as a solution for adolescent problems, sex, etc., which should be treated within the family as well as the immediate neighbourhood, which is the main supervised children’s and youth community.

At the neighbourhood corner beside the main shopping centre is the cultural centre mainly meant for the adults. It includes a library, a meeting hall, a restaurant and cafés.
Remarks

This conception of the provision of cultural centre to the neighbourhood unit is mainly stressed by Prof. Dr. Ernst May, Hamburg, in his definition of the neighbourhood unit: 38

'A neighbourhood unit is a defined section of a town grouped round a centre comprising schools, sporting facilities, shops, restaurants, and first of all a cultural centre, i.e. a place where people can meet for discussions, lectures, musical and theatre performances, and games. A library should be connected with the centre and also rooms allowing people to segregate for various purposes. A cultural centre should in these days also comprise a section in which various handicrafts are taught, especially for the youth.' 39

2. The residential unit is provided for 1000 to 2000 inhabitants in an area of about 3.25 ha, being defined by the children’s walking distance, for density about 370 p/ha. The visual development is the layout conception and the interrelation with the larger sphere of the neighbourhood unit. This is specially observed at the selected unit fig. 48 where we see that:

a) The residential unit core including the nursery or kindergarten, besides focusing the unit forms with the central neighbourhood common a larger core, i.e. there is an interrelation between both. This is different from Kolo, where the nursery and kindergarten with the play-lots were concentric, centering the unit and merely separated from the larger neighbourhood core.

b) The layout of the blocks is generally happy, since it allows the individual in his dwelling to overlook both the intimate space and also the larger neighbourhood space.

c) The kindergarten with the children's play area is located so as to be far enough from the dwellings to keep the noise of the children away, and at the same time close enough to be easily watched by the mothers.

d) For the children of 1 to 3 years especially another play-lot is provided centering the unit away from the older children's area.

e) As an administrative unit it includes an administrator to take care of the dwelling conditions, cleaning, etc. and as a social unit a special person selected from among the inhabitants to organize a social life among the unit members through clubs, etc. and also to make, by his own means, possible contact and relations between the residential units.

Fig. 48 A residential unit at Miociny neighbourhood project.

Comment

All the aforementioned points show a far-sighted social and human concept for developing a workable healthy living organism.

Concerning the communal facilities as laid out in the project we see that they are determined rather by mathematical norms than by the wish to form a rich architectural expression. They should be grouped together in such a way as to offer a point of interest to attract the neighbourhood community. This is a great help in forming a busy centre zone of urban quality. The lack of such a busy centre makes the people
abandon their neighbourhoods for the downtown centre, or anywhere where more attraction is provided. And then no social contact, no culture and no neighbourhood community can develop successfully.

The inner organism of the district as a whole is rather a system of city blocks divided by a merely rigid network of roads which could be better articulated organically, especially to avoid too many road crossings, and to provide an overlooked district centre besides being interrelated with the neighbourhood unit centres and with the city centre.

D. Neighbourhood standards recommended in Poland from 1961 until 1965, explaining the method of calculations used in Poland

A comparison between the standards deduced from Kolo neighbourhood, 1947, and Miłoczyna neighbourhood project, 1957.

In 1959 the Polish committee on town planning and architecture worked out regulations for the planning and program of the residential neighbourhoods to be applied in 1961–1965.

The scope of these regulations includes the neighbourhoods of multi-family houses on free land; a part of a settlement and for slum clearance, being expressed in the form of a hope or recommendations. The committee defined the residential neighbourhood as the smallest basic unit for which a main program is required for social services, schools, shops and green areas. It is the basis for a certain system of units.

Size and limits

The number of inhabitants of such a unit, and its area, are determined by:

a) The local conditions
b) Size of the city as a whole
c) The topographical relief
d) Location in relation to the city
e) As a theoretical optimum it is considered to comprise 10000 inhabitants, but such a size must be related to the primary school – the smallest unit should populate one primary school.

<table>
<thead>
<tr>
<th>Type of neighbourhood (size)</th>
<th>3- to 5-storey by net exploitation coefficient</th>
<th>More than 5-storey by net exploitation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross exploitation coefficient</td>
<td>0.70–0.95</td>
<td>0.95–1.20</td>
</tr>
</tbody>
</table>

| A. Neighbourhoods of under 5000 inhabitants with children to 14 years old more than 30% | 0.52–0.64 (310–390 p/ha) | — |
| B. 1) Neighbourhoods of more than 5000 inhabitants of distance about 500 m from a town centre, community centre, or city park, with children up to 14 years old less than 30% | 0.53–0.65 (330–400 p/ha) | 0.65–0.76 (400–470 p/ha) |
| B. 2) Special neighbourhoods less than 5000 inhabitants (special case) | — | — |
| C. Neighbourhoods of more than 5000 inhabitants with distance more than 500 m from community centre, with children up to 14 years old more than 30% | 0.50–0.60 (300–360 p/ha) | 0.60–0.67 (360–400 p/ha) |
The size recommended has always been the same since the war; the Kolo neighbourhood (1947) is to comprise 8000 to 10000 inhabitants and Mlociny neighbourhood about 11000 inhabitants, each including 2 primary schools for about 1200 pupils.

The boundaries of the neighbourhood are either traffic ways or other zones.

The residential unit – the sub-division of the neighbourhood unit – cannot be dimensioned, but its size is generally determined by number of inhabitants that can support a kindergarten. According to the experiments of W.S.M it is 1000 to 1200 inhabitants, as also proposed at Mlociny neighbourhood.

**Density, exploitation coefficient and floor area per person**

The committee classified the residential neighbourhoods into three types as shown in table 4, which includes also the relation between the density and the exploitation coefficient.

The gross floor area per person is between 16 and 17 m². At Kolo neighbourhood the deduced net floor area per person is 11 m² and the gross floor area is 17 m² according to the existing condition which is the number of beds.

Comparing the density and the exploitation coefficient at Kolo neighbourhood and the norms recommended, we find that they have become higher, ranging between 300 and 380 p/ha compared to 250 p/ha, i.e. 0.50 to 0.65 compared to 0.42 exploitation coefficient in the case of 3- or 5-storey neighbourhoods. The neighbourhoods located within the central city area will be of density 400 to 470 p/ha, i.e. of exploitation coefficient 0.65 to 0.76.

**Neighbourhood services**

Programme

- Nursery
- Prep school (kindergarten)
- Primary school
- Shopping centre
- Small shops
- Handwork (workshops)
- Health centre
- Pharmacy
- Garages and parking places
- Possibly central heating
- Administration
- Public garden

(The programme is controlled by the number and ages of the inhabitants.)

a) Nursery, prep and primary school

<table>
<thead>
<tr>
<th>Kind</th>
<th>% of the inhabitants of this age</th>
<th>% of children: 30-60 % of women working</th>
<th>Size (number of children)</th>
<th>Area in ha</th>
<th>Area per child in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursery</td>
<td>7%-9%</td>
<td>10%-20%</td>
<td>55</td>
<td>0.25</td>
<td>45</td>
</tr>
<tr>
<td>Prep school</td>
<td>8%-10%</td>
<td>40%-60%</td>
<td>60</td>
<td>0.30</td>
<td>50</td>
</tr>
<tr>
<td>Primary school</td>
<td>12%-16%</td>
<td>variable</td>
<td>var. 7 cl.</td>
<td>1.00</td>
<td>20</td>
</tr>
</tbody>
</table>

At Kolo, the areas provided are according to the standards recommended. For the nursery (80 children) 0.35 ha, and for the kindergarten (120 children) 0.48 ha, i.e. of average 41.50 m² per child.
At Mlociny neighbourhood project, the standards derived are in table 6.

<table>
<thead>
<tr>
<th>Kind</th>
<th>% to total population</th>
<th>Number of children</th>
<th>Area in ha</th>
<th>Area per child in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursery</td>
<td>1.5%</td>
<td>165</td>
<td>0.75</td>
<td>45</td>
</tr>
<tr>
<td>Prep school</td>
<td>3.27%</td>
<td>360</td>
<td>1.40</td>
<td>40</td>
</tr>
<tr>
<td>Primary school</td>
<td>11.0%</td>
<td>1200</td>
<td>2.50</td>
<td>20</td>
</tr>
</tbody>
</table>

The two above tables show the relation of the children who ought to go to the nursery, kindergarten and primary school and those who actually do go. We find that about 1.5% of the children go to the nursery (from a total percent 7 to 9%), 3.27% go to kindergarten (from a total percent 8 to 10%), while 11% of the children go to the primary school, which is now obligatory.

Remarks

The number of children between 7 and 18 years old is rapidly increasing in Poland. The expected population in 1965 is 32 millions, of which 8 millions will be children of school age, i.e. about 25% of the total population. The primary school children, 7 to 13 years old, will form 14.5% of the total number of population. The number of children 7 to 13 years old in 1937–1938 was 15%, in 1945–1946 12.5%, and in 1958–1959 it 13%. In Poland, there are 1037000 more women than men, i.e. for every 100 men there are 107 women. The percentage of women who work ranges between 30 and 60% of the total number.42

b) Commercial buildings

<table>
<thead>
<tr>
<th>Kind</th>
<th>Built-up area for 1000 inhabitants in m²</th>
<th>Net sales area for each 100 m² of the 170 m²</th>
<th>Index for gross sales area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shops</td>
<td>170</td>
<td>230</td>
<td>1.15</td>
</tr>
<tr>
<td>Restaurant</td>
<td>20–30</td>
<td>230</td>
<td>1.15</td>
</tr>
</tbody>
</table>

From the above table we find that for each family about 2 m², i.e. 0.50 m² for each person, is recommended on the basis of 4 p/family.

At Kolo, \[ \frac{\text{gross sales area}}{\text{number of families}} = \frac{1200}{600} = 2.00 \text{ m}^2 \text{ per family} \]

c) Handwork

<table>
<thead>
<tr>
<th>Kind</th>
<th>Built-up area for 1000 inhabitants in m²</th>
<th>Net floor area for each 100 of the 150 m²</th>
<th>Index for the gross floor area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops</td>
<td>100–150</td>
<td>230</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Area is calculated without the basement.
According to the regulations, it is forbidden to heavy buildings in the residential areas. For each family 1.00 to 1.60 m² of workshops is recommended, i.e. 0.25 to 0.40 m² per person.

At Kolo, \[
\frac{\text{gross needed area}}{\text{number of families}} = \frac{800}{600} = 1.33 \text{ m}^2, \text{ i.e.} 0.35 \text{ m}^2 \text{ per person}
\]

d) Public health

<table>
<thead>
<tr>
<th>Kind</th>
<th>Number of inhabitants</th>
<th>Number of Doctors rooms</th>
<th>Total area in ha</th>
<th>Cubic meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health centre</td>
<td>5000</td>
<td>4</td>
<td>0.18</td>
<td>1600</td>
</tr>
<tr>
<td></td>
<td>10000</td>
<td>6</td>
<td>0.26</td>
<td>3000</td>
</tr>
</tbody>
</table>

e) Garages and parking areas

<table>
<thead>
<tr>
<th>Kind</th>
<th>Number of garages and parking spaces for 1000 inhabitants</th>
<th>m² per one car</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Built area</td>
<td>Gross area</td>
</tr>
<tr>
<td>Garages</td>
<td>15–20</td>
<td>18</td>
</tr>
<tr>
<td>Parking</td>
<td>35–50</td>
<td>-</td>
</tr>
</tbody>
</table>

The gross area is calculated for one car or four motorcycles.

According to the Polish regulations the one garage in the residential areas (built freely) should not include more than 25 cars. The parking areas should be decentralized all over the residential area.

Both the garage and parking areas are counted within the net housing area. The number of parking spaces and garages recommended for each 1000 inhabitants = 50 to 70.

f) Central heating

<table>
<thead>
<tr>
<th>Central heating</th>
<th>Heated volume in m³</th>
<th>Area in ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5 million</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>1.0 million</td>
<td>1.00</td>
</tr>
</tbody>
</table>

g) Administration

| Administration office with a meeting hall | 0.2 % of the total neighbourhood area |
h) Gardens

Meant to be for children (play-lots), for young people (playgrounds) and for adults (recreation areas).

<table>
<thead>
<tr>
<th>Kind</th>
<th>Area in m²</th>
<th>Area per person in m² average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play-lot</td>
<td>1–1.5 per child</td>
<td>2.5–3.5</td>
</tr>
<tr>
<td>Playgrounds and</td>
<td>1.5–2 per youth and</td>
<td></td>
</tr>
<tr>
<td>recreation areas</td>
<td>adults</td>
<td></td>
</tr>
</tbody>
</table>

The regulations point out that:

a) the one area of neighbourhood garden should be minimum 70 m wide and be 15 m from windows;

b) if planned near a city park, it is not necessary to build special areas for the neighbourhood.

Fig. 49: Idea of the zoning plan of Warsaw, 1960. The main places of work are within 2 to 3 km from the surrounding neighbourhoods. A concept which gives good results for the development of the neighbourhood principle.
E. Concepts of the general zoning plan and communications network of Warsaw concerning the relation of the places of work to the places of living as largely affecting the development of the neighbourhood principle

Studying the concept of the general zoning plan of Warsaw and the communications network, fig. 50, we come out with interesting recommendations which would largely help and influence the development of neighbourhood planning and town extension. We should like here to lay stress on the ideas which would develop well in the future and which would largely affect the neighbourhood planning.

1. The distribution of industry, which is a main place of work, into four main zones radiating from the central city area, integrated into the places of living besides being isolated from them - this concept we think gives good results for the development of the neighbourhood principle.

The reason is that one of the main essentials for developing a workable neighbourhood unit is the provision of places of work as near as possible within direct and easy reach of dwellings. The failure of many neighbourhood schemes in spite of their good architectural quality is mainly due to the fact that the neighbourhood population had to suffer always because of the bad location of places of work with respect to their homes. Therefore the neighbourhood principle could develop with a carefully studied general plan of a city.

Analysing the idea of the zoning plan of Warsaw, fig. 49, we find that the places of work are within a maximum of 2 to 3 km from surrounding neighbourhoods. No doubt a large percentage of the inhabitants in the surrounding neighbourhoods would prefer working close by. Or in other words people would prefer to live beside their places of work.

2. Fast and direct communications, connecting all the zones of living and work, are also another essential factor in the development of neighbourhood living. People who might not work near their homes will also be able to spare time for living besides travelling and working. The network of communications explained in fig. 50 is carefully studied to fulfil these aims:
a) The tramway, which is the main communication usually used by the mass of people, connects the four industrial zones as well as the neighbourhood units by a ring-way surrounding the inner city area from which other ways distribute serving the outer city area.

b) The metro distributes into four wings and connect with the residential neighbourhoods, which are also main places of work.

c) The railways distribute from the loop surrounding the city centre and connect with the industrial areas.

3. These zoning and communication concepts would also help for the avoidance of over-concentration of people in a certain area. Both naturally help towards a balanced distribution of people.

We believe that if care is taken in applying such concepts a healthy neighbourhood community can develop well.
Chapter 4

The neighbourhood as a unit for the extension of a region including a number of towns

Contents

The neighbourhood as a unit for the extension of a region including a number of towns
Extension scheme of ‘Noord-Kennemerland’, Netherlands, 1959, van den Broek and J. B. Bakema
A. Problem of Noord-Kennemerland
B. The extension plans
C. Analytical study of the community south of Alkmaar, population = about 50,000
1. System of units
2. Road system
3. Zoning
4. The neighbourhood unit
5. Social and human aspects
6. List of derived standards and method of calculation

Extension scheme of ‘Noord-Kennemerland’, Netherlands, 1959, van den Broek and J. B. Bakema
(Existing population 1959 = 100,000; expected population 1995 = 300,000)

A. Problem of Noord-Kennemerland region

1. Location, geography and characteristics of the region

Noord-Kennemerland region lies, as show in fig. 51, north of Amsterdam, and includes the towns of Alkmaar, Akersloot, Bergen, Castricum, Egmond, Egmond-Binnen, Heiloo, Koedijk, Limmen, Oudorp, St. Pancras and Schoorl. The region lies within the area...
below sea level, and contains in general horticultural and agrarian areas. It is bordered on the west side by the extended area of dunes along the North Sea and by the Noord Holland's Canal on the east side, fig. 51.

2. The expected growth of population

The population of the area numbered about 100,000, in 1959, of which 43,000 were in Alkmaar, 10,000 in Bergen, 11,600 in Castricum and 12,000 in Heiloo; the rest of the population is generally equally divided among the other municipalities. By 1995 a rapid growth of population is expected, to three times the existing number, i.e., to about 300,000 people, of whom many will be employed in the industrial areas of IJ-mouth and the Zaan-district which border the region near Amsterdam.

3. Kind of inhabitants

The inhabitants are generally engaged in horticulture, agriculture, industry and other occupations. To have an idea of the kind of inhabitants we may take the following data regarding the total male professional population: 22% are employed in horticulture and agriculture, 30% are employed in industry, 13% are employed in the other occupations of centre functions, 35% are not employed in this region (Pendler). This percentage is expected to increase in the coming years.

4. Cooperation between the municipalities to meet the problem

The local authorities and municipalities of the towns already mentioned, who recognized the problems of their region, commissioned the architects van den Broek and J. B. Bakema to make a study in consultation with the Provincial Planning Service, with regard to the application of new living-concentrations to meet the rapid growth of population in the region formed by such towns. The commission's task was further defined as follows:

a) to submit in as much detail as possible one or more sketches of ideas by way of example for new living-concentrations and their ancillary appendages in the direct environment;

b) to make suggestions with regard to the situation of the complexes concerned, whether or not linked with existing cores, attention being given to how to unlock these complexes, and their size in proportion to the number of inhabitants;

c) to provide information about the areas of land required for the contemplated complexes for building purposes, recreation, traffic and maintenance, and the distances between the buildings;

d) to conduct research into the possibilities, also in connection with the building costs, included in the application of new building systems; the municipalities suggested aiming at prefabricated building methods, especially for multi-storeyed buildings;

e) to explain the social aspects of the ways of life advocated.

B. The general conception of the extension plans

1. Communications

A network of roads has been studied to serve the whole area. The highway, fig. 52, is considered to be of major importance for the development of the region forming a part of the primary north-south communications between Holland and the northern provinces. The other roads branching from the highway serve the towns and their extensions. It is also proposed to encircle Alkmaar with the ring road, fig. 52, from which branch the two arteries serving the north and south extension wings of the town. The railway passing through Castricum, Heiloo and Alkmaar reaches the towns of Hoorn and Enkhuizen to the east and Den Helden to the north. The Noord Holland's Canal passing through Alkmaar is used for shipping connecting the IJ-mouth with the region and the town of Den Helden.

2. Principle of layout and the idea of a 'Living unit'

The idea mainly visualizes the grouping and the forms of living in relation to the space problem and the building process. Three main groups of living forms were distinguished by the architects:

It is interesting to note that one-fifth of the area of the Netherlands (12,850 square miles) lies below the average sea level and more than half of the country (6,603 square miles) would be subject to flooding at storm level, if no dunes, sea and river dykes protected this area. (After the Netherlands Government Information Service.)

It should also be stated that a large part of the Netherlands has been won and maintained as a result of an everlasting struggle against the water, which is a testimony to the character of the inhabitants. For example, there are under construction (1962) the west-polder, the south-polder, the east-polder and the northeast-polder at the Zuider Sea, fig. 51.

After a report concerning the study made for the development and application of new forms of living for the benefit of an increase in population, by 1995, of 200,000 inhabitants in the Noord-Kennemerland district, (With a kind permission of architect J. B. Bakema.)

The commission was given by letter in August and September 1957 by the local authorities of the towns.

* In the report concerning such study it is pointed out that changes are to be expected near Alkmaar, particularly in the course of the 'Noord-Holland's Canal', which would affect the further elaboration of the study.
Fig. 52 Noord-Kennemerland extension scheme. The "living units" are distributed all over the area, according to the needs of each town, surrounding the old cores.
a) single-family houses standing free and in rows; this group involves a form of living in which the firm ground remains directly connected with the dweller’s life;
b) multi-storey blocks, in the form of slabs or point blocks (15-storey); this group involves a form of living in which the horizon is drawn into the dweller’s life;
c) flats and maisonnettes (3- to 6-storey); this group is a transitional form between a and b.

The above-mentioned forms are grouped in living units which are distributed in a repetitive manner according to the needs of each town. The repetition of equal forms of living has been accepted for the sake of surveyability of the urban picture, and as important from the construction point of view – as also has been considered and developed through the projects worked out by van den Broek, Bakema and the CIAM group opbouw since 1945 (already discussed in Chapter III).

Each living unit is planned to include about 950 dwellings of which about 30% will be in multi-storey buildings – slabs or point blocks; it is proposed by the architects to restrict the single-family houses, flats and maisonnettes to 70%.47

Generally a living unit of this size requires about 20 ha of which 10 ha will be reserved for dwellings. The total length of the layout of roads is about 2300 m and 300 m dwelling paths.48 There is a possibility of laying out sports fields between the living units.

3. The applications in Kennemerland towns

It has been proposed to apply such living units to Kennemerland region as follows, fig. 52:

a) The extension of Alkmaar, Heiloo, Koedijk, Oudorp and St. Pancras will take place in the two wings north and south of Alkmaar developing as ‘a linear city’. This means that these towns will concentrate their further development in groups of 29 living units with a total of about 29000 dwellings, i.e. about 100000 inhabitants. (The southern extension wing of Alkmaar is our example, analysed in the following pages.)

b) The extension of Castricum will take place with 7 living units with a total of about 6500 dwellings, i.e. about 23000 inhabitants.

c) In Akersloot, Limmen and Schoorl there is room for 2, 1 and 3 ‘½-living units’ respectively. Each ½-living unit includes about 450 dwellings consisting of one multi-storey buildings, blocks of flats, maisonnettes and a number of single-family houses.

d) In Bergen it is estimated that two point blocks will be erected one at the north corner and the other at the west corner including together about 120 dwellings.
C. Analytical study of the community south of Alkmaar

(Population = about 50,000; number of dwellings = about 14,250; number of living units = 15; area = about 390 ha.)

As an example for analytical study we select the southern extension wing. We also analyse one neighbourhood unit (III, fig. 53) deducing the different data and standards.

---

**Fig. 51a** System of units. Kennemerland scheme, the community south of Alkmaar.

<table>
<thead>
<tr>
<th>Divisions and sub-divisions</th>
<th>Elements controlling</th>
<th>Number of inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 The smallest residential unit (1/2-living unit)</td>
<td>Primary school 6 classes</td>
<td>1660 (450 dwellings)</td>
</tr>
<tr>
<td>2 The residential unit (living unit)</td>
<td>2 primary schools 12 classes 2 kindergartens 2 classes 2 shopping units 10 shops 2 playgrounds 4 play-lots</td>
<td>3325 (950 dwellings)</td>
</tr>
<tr>
<td>3 The neighbourhood unit (2-3 living units)</td>
<td>Secondary school 4-6 primary schools 24-36 classes 4-6 kindergartens 4-6 shopping units 20-30 shops 4-6 playgrounds 8-12 play-lots</td>
<td>7000-10,000 (1900-2850 dwellings)</td>
</tr>
<tr>
<td>4 The community (6 neighbourhood units, i.e. 15 living units)</td>
<td>Shopping centre Cultural centre Light industry Sports centre</td>
<td>50,000 (14,250 dwellings)</td>
</tr>
</tbody>
</table>
1. System of units

As already mentioned, we find that the 'living unit' is the basic unit, which comprises about 950 dwellings, i.e. about 3325 inhabitants. To this unit are related two kindergartens, 12 classes for primary education schools in two units, 10 shops in two units, two playgrounds and two play-lots. Such division of the communal services into two units makes it possible to divide the 'living unit' into \(2 \times \frac{1}{2}\) living units. This means that the smallest residential unit measures about 450 dwellings, i.e. about 1660 inhabitants to whom are related one kindergarten, 6 primary-school classes, one unit of 5 shops, 1 playground and 1 play-lot.

The community, including 15 living units grouped in six neighbourhood units, numbers about 50000 inhabitants, i.e. about 14250 dwellings.

To the community are related the cultural institutions including schools, churches, light industry, workshops, public services and the main shopping centre.

The neighbourhood unit includes two to three living units, i.e. comprises 7000 to 10000 inhabitants, or 1900 to 2850 dwellings.

To the neighbourhood unit which comprises 1900 dwellings (7000 inhabitants) is related a secondary school; moreover – according to the repetitive system of units – it includes 24 primary-school classes in four units, 4 kindergartens, 20 shops in four units, 4 playgrounds and 4 play-lots.

Accordingly, for the neighbourhood unit which comprises 2850 dwellings (10000 inhabitants) there are a secondary school, 36 primary-school classes in six units, 30 shops in six units, 6 playgrounds and 6 play-lots. (See neighbourhood standards page 110.)

Remarks

The hierarchy which has been developed through all the schemes worked out by van den Broek, Bakema and their group arises mainly from the conditions, the contemporary needs and the construction possibilities of their environment. Therefore we should bear in mind that we cannot relate a certain order or size of units to a particular element or institution only, such as the school, (although this is a helpful means) without taking into consideration the local, social and economical conditions.

Fig. 54 A perspective of the centre zone, giving an idea of the character of the community core. A core where people go shopping, get together and amuse themselves in an area reserved only for pedestrians secure from any motor traffic.

Fig. 55
1 The central area of the centre zone including:
   a Shops
   b Department store
   c Community hall
   d Library and exhibition premises
   e Cinema, restaurant and club rooms
   f Café, restaurant
   g Covered stands (market)
   p Parking areas

2 The south wing of centre zone including schools, churches, public services, light industry and workshops.
3. Zoning

The main points of the zoning pattern in this project, which has been worked out from the former experiments of the architects and their groups in neighbourhood planning since 1945, are especially evident in the following:

- the relation of the centre zone to the community as a whole;
- the relation of the neighbourhood centres to the community centre zone and to the residential zones;
- the distribution of the kindergartens and schools;
- the distribution of the play-lots and the playgrounds within the neighbourhood unit;
- the distribution of parking areas and garages; and
- the relation between the different living forms.

a) Centre zone: 4.6% excluding sports centre, 8.4% including sports centre.

i) Layout

![Diagram](https://via.placeholder.com/150)

Fig. 56 The longitudinal centre zone centering the community is within about 10 minutes walk, i.e. about 700 m, from the farthest house. The two wings B (fig. 34) each include schools, churches and cultural centre and light industry - each serves the three surrounding neighbourhood units. The central area A, which includes the main shopping centre, administration, restaurants, cafes, library and exhibition premises, is meant to serve the whole community within 15 minutes walk.

ii) Functions

<table>
<thead>
<tr>
<th>Area in ha</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural centre including light industry, etc.</td>
<td>11.60</td>
</tr>
<tr>
<td>Central area including shopping centre, etc.</td>
<td>6.40</td>
</tr>
<tr>
<td>Sports centre</td>
<td>15.0</td>
</tr>
<tr>
<td>Total</td>
<td>33.0</td>
</tr>
</tbody>
</table>

Diagram shows the relationship between the areas of the different functions in the community centre zone.

The total services in neighbourhood units and in the community centre zone form together about 9.8% of the total community area. To the neighbourhood units are related 53% of such services while the remaining 47% are at the community centre zone.
### Table

<table>
<thead>
<tr>
<th>Area in ha</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community services at centre zone</td>
<td>18.0</td>
</tr>
<tr>
<td>Neighbourhood units services</td>
<td>20.25</td>
</tr>
<tr>
<td>Total</td>
<td>38.25</td>
</tr>
</tbody>
</table>

Diagram shows the relationship between the community services and the neighbourhood units services.

For each family there are 26.7 m² of the total community services, for each person 7.65 m², of which 3.9 m² are at the neighbourhood units.49

b) Residential zones: 26.9% net housing area, 70% including neighbourhood greens and services.

See pages 114 and 115, and list of comparison page 178.

Fig. 57 The zoning pattern of the community south of Alkmaar provided for about 50000 inhabitants.
The six neighbourhood units include 15 'living units' covering about 70% of the community area (compared to 55% at Alexanderpolder project 1956 for the provision of the agricultural land). The 30% includes the green belt, the centre zone and the sports centre. The community which covers a total area of about 390 ha includes about 14250 dwellings; it thus has an overall density of 37 dwellings per ha, i.e. about 130 p/ha on the basis of the conditions at Kennemerland about 3.5 persons per family.

Grouping and general layout

According to the general idea of the 'living unit', we observe that the percentage of dwellings grouped in vertical blocks is here more than the average customary percentage proposed for the former Alexanderpolder projects and as also derived from neighbourhood III (page 110) where the dwellings in vertical groupings compose 27% of the total compared to only 16%.

Also, the percentage of single-family houses has increased to 13% (compared with 6.5% and 4% in the Polder projects); the remaining 60% are flats and maisonettes - although such later percentage are considered generally to be variable according to the local conditions of each town.

Each living unit includes a mixed development of dwellings of 1 to 5 rooms, as well as the ½-living unit, owing to the provision of the 15-storey blocks within such units. The single-room flats compose 0.6% of the total number of dwellings, the two-room flats 5.1%, the three-room flats 41.5%, the four-room flats 44% and the five-room flats 8.8%.

Sketch  The silhouette of the community south of Alkmaar seen from the west.

By their layout and situation of the three 'forms of living' the architects propose to enable each form of living to be used without hindrance from the others, and also that the three forms shall be recognizable in the daily life of all the inhabitants, fig. 59.

The silhouette of the heights of blocks of the living unit is the same in conception as at Alexanderpolder project of 1956. By repeating the units as shown in fig. 62 the silhouette form of the community as a whole changes, as shown at sketch above.

Fig. 58

Fig. 59 Figures 58 and 59 are views of a residential unit at the community at Alkmaar showing the spatial grouping of the different housing blocks with the 15-storey block at the far end.
4. The neighbourhood unit

Neighbourhood standards:

(Neighbourhood number III, fig. 62, is here selected for analytical study.)

1. Size

The neighbourhood unit here forms the major unit of the community. Its size is generally determined by the number of the residential units or ‘living units’ which it includes. Accordingly our analysed neighbourhood III comprises about 2850 dwellings, i.e. about 10000 inhabitants, including 3 living units each in turn including about
950 dwellings. We thus find that in this project the neighbourhood unit is recommended to comprise about 7000 to 10000 inhabitants, i.e. about 1900 to 2850 dwellings. (See system of units, page 105.)

2. Neighbourhood area

This neighbourhood population of 10000 requires in the analysed neighbourhood III about 57 ha, i.e. 19 ha are provided for each living unit. The area provided is based on the general idea of the living unit; it is proposed as 20 ha, being the area demanded for 950 dwellings as recommended by the architects.

The neighbourhood area is divided into 18 ha (31.5%) for net housing areas, 31.7 ha (55.5%) for greens and open spaces including 12 play-lots (0.6 ha), 6 playgrounds (1.8 ha), 0.227 ha allotments and water courses, 3.85 ha (7%) for neighbourhood services, 3.45 ha (6%) for roads.

Considering that the project at Kennemerland is a further development of long experience in neighbourhood planning and one of the latest schemes worked out by the architects and their groups — the neighbourhood areas described above could be recommended generally as typical Dutch recommendations.

Relating the aforementioned areas per family and per person we find that — as explained in the table — the area per family is about 260 m² and per person about 72.8 m² according to the existing conditions 3.6 p/family; it would be 57.9 m² per person according to the theoretical number of beds (4.5 p/dwelling) — which could function well in case of population growth within the neighbourhood unit.

A visual aspect is also pointed out here — the provision of about 30% of the neighbourhood area per person for housing area (18 m²) while the other 70% (39 m²) is provided for the recreational needs and services of each person.

3. Densities

The overall density is about 175 p/ha including open spaces, sports, etc., i.e. about 50 dwellings per ha. This density is considerably higher than the neighbourhood unit density in the Alexanderpolder project of 1956 (40 dwellings per ha). (Generally, according to the ‘living unit’ idea, the density of this unit is proposed as 47 dwellings per ha as already discussed.) The net density, i.e. over the net housing area, here rises to 55.8 p/ha.

This increase in density is due to the increase in the percentage of the vertical groupings (27% compared to 16% which has been the customary percentage provided for by the architects and the opbouw group) — beside the decrease in net housing area per person (18 m² compared to 27.4 m² in the 1956 project).

4. Exploitation coefficient

The plot ratio is affected relatively by the increased density, reaching 0.48, or five times the building area (7.4%), compared with 0.41 plot ratio and 8.4% building area in the 1956 project.

Therefore we also find that the plot ratio of the overall net housing area is considerably higher: 1.5, compared to 1.06 in the 1956 project.

Neighbourhood services

Programme:
Kindergarten Garages and parking
Primary school Neighbourhood play-lots and playgrounds (children)
Secondary school and allotments
Shopping units

Standards

a) Kindergartens and schools

<table>
<thead>
<tr>
<th>Kind</th>
<th>% of total population</th>
<th>Number of children</th>
<th>Area in ha</th>
<th>Area per child in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kindergarten</td>
<td>1.2–1.5</td>
<td>150 6 classes</td>
<td>0.6000</td>
<td>40–50</td>
</tr>
<tr>
<td>Primary school</td>
<td>8.5–8.8</td>
<td>880 24 to 36 classes</td>
<td>1.5000</td>
<td>17–18</td>
</tr>
<tr>
<td>Secondary school</td>
<td>3</td>
<td>300 12 classes</td>
<td>1.0000</td>
<td>33</td>
</tr>
</tbody>
</table>
The total area of kindergartens and schools is about 3.1 ha, i.e. about 5.4% of the
neighbourhood area and about 80% of the area reserved for neighbourhood services,
while the remaining 20% is reserved for shops. The average area for a school pupil is
about 25 m² and for a kindergarten child is 40 to 50 m².

b) Neighbourhood shopping

<table>
<thead>
<tr>
<th>Number of families served</th>
<th>Gross sales area in m²</th>
<th>Gross sales area per family in m² (G)</th>
<th>Net sales area per family in m² (G) / 1.25</th>
<th>Gross sales area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>2850</td>
<td>2992</td>
<td>1.05</td>
<td>0.88</td>
<td>0.30</td>
</tr>
</tbody>
</table>

The gross sales area per family is generally small, but considering that the main
shopping centre is within about 10 minutes walk, the area per person could accord¬
ingly be reduced; here about half the area (2 m²) into be recommended.

c) Neighbourhood parking and garages

<table>
<thead>
<tr>
<th>Kind</th>
<th>Gross area in m²</th>
<th>Number of (G) and (P) per 1000 inhabitants</th>
<th>Total (G) and (P) per 1000 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garages (G)</td>
<td>7585</td>
<td>210</td>
<td>69</td>
</tr>
<tr>
<td>Parking stalls (P)</td>
<td>12000</td>
<td>480</td>
<td></td>
</tr>
</tbody>
</table>

Adding the number of private garages we find that for each 1000 inhabitants there is
provision of (G) and (P) for about 80 cars.

d) Neighbourhood recreation

<table>
<thead>
<tr>
<th>Kind</th>
<th>Total area in m²</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play-lots</td>
<td>6000</td>
<td>2.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Playgrounds</td>
<td>18000</td>
<td>6.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Allotments</td>
<td>2270</td>
<td>0.80</td>
<td>0.23</td>
</tr>
<tr>
<td>Neighbourhood greens</td>
<td>290730</td>
<td>101.75</td>
<td>29.07</td>
</tr>
</tbody>
</table>

The total recreation area per person is generally about the same as recommended in
the Alexanderpolder project of 1956, page 49, but here there is also provision for play¬
lots, playgrounds and allotments.

5. Comments, social and human aspects

1. The way of treating the problem of Noord-Kennemerland towns as a whole is in
itself a recognition of a characteristic problem in our contemporary life.
Studying the process of dealing with the problem, we observe that cooperation between
the municipalities within the one region is quite essential. Each municipality should
study its own needs, social and economical, within the wider frame of the region and
within its natural environment.
Accordingly the population should be distributed fairly evenly over the whole area. The development of concentrations of already developing existing towns should be balanced, to assure equilibrium within the region as a whole.

The human, social and economical standards within such a coordinated planning system will naturally develop well.

As a basic unit for the whole organism, the residential neighbourhood unit integrating and coordinating with the larger units of community, town and region assures a workable whole. Its organism is planned with respect to the requirements of the town and the region fitting into the town plan and the regional plan.

2. Integration of the centres of the residential units with the neighbourhood units into the community centre:

A characteristic of this scheme is the conception of making the centres of the residential units form together a longitudinal physical centre of the neighbourhood unit. This could be considered an evolution of the neighbourhood planning ideas worked out by the architects with regard to the arrangement and the relation of the different centre zones of the small, medium and larger units. This means the transformation of the neighbourhood concentric centre to a linear centre directly connected and integrated with the community centre.

This arrangement could help in providing the following advantages:

a) It gives more chance for the neighbourhood population to choose and differentiate in providing for their needs and services within their own neighbourhood, within short walking distances.

b) The community centre zone extends on a ribbon system integrating with the neighbourhood units, giving maximum choice and providing for needs especially in shopping – also within walking distance.

c) The neighbourhood unit centres gain an urban character from being connected to an ‘urban’ centre; which ensures the individual a living environment where he feels he is living fully – besides being able to live intimately, overlooking his direct neighbourhood. A drawback from the economical point of view is that the neighbourhood shops located near the main shopping centre would not function well owing to the unequal competition between them. Therefore care should be taken in choosing the kinds of shops to be situated near to the main shopping centre. This has been recognized at Harlow, the satellite town of London, and Vällingby, the satellite town of Stockholm, where the main shopping centre serves the direct neighbourhood unit, which does not have a shopping centre of its own.

3. The kindergartens, play-lots and playgrounds form social cores between the successive residential units as shown in fig. 62.

The housing blocks are laid out to form an intimate space which helps to develop social contact between the various inhabitants who will live in the different types of dwellings. The kindergarten and the playgrounds are easily reached without crossing any traffic way within 100 to 150 m. This layout also meets the need of the individual and the family for contact with open spaces within the immediate neighbourhood.

4. The longitudinal compact centre zone provided for the neighbourhood units would generally allow for an intimate core, but it might not be busy enough owing to the high-density zones being located at the periphery of the units; their inhabitants might prefer to go to the community centre, especially for shopping, since the walking distance is about the same.

5. The adults will find their interests at the community core where there is provision for cultural activities and amusements within 10 minutes walk. Also they will find the sports centre at a maximum of 2000 m from the south neighbourhood. We consider this distance not far, since it could be reached by bicycle in a few minutes. In Holland, as a special case, there is one bicycle for every 2½ persons.50

6. The main traffic artery is lined on one side by a thick green belt and on the other by the centre zone; both work as insulation from noise which might disturb the residential zones.
### 6. List of derived standards and method of calculation

#### 1 Community areas
Divisions of community areas in percent, per family and per person

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area (incl. inner roads)</td>
<td>105</td>
<td>26.9 %</td>
<td>73.5</td>
<td>TH EC 16.3 21.00</td>
</tr>
<tr>
<td>b) Greens and open spaces</td>
<td>202.25</td>
<td>51.8 %</td>
<td>141.5</td>
<td>31.4 40.45</td>
</tr>
<tr>
<td>2 NB greens incl. play-grounds, allotments and water courses</td>
<td>157.25 ha</td>
<td>3 Green belt 30.0 ha</td>
<td>4 Sports fields 15.0 ha</td>
<td></td>
</tr>
<tr>
<td>c) Community services</td>
<td>38.25</td>
<td>9.8 %</td>
<td>26.7</td>
<td>5.9 7.65</td>
</tr>
<tr>
<td>5 Kindergartens 3.0 ha</td>
<td>6 Primary schools 7.5 ha</td>
<td>7 Secondary schools 6.0 ha</td>
<td>8 Cultural centre 11.6 ha</td>
<td></td>
</tr>
<tr>
<td>9 Shopping centre 6.4 ha</td>
<td>10 Neighbourhood shopping 3.75 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 11 Parking (excl. garages)</td>
<td>5.50</td>
<td>1.5 %</td>
<td>3.8</td>
<td>0.8 1.1</td>
</tr>
<tr>
<td>e) 12 Roads (main only)</td>
<td>39.0</td>
<td>10 %</td>
<td>27.3</td>
<td>6.1 7.8</td>
</tr>
<tr>
<td>Total</td>
<td>390.00</td>
<td>100 %</td>
<td>272.8</td>
<td>60.5 78.0</td>
</tr>
</tbody>
</table>
### Neighbourhood areas

Divisions of neighbourhood areas in percent, per family and per person

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area</td>
<td>18.00</td>
<td>31.5 %</td>
<td>63.00</td>
<td>TH 14.00 EC 18.0</td>
</tr>
<tr>
<td>b) 2 Greens and open spaces</td>
<td>31.70</td>
<td>55.5 %</td>
<td>110.95</td>
<td>24.6 31.7</td>
</tr>
<tr>
<td>(including 12 play-lots 0.6 ha + 6 playgrounds 1.8 ha, allotments 0.227 ha + water courses)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Neighbourhood unit services</td>
<td>3.85</td>
<td>7 %</td>
<td>13.47</td>
<td>3.0 3.9</td>
</tr>
<tr>
<td>3 Kindergartens 0.60 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Primary schools 1.50 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Secondary schools 1.00 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Shopping 0.75 ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 7 Roads</td>
<td>3.45</td>
<td>6 %</td>
<td>12.10</td>
<td>2.7 3.4</td>
</tr>
<tr>
<td>Total</td>
<td>57.00</td>
<td>100 %</td>
<td>199.52</td>
<td>44.3 57.0</td>
</tr>
</tbody>
</table>

TH = Theoretical number of beds, 4.5/dwelling
EC = Existing condition, 3.5/dwelling
3. Total gross area and net housing area

a) Total gross area = area of neighbourhood  
57 ha

b) Net housing area = area of plots  
18 ha = 31.5%
4. Number of inhabitants per dwelling

Number of inhabitants per dwelling = \( \frac{\text{total number of inhabitants}}{\text{total number of dwellings}} \)

Overall, both horizontal and vertical groupings

Total number of inhabitants = 10000 (according to the existing condition)

Total number of dwellings = 2850

3.5 p/dwelling

5. Number of persons per room

Number of persons per room = \( \frac{\text{number of inhabitants}}{\text{number of rooms}} \)

Overall, both horizontal and vertical groupings

Number of rooms = 10128 (3376 a living unit)

0.9-1 p/room

6. Lodging coefficient

Lodging coefficient = \( \frac{\text{number of inhabitants}}{\text{number of blocks}} \) = number of inhabitants/block

Overall, both horizontal and vertical groupings

Number of blocks = 102 (34 blocks a living unit)

100 p/block

Single-family houses

+ 2-storey

+ 3- or 4-storey

+ 3×2-storey

15
7. Total gross area of floors and total net area of dwellings

<table>
<thead>
<tr>
<th>Net area of dwellings in horizontal grouping</th>
<th>Gross area of dwellings in horizontal grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>about 15.6645 ha</td>
<td>about 19.3836 ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Net area of dwellings in vertical grouping</th>
<th>Gross area of floors in vertical grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>about 6.0900 ha</td>
<td>about 8.1024 ha</td>
</tr>
</tbody>
</table>

| Total 21.7545 ha                          | Total 27.4860 ha                           |

Net/Gross = about 78%

8. Net and gross floor area per person

\[
\text{(Net), (gross) floor area per person} = \frac{\text{total (net), (gross) area of floors}}{\text{number of inhabitants}}
\]

<table>
<thead>
<tr>
<th>Net horizontal</th>
<th>Net vertical</th>
<th>Net overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 19.9 m²</td>
<td>TH 28.9 m²</td>
<td>EC 21.8 m²</td>
</tr>
<tr>
<td>Gross horizontal</td>
<td>Gross vertical</td>
<td>Gross overall</td>
</tr>
<tr>
<td>EC 24.6 m²</td>
<td>TH 38.5 m²</td>
<td>EC 27.5 m²</td>
</tr>
</tbody>
</table>

EC = according to 3.5 p/dwelling (existing condition)
TH = according to 4.5 p/dwelling (theoretical number of beds)

9. Percentage number of tenants, groupings and dwelling types

Percent number of tenants in each type of grouping and in each type of dwelling related to the total number of inhabitants

<table>
<thead>
<tr>
<th>Single-family houses</th>
<th>3- to 6-storey</th>
<th>15-storey</th>
<th>1 room</th>
<th>2 rooms</th>
<th>3 rooms</th>
<th>4 rooms</th>
<th>5 rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop. 15.5%</td>
<td>63%</td>
<td>21.5%</td>
<td>0.17%</td>
<td>2.83%</td>
<td>36%</td>
<td>49%</td>
<td>12%</td>
</tr>
<tr>
<td>Dw. 13.3%</td>
<td>59.5%</td>
<td>27.2%</td>
<td>0.6%</td>
<td>5.1%</td>
<td>41.5%</td>
<td>44%</td>
<td>8.8%</td>
</tr>
</tbody>
</table>

abcabcde
10. Percentage of built-up areas

a) At overall density 175 p/ha
Both horizontal and vertical groupings

Built-up areas (housing) = 7.4%
Built-up areas (public buildings) = 2.4%
Roads = 6.0%
Greens and open spaces = 84.6%

b) Net built-up areas = total area of ground floors / net housing area

Horizontal at density 540 p/ha
Built-up areas = 25.4%
Greens = 74.6%

Vertical at density 620 p/ha
Built-up areas = 13.7%
Greens = 86.3%

c) Net built-up areas at density 555 p/ha
Overall, both horizontal and vertical grouping

Built-up areas = 23.3%
Greens = 76.7%
11. Density

a) Gross (overall) density = \( \frac{\text{number of inhabitants}}{\text{total gross area}} \)

Mixed grouping, vertical and horizontal

Number of dwellings = 2,850 at 3.5 p/dwelling
Total gross area = about 57 ha
about 50 dwellings per ha

175 persons per ha
(Theoretical according to number of beds = about 225 p/ha)

b) Net density = \( \frac{\text{number of inhabitants (for each type of grouping)}}{\text{net housing area of the type of grouping}} \)

1. Zone of horizontal grouping
2. Zone of vertical grouping

540 persons per ha
620 persons per ha

c) Net density = \( \frac{\text{number of inhabitants (of the mixed grouping)}}{\text{net housing area (total 1. and 2.)}} \)

Zones of horizontal and vertical grouping

555 persons per ha
12. Exploitation coefficient

a) At density 175 p/ha

Overall, horizontal and vertical grouping

```
0.48
```

Built-up area: Gross floor areas = about 1:5

b) Exploitation coefficient = \( \frac{\text{gross floor area (each type)}}{\text{ground pieces (each type)}} \)

1. Horizontal: at density 450 p/ha

```
1.3
```

Built-up area: Gross floor areas = 1:5.2

2. Vertical: at density 620 p/ha

```
2.38
```

Built-up area:
Plot ratio = 1:17

c) Exploitation coefficient = \( \frac{\text{gross floor area (both types)}}{\text{ground pieces (both types)}} \)

Overall at net density = 555 per ha

```
1.5
```

Built-up area:
Gross floor areas = 1:6.5
Leer - Vide - Empty
Part III

The Doxiadis Dynapolis and the Hook town planning principles as contributions to neighbourhood planning
Leer - Vide - Empty
Chapter 5

The idea of the Dynapolis applied to the general plan of Baghdad, 1958, with an analytical study of sector number 10; C. A. Doxiadis

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Introduction

The government of Iraq commissioned Dr. C. A. Doxiadis, as a consultant engineer, to study the planning problem, policy and program of Baghdad, Iraq.

The work began in 1955 with the help of 100 architects, civil engineers, topographers and other specialists: Greeks, Iraqis and a few Americans, Austrians and Italians.

The program covers 25 years, with immediate solutions for the first five. It includes all aspects of the housing problem, policy, city planning, dwelling types in general, building of villages and space surroundings. This program also emphasizes the governmental system, the economic problem, the existing building materials and the teaching of technicians.

Dr. Doxiadis has been given the chance to apply his theory of the city of the future, 'Dynapolis', to actual problems such as the metropolis of Baghdad, which has special local conditions as well as the same universal problems of growth and expansion.

Before discussing our analyzed example of sector number 10 (1959–1962) as one of the basic units of the general plan of Baghdad, it is essential to analyze the ideas of Dr. Doxiadis with respect to the city of the future, as applied to the plan.

These ideas have been explained by Dr. Doxiadis himself in a number of lectures given in different cities, such as Athens, Baghdad, Cairo, London, Oslo, Paris and Zurich. We single out on the next pages the main points which are in direct relation to this thesis.

A. The idea of Dynapolis

1. Principles of the Dynapolis

Dr. Doxiadis gives four main principles which should determine the existence of the city of the future.

First: ‘Planning and building should satisfy all human needs on the basis of the principle of unity of purpose.’

To achieve this principle

a) planning must be comprehensive and include all social and all income groups and all types of functions;

b) the economical, the social, the political and the aesthetic and cultural requirements should be satisfied;

c) democracy should be the basis, with equal opportunities for the inhabitants.

Second: ‘The order and hierarchy of functions are indispensable elements for the survival of our cities.’

This principle concerns the basic structure of the city. The type of people, their diversified needs and the other internal social forces will interact within the city. Therefore good organization and proper hierarchy of functions is needed to meet these social forces. He recognizes that the city of the future can no longer be built in the haphazard way that the cities of the present have developed, where people and cars, residences and factories, shops and schools are mixed together in a manner that defies order and hierarchy in city structure.

Economy should be observed in every respect; in time, money and movement of people and machines within the city. ‘We must follow a certain functional hierarchy in our design that will make all functions part of a well coordinated system of interdependent activities.’
Third: 'Freedom of the city to develop dynamically.'
He points out that the concept, formation and the physical expression of the city must be influenced by the time factor. The time must be as a fourth dimension and must be given greater importance than the other three, because the city of the future will double its population and size within, at most, one generation. This means that the forces of expansion will be much greater than the static and will create additional problems every day. Recognition of the time factor is the reason for his calling the city of the future 'Dynapolis', i.e. the dynamic city, the expanding city. (Dynapolis = dynamic 'Polis' or city.)

1. Unity of purpose
A project must be satisfactory:
- economically
- socially
- politically
- technically
- culturally
- aesthetically

2. Hierarchy of functions
The still larger community needs an administrative centre, more provision for public services, entertainment and central meeting facilities etc.
- Larger numbers of families need houses of worship, more schools, a shopping centre, a park, some health facilities, group meeting places, etc.

3. The four dimensions
- The city in the past
- The city in the present
- The same city in the future
- The satellites are being absorbed into the main body of the city

Fig. 64 Table showing the annual rate of increase of world population and principal towns.

Fig. 65 Schematic diagram showing the physical growth of the city absorbing its satellites.
Fourth: 'The city of the future has to be built in various different scales.'
Dimensions and proportions of cities should be for different scales, men, cars, aeroplanes and even rockets.

2. Size of the Dynapolis

The definition of the Doxiadis Dynapolis is that it grows continuously and therefore no limit to its size has been set.

We may single out the main points which Dr. Doxiadis stresses to prove such definition.

a) Assuming a country the population of which is growing at 1% per year, if the urban population is one third of the total, this means that the urban population is growing by three percent per year – even if the productivity in the rural areas remains the same and thus the rural population does not decrease.

b) There is a continuous decline in the number of rural population owing to the increase of productivity of secondary and primary industry. This means that a smaller rural population will produce the food for the whole nation; there therefore occurs a gradual movement of a percentage of the rural people to urban areas, adding to the growing urban population.

c) With respect to size, location and importance of cities, these will grow, some by 6% or 7% or more, others by 5%, 4%, 3% or less annually. This means that there are cities which might double their population within a decade and others in 15, 20, 25 or more years.

d) Some urban centres are increasing more than the others according to their locations, as focus of central functions. Therefore Dr. Doxiadis observes that the even spread of urban growth as a proposition to avoid cases of double population within 10 years time or even less is impracticable, because it is not natural to reverse the normal trends of population growth of urban centres. Growth should be controlled in order to avoid unreasonable increases due to factors which are not normal, such as the unequal spread of development projects over short periods, which leads to abnormal growth of certain centres and upsets the balance existing between them.

His point of view concerning satellite towns as a solution to avoid the physical growth of a city is that they will only remain so for a short time until the growing and expanding city reaches them. He thus observes that the satellite towns will have to be conceived from the beginning as integrated parts of the city.

e) As a conclusion he points out that:
There is no reasonable way to limit the growth of cities, as this is due to forces in our era which are beyond the city's control and cannot be reversed.

There is no reasonable way to limit the spread of the city as it needs a certain surface for its functions. If we spread them, the city will reach them and incorporate them again.

3. Form of Dynapolis

Three main rules were observed to determine the form of Dynapolis:

a) The rule of one main direction of development:
As a solution of the problem of growth of the city of the present, the centre of which is expanding and conflicting with the other functions and with the city cell, Dr. Doxiadis states that the city of the future must possess an expanding central part, arranged in such a way that it can expand without breaking into the other parts of the city (C, fig. 66).

Expansion of the city centre in the third direction, in height, is seen as wrong because it only increases the cells of the city centre and not the arteries feeding it. An expansion along a predetermined axis comprising the original central core of the city and its new development on both sides and along the central core is proposed. This means that the city would follow one topographical direction and its expansion would be mainly unidirectional.

The aforementioned idea is transformed into a scheme D, fig. 66, where the expansion can also be in the other three directions but at a much slower rate. The relation between the expansion in the one main direction and in the other three would depend on the speed of growth of the population, the speed of growth of the economy, and the relation between them and the control exercised on the growth of the city.

To understand his point of view with respect to the development of the centre, we have to look at D, fig. 66. Centres 2, 3 and 4 etc. are centres developing, along the main axis and in the main direction, at each development of the city. Centres 2', 3' and 4' etc. are additional centres created to assist the former centres to serve the new additions to the city north, south and west of it.
In the past
The city

The centre

Expansion of
the city

Expansion of
the centre

The concentric expansion strangles the centre which
struggles with other functions.

In the future
The city

The centre

The expansion in one direction allows the centre to
expand without difficulty.

Fig. 66 The form of Dynapolis as explained in
diagrams by Doxiadis.
D shows the development of the centres with the
other parts of the city.
E shows the location of the highways at the succes-
sive phases of development.
Fig. 67 The angular pattern of highways. The dotted parts would be incorporated into the city (closed, rebuilt or used as internal roads).

THE OLD CITY

here the modulus is the block

THE NEW CITY IN THE SAME SCALE

now the modulus should be the sector

Fig. 68 'The community sector', corresponding to the size of tens of the blocks of the past.

The scale in our city planning has changed. Thus the basic element which used to be the city block is now replaced by the community sector.
b) The rule of development on a system of vertical axes:

This means that the city of the future as proposed by Doxiadis is conceived as a city built and developing at varying rates along a system of perpendicular axes. One should bear in mind that this development has to become an integral part of the overall area around the city and, from a planning point of view, of the overall development of the whole nation; this he observes is based physically on a system of hexagonals.

c) The rule of a pattern of highways based on different expressions of the hexagonal pattern (but never of hexagons or diagonals, as pointed out by Doxiadis) on the vertical system of axes within the city:

Highways A, B, C, D, E and F (E, fig. 66) connect the surrounding area at the initial stage of development.

Highways C' and E' and C'' and E" etc. are the new positions of the axes C and E at the first, second, etc. phase of development. The parts of the highways which would be incorporated into the city are seen to be closed at every time, rebuilt, or used as internal roads of lower categories.

Highways A and D suffer no major relocation since they are the main axes along which the major expansion takes place.

Moreover, it is proposed to divide the city into sectors of similar shape, following the rules imposed by the hexagonal pattern, or by means of an angular pattern such that the sides of the main sectors and their incidence with the highways form 30° to 60° triangles.

4. Structure of Dynapolis

a) Module

As a module of the city of the future is proposed the community sector, ‘an area comprising hundreds or thousands of dwellings and correspond to the size of tens of blocks of the past’, fig. 68. The number of families (i.e. dwellings) correspond to one or more primary schools or secondary schools, shopping centres, community centres, religious buildings, etc., i.e. served by one or more types of central functions.

Spatially the sectors are related to the city size. If the city is small it can have sectors repeated in a similar way and form a uniform pattern. If it is large, or when it becomes so, it is proposed that these sectors be united in a major or super sector, and this will become the part that can be repeated in order to form the city. If the city is even larger, it is proposed that the super sectors be united into even larger sectors, which will be the major divisions of the city.

b) Divisions corresponding to functions

The sectors, super sectors, etc. correspond to functions and follow their hierarchy. If one sector needs one primary school, a super sector should correspond to a high school and a major division to a more specialized educational institution. With respect to shopping, if a sector has a small shopping centre, the super sector may have a super market and, if a sector has a small community centre, the super sector will have the cinema of the whole area.

The structure of the city as seen by Doxiadis corresponds to the hierarchy of its functions and its main axes; the major divisions are those delimited by the axes passing through the whole length or width of the city.

All functions, buildings, roads, facilities, etc. will be designed and built according to their hierarchical importance.

Sizes: The sectors will vary in size according to physical considerations, sizes of plots, incomes etc.; therefore Doxiadis classifies the sizes by communities because they can
c) The scale of Dynapolis

Dr. Doxiadis observes that the scale of man can be imposed up to one kilometer or up to a maximum of one mile, which is the scale corresponding to a community class IV if this community consists of minor plots and houses. Divisions of Dynapolis are classified with respect to scales as follows:

Communities class I, II and III and sometimes IV are considered as human communities, the internal connections of which are based on human movements.

Communities class III or IV onwards are considered as 'mechanical communities', based on connection by car and train.

Communities class V or VI are would contain an airport for external connections.

Larger communities would depend on air connections even for internal lines.

He also envisages communities which are going to have rocket-launching bases, but this cannot be predicted.
5. Divisions of the community (super sector) 60,000 to 100,000 people, controlling elements and sizes

<table>
<thead>
<tr>
<th>Div. No.</th>
<th>Divisions and sub-divisions</th>
<th>Elements controlling</th>
<th>Number of inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Community class I</td>
<td>Neighbourhood play-ilot and meeting place</td>
<td>75–100</td>
</tr>
<tr>
<td>2</td>
<td>Community class II</td>
<td>Neighbourhood shopping corner Neighbourhood gardens</td>
<td>300–500</td>
</tr>
<tr>
<td>3</td>
<td>Community class III</td>
<td>Elementary school Playground</td>
<td>1500–2000</td>
</tr>
<tr>
<td>4</td>
<td>Community class IV 'Sector, basic unit'</td>
<td>Secondary school Religious building Shopping centre</td>
<td>6000–10000</td>
</tr>
<tr>
<td>5</td>
<td>Community class V Super sector</td>
<td>Supermarket</td>
<td>30,000–60,000</td>
</tr>
</tbody>
</table>

B. The Master Plan of Baghdad, 1958, application of the idea of Dynapolis and solution of the housing problem

1. Problem

Baghdad, the capital of Iraq, is located on the river Tigris, in the central part of the Middle East. It lies between Iran to the east, Syria to the west, Turkey to the north and Saudi Arabia to the south. The main element within the landscape of Baghdad is the river Tigris along which it has always grown.

The population in the year 1935 was 287,000, which grew to 740,000 within 25 years and will, it is estimated, reach 1,500,000 in the year 1980.

The master plan was required to meet such rapid growth of population, as well as to solve the existing housing problem.

\*Goldmanns Großer Weltatlas.
2. Application of the idea of the Dynapolis to the master plan

The growth of the city is directed along the river Tigris, allowing the centre to expand along the main highways Damascus–Kut, assisted by horizontal expansion to the right and to the left bank of the river.

The plan is based on the geometric grid pattern formed by the main internal thoroughfares which delimit the major divisions of super sectors. Each super sector ranges in area between 10 and 12 km², and each includes its centre, which is schematically indicated on the plan, but the location of which will be determined by local considerations in each case.

The divisions and sub-divisions follow a hierarchy of functions and correspond to communities classified according to their importance (see fig. 69).

The master plan, fig. 74, covers an area of roughly 32×18 km, i.e. 576 km² including the river area. For the major city centre zone, including the civic, commercial and business centre, about 12% of the total area is reserved, for the major industrial zones...
north-west and south-east 7%, for major green areas and parks 15% including the river area, and for residential purposes, including the local centres and green spaces, 60%. The major roads and railway land, indicated on the plan, cover about 3% of the total area, the pilgrims area (holy district of Shia) covers 0.5% and the area reserved for the army covers about 2.5% (see diagram and table below).

<table>
<thead>
<tr>
<th>Area in km²</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential (Including local centres and local green spaces)</td>
<td>345.6</td>
</tr>
<tr>
<td>Major city centre</td>
<td>69.12</td>
</tr>
<tr>
<td>Industry</td>
<td>40.32</td>
</tr>
<tr>
<td>Green spaces and river</td>
<td>86.0</td>
</tr>
<tr>
<td>Pilgrims, army, roads and railways</td>
<td>34.96</td>
</tr>
<tr>
<td>Total</td>
<td>576.0</td>
</tr>
</tbody>
</table>

Diagram shows the major divisions of the city area of Baghdad, after the master plan.

- Pilgrims: 2.8 km², 0.5%
- Army: 14.4 km², 2.5%
- Major roads and railway land: 17.76 km², 3.0%

Fig. 74 The master plan of Baghdad, 1955–1980 (by Doxiadis Associates).
3. Solution of the housing problem with respect to the economical conditions, class problem, needs and desires of the people

a) Classification of the dwellings with respect to incomes:

To develop a home for the poorest people, the designers had to understand the local economic conditions which guided the planning and design.

First, an analytical study was made for the whole population, in order to discover the different incomes of people.

Then the people were classified according to their incomes in order to develop for each social group a suitable type of dwelling.

The dwellings were designed and studied so as to meet the needs of people when their income increases. Therefore each dwelling was designed in a middle category between each two incomes.

This study led to classification of dwellings into seven major groups – A, B, C, D, E, F, and G which represent the incomes from 10 Dinars to 200 Dinars per month, i.e. from 120 Dinars to 2400 Dinars per year.

b) Dwelling costs and the part of the government

It has been agreed with the authorities to develop dwellings which cost two yearly incomes. But this was not absolutely considered, because there are poor families who cannot afford to pay even the income of one year. In this latter case, the government would pay part of the costs of the dwelling or even the whole costs. According to this consideration it has been decided that the houses would cost between 240 and 4800 Dinars.

To develop houses within such costs the following analysis was made:

The costs of construction in Iraq were analysed and classified with respect to income classes: for the poorer groups cheaper construction and for the successively better-off groups a more expensive construction.

The volume of houses was also adjusted relative to the different social groups.
An analysis of the property limits was made; this was essential to start with in studying the types of houses. This analysis we may briefly give as follows: (it is studied and discussed in detail in sector 10, page 137).

Four main factors were considered; first the property limits, second the city plan, third the present costs of land, fourth the future costs of land. These led to a module for the plots in m², the size and relation between the width and depth of the plots for the types of houses. The volumes of houses and areas of their plots were determined accordingly and classified as mentioned into groups A, B, C, etc.

A rational, simple method of construction was sought in order to keep down costs. Therefore for each category of houses the same walls, doors, windows, steps and handrails were provided.
c) Consideration of the needs and desires of the people

Before dealing with the aesthetic aspects and the design of the types of houses, the designers took into consideration the needs and desires of the people – whether they would consent to live in them or not – in order to develop functional and organic architecture.

Each type of house is studied with respect to topography, location and orientation. About 60 possibilities for each category have been studied which we show in examples A, B, C and D at the primary studies, page 135. Also examples of the different design solutions for one type are shown, the conception of which is generally the same. From the models we note the gradually improving elements of construction from type to type (for example the parapets) and in the plans the gradually improving utility accommodation (for example type C 01 includes only a shower while type D 01 includes a bathroom – although each consists of 4 rooms).

Examples of primary studies of types of houses, income categories A, B, C and D

Fig. 75 Location of sector 10 within the super sector (community class V, 100000 people), Western Baghdad development.

C. Analytical study of sector 10, Baghdad, 1959–1962

1. Site location

Sector No. 10 is located in the western part of Baghdad, about 2 km from the Damascus–Kut highway and about 4 km from Baghdad central station, fig. 75. It is one of the sectors, community class IV, of the super sector, community class V (100000 people) surrounded by the main highways to Hilla, Mosul and Damascus. The main centre of the super sector is about 800 to 1000 metres to the south of the site. The local railway station is at the same distance, but this does not apply to all the sectors.
2. Road systems

As shown at fig. 76, we find that there are three kinds of vehicular roads:
Thoroughfare to the east (50 m total width) is divided into four separate traffic lanes;
the outer ones, from which branch the cul-de-sacs (6 m) serving the sector, are for
infrequent local traffic and the inner ones for frequent vehicular traffic (7.5 m).
As a governing conception, the two intersecting thoroughfares cutting through the
super sector, fig. 75, pass by all the minor sectors, helping to speed connections between
them and with the main centre and the other parts of the city. Both thoroughfares are
connected to the highways surrounding the super sector.
Roads (20 m in width), north and south, from which branch the cul-de-sacs.
The western road is 15 m in width and no cul-de-sacs branch from it.
Cul-de-sacs (6 m in width) with parking areas at the end; these reach the housing
groups and the centre zone from the back.
Footpaths (pedestrian ways) are also classified into heavy pedestrian-traffic ways (15 to
25 m), which lead to the centre zone, and other lanes, connecting the housing groups
from which branch off access pedestrian lanes leading to the houses.

3. Zoning

The zoning pattern is an expression of the idea of hierarchy discussed on page 130. The
primary schools are the focus of three residential units (community class III), which
are the sub-divisions of the sector. Each unit consists of a number of residential groups
(community class II) which in turn consist of a number of housing blocks (community
class I), as further analysed.
The total area (32 ha excluding outer roads) consists of three main zones: the centre
zone (5 ha, 15.7%, including the inner central footpaths (pedestrian ways)); the sports
centre zone linked to it (3.4 ha, 10.6%); and the residential zone (22.0 ha, 68.7%). The
vehicular service roads cover 1.6 ha, i.e. 5%.

a) Centre zone
Community services = 4 ha, 12.5%.

i. Layout
All the community services are grouped together to form one linear central area, kept
free of any vehicular traffic and reached within 3 to 5 minutes walk. The elements and
the distribution reflect the character and needs of an Arab community. Analysing their
distribution we find that:
Shopping and schools are distributed as shown in fig. 76 to serve the sector sub-divisions and at the same time to be connected with the other services as main elements of the central area.

The market, which is an important Arabian social meeting point, doubles the main pedestrian way, forming the main spine of the central area. The central market is the major one, being opposite the mosque, and focusses two entries to the centre from north and south.

The public bath is located at the entry to the centre zone, directly connected to the market.

Cafés are distributed as main elements of the market.

The mosque with its minaret is located as a central point focussing the centre zone as well as the sector as a whole.

The sports centre zone is located at a maximum of 600 m from the houses, linked to the centre zone but not disrupting its unity.

### Functions

<table>
<thead>
<tr>
<th></th>
<th>Area in ha</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools</td>
<td>2.2</td>
<td>29.7%</td>
</tr>
<tr>
<td>Shopping</td>
<td>0.4</td>
<td>5.4%</td>
</tr>
<tr>
<td>Municipal and public buildings</td>
<td>1.4</td>
<td>18.9%</td>
</tr>
<tr>
<td>Sports and recreation</td>
<td>3.4</td>
<td>46.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.4</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Diagram shows the relationship between the different functions in the centre zone.

Each household is allocated 34.4 m² of community services at the centre zone, and each person 6.9 m². The sports and recreation centre form about 62% of the total green areas. For each person there are 6.2 m² and for each household about 31 m². The other 38% are distributed all over the residential zone as neighbourhood gardens and children's playgrounds – 3.6 m² for each person and about 18 m² for each household.

These standards for green areas show the effect of climate if compared with the other standards in the neighbourhoods in Europe. However, the planning aspects affect the standards of greens and recreation areas within the neighbourhood. For example, in the Alexanderpolder project 1953, page 27, the area per person is about the same within the neighbourhood (10.8 m²), owing to the provision of the playing fields in a special zone outside the neighbourhood area. Also we shall see in the Hook study the provision of playing fields outside the residential unit 'super-block', according to the principle of compactness and urbanity within the inner town zone, where the greens and recreation area per person is 16.82 m².

### Residential zones

#### i. The zoning pattern of the residential zones is mainly determined by the economical and social factors.

The sector as a whole is planned to include three kinds of inhabitants, classified and distributed in groups according to income. The types of houses in general are provided to suit three income categories: A (247 houses, 21.3%), B (602, 51.8%) and C (313, 26.9%). For income group A two types of houses are provided: A 02 (173, 14.9%) and A 13 (74, 6.4%).
For income group B also two types are provided: B 15 (103, 8.9%) and B 22 (499, 42.9%). For income group C only one type is provided: C 27 (313, 26.9%).

The five types of houses are distributed in such a way that each housing block and each group of blocks includes one of the five types of houses. Each two groups of blocks including two types of houses form a housing group relative in size, i.e. number of houses as well as number of inhabitants, to the types of houses provided for the different income groups.

For example, at the north-west corner of the sector is the housing group (X, fig. 77) consisting of two types of houses of the lower income group A, of size 168 houses (2 rooms), i.e. 740 people, at 5 p/house and occupancy ratio of 2.5 p/room. It covers plot areas of 1.1770 ha, i.e. at a net density 713 p/ha.

Comparing this housing group with another, for example Z, fig. 77, which consists of two types of houses of income group B, i.e. the group immediately above A, we find that it contains 118 houses (48 of B 15 and 70 of B 22). The number of inhabitants ought to be 590 at an occupancy ratio of 1.67 p/room at B 15 and 1.25 p/room at B 22 (three and four rooms respectively). This housing group covers plot areas of 1.4634 ha, i.e. at net density 403 p/ha – which is less in size and density than the former X group.

The two housing groups discussed above each represent a small neighbourhood of community class II, and each housing block represents a community class I (about 20 houses).

Analysing the housing group Y, which represents a neighbourhood community class III, we find that it contains 348 houses of two types, B 22 and C 27, at overall density 355 p/ha – classified as in the following table.
Income group A02

Types A02

Number of rooms per house 2

Number of persons per room 2.5

Gross floor area per person at each type 7.2

Gross floor area of house in m² 36.00

Plot area of house (in m²) 54–72

Number of houses of each type 173

Percent 14.9%

Number of tenants in each type (theoretical) 865

Percent 14.9%

This house type is implemented into 6x9 and 6x12 m plots.

Income group A13

Types A13

Number of rooms per house 2

Number of persons per room 2.5

Gross floor area per person at each type 11.84

Gross floor area of house in m² 58.22

Plot area of house (in m²) 81.00

Number of houses of each type 74

Percent 6.4%

Number of tenants in each type (theoretical) 370

Percent 6.4%
**Income group B15**

Types B15

- Number of rooms per house: 3
- Number of persons per room: 1.67
- Gross floor area per person at each type: 17.08
- Gross floor area of house in m²: 85.42
- Plot area of house (in m²): 108.00
- Number of houses of each type: 103
- Percent: 8.9%
- Number of tenants in each type (theoretical): 515
- Percent: 8.9%

**Income group B22**

Types B22

- Number of rooms per house: 4
- Number of persons per room: 1.25
- Gross floor area per person at each type: 19.99
- Gross floor area of house in m²: 98.95
- Plot area of house (in m²): 135.00
- Number of houses of each type: 499
- Percent: 42.9%
- Number of tenants in each type (theoretical): 2495
- Percent: 42.9%
### Income group C27

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types</td>
<td>C27</td>
</tr>
<tr>
<td>Number of rooms per house</td>
<td>5</td>
</tr>
<tr>
<td>Number of persons per room</td>
<td>1.00</td>
</tr>
<tr>
<td>Gross floor area per person at each type</td>
<td>29.55</td>
</tr>
<tr>
<td>Gross floor area of house in m²</td>
<td>147.76</td>
</tr>
<tr>
<td>Plot area of house (in m²)</td>
<td>144.00</td>
</tr>
<tr>
<td>Number of houses of each type</td>
<td>313</td>
</tr>
<tr>
<td>Percent</td>
<td>26.9%</td>
</tr>
<tr>
<td>Number of tenants in each type (theoretical)</td>
<td>1565</td>
</tr>
<tr>
<td>Percent</td>
<td>26.9%</td>
</tr>
</tbody>
</table>

**West elevation**

**First-floor plan**

**Ground floor plan**

**General plan**

**Remarks**

The types of houses express the local Arab character, requirements and conditions. A general conception in design is applied to all types.

Each house includes a patio which is a typical Arab element, successfully maintained by the designer. The patio, beside being a solution for the dry climate, is also the private core for the family - an intimate living and recreational area.

The roof in every house could be used as extension to the living area, reached by steps from the patio. Privacy is also required on the roof; therefore the parapets are fairly high (1.10 m), in order to block vision from the lane or from the neighbouring houses. (Towards the neighbours the parapet is higher.)

![Fig. 78 A group of houses of B category, sector 10. Simplicity-character-shades and shadows at the narrow access pedestrian road.](image)
The housing blocks of A 13, B 15, B 22 and C 27 are all directed north-south, allowing for the bedrooms south orientation and for the 'guest' room either west and south or east and south orientation.

As protection from the sun, a shade is provided above the rooms openings (see sections and plans), which at the same time covers a part of the patio.

Fig. 79  A group of houses of B category, sector 10. Notice the higher parapets for privacy from the neighbouring houses.

Fig. 80  A house type of C category (C 27), sector 10. Notice the better quality compared to the houses of B category, fig. 78, 79.

Fig. 81  A house type of C category (C 27), sector 10.
The 'guest' room is the largest one of the house (17 to 20 m²), while the bedrooms are of area ranging from 10 to 12 m²), better oriented and used for reception. It is located right at the house entrance, also for privacy.

The standards of the types of houses conform to their classification with respect to income categories.

We therefore find that each house is (theoretically) designed for five persons. The standards per person gradually improve from type to type.

For example, the floor area per person increases from 7.2 m² in the A02 house type to 29.55 m² in the C27 type.

The areas of plots, too, increase from 10.8 m² per person in A02 to 28.8 m² in C27.

Although the average occupancy ratio (1.33 p/room) could be accepted owing to economic factors, it is quite high in types A02 and A13 (2.5 p/room).

We hope that economic conditions in Iraq will in the near future allow the government and the people to provide better standards and better equipped homes for the lower class.

4. Community (sector 10) standards

1) Size

The theoretical number of inhabitants ought to be 5810, at an average 5 p/house. It is considered as community class IV (6000 to 10000) owing to the definition of the designer (as already discussed).

2) Community areas

The total gross area of the sector is divided into 14.7 ha (46%) net housing area (plots), 5.6 ha (17.5%) greens and open spaces, 4.0 ha (12.5%) community services, 0.4 ha (1.2%) shopping, 2.2 ha (6.9%) schools and 1.4 ha (4.4%) municipal and public buildings; inner vehicular roads and pedestrian ways 7.15 ha (22.3%), and 0.55 ha parking (1.7%).

The average community area per house is 275.4 m², which is comparable with the other neighbourhoods discussed, owing to the system of grouping (100% single-family houses with gardens).

The average net housing area (plot areas) per house is relatively high (126.5 m²), about half the community area per house. One should add to this the high average area of roads per house (61.5 m²) owing to the system of pedestrian movements.

The average community area per person is 55.00 m², of which 25.3 m² is net housing area (plot area), 9.6 m² greens and open spaces, 6.9 m² community services, 1.00 m² parking and 12.2 m² roads, of which only about 2.9 m² are for vehicular traffic (excluding the outer roads) as compared with 9.3 m² pedestrian ways.

3) Density

The overall gross density is about 181 p/ha and the overall net density (over the plot areas) about 395 p/ha. Although the single-family houses account for 100% of the total we find that the overall density is quite high; this reflects the system of layout and the influence of the average occupancy ratio of 1.33 p/room.

4) Exploitation coefficient (plot ratio)

At an overall density of 181 p/ha the exploitation coefficient is 0.35, and at an overall net density (over plot areas) of 395 p/ha it is 0.78 (the average gross floor area per person = 19.2 m²).

Classifying the exploitation coefficient with respect to each house type we find that each expresses the floor area per person in each as shown at table below.

<table>
<thead>
<tr>
<th>Exploitation coefficient</th>
<th>A 02</th>
<th>A 02</th>
<th>A 13</th>
<th>B 15</th>
<th>B 22</th>
<th>C 27</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.66</td>
<td>0.50</td>
<td>0.71</td>
<td>0.77</td>
<td>0.71</td>
<td>1.00</td>
<td>0.78</td>
</tr>
<tr>
<td>at plot areas</td>
<td>54.0 m²</td>
<td>72.0 m²</td>
<td>(1:1.5)</td>
<td>(1:1.4)</td>
<td>(1:1.3)</td>
<td>(1:1.0)</td>
<td>(1:1.2)</td>
</tr>
</tbody>
</table>

5) Program and standards of community services

Schools
Commercial (shops, market, coffeehouses)
Cultural centre
Public health (red cross, public health centre and public bath)
Recreation (sports field, open-air theatre, public park, and neighbourhood gardens and playgrounds)
Religion (mosque)
Administration (police station and administrative building)
Parking

"For the standards of the other services see page 141."
### a) Schools

<table>
<thead>
<tr>
<th></th>
<th>Number of children</th>
<th>Number of classes</th>
<th>Percent of population</th>
<th>Total area in m²</th>
<th>Area per child in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school</td>
<td>870</td>
<td>24</td>
<td>14.5</td>
<td>14000</td>
<td>16</td>
</tr>
<tr>
<td>Secondary school</td>
<td>490</td>
<td>12</td>
<td>8.5</td>
<td>8200</td>
<td>16</td>
</tr>
</tbody>
</table>

To each household is allocated 18.9 m², and to each person 3.8 m², of school area.

### b) Shopping centre

<table>
<thead>
<tr>
<th>Gross sales area in m²</th>
<th>Number of families served</th>
<th>Gross sales area per family in m² (G)</th>
<th>Net sales area per family in m² (G)</th>
<th>Gross sales area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000</td>
<td>1162</td>
<td>3.5</td>
<td>2.75</td>
<td>0.7</td>
</tr>
</tbody>
</table>

### c) Parking

<table>
<thead>
<tr>
<th>Population served in m²</th>
<th>Parking areas in m²</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
<th>Number of persons per one-car parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>5810</td>
<td>5500</td>
<td>473</td>
<td>0.95</td>
<td>25</td>
</tr>
</tbody>
</table>

For each 1000 inhabitants about 40 parking spaces are provided, which is recommended for conditions in Baghdad for the next 25 years.

### 5. Comment, social and human aspects

Analysing the sector with respect to social relationships we find that:

a) for the smallest residential unit, which contains a small group of about 20 families, a garden is provided. It is a lay-by off the pedestrian road covering one or two plots of the housing block. It is meant to be an outdoor amenity for the children and a contact zone where the neighbours of women can meet and chat. It is located close to the houses and at the same time along the main pedestrian neighbourhood road, at the intersection between it and the smallest footpaths giving access to the houses. This location makes it possible:

- for accidental contact to be made when passing through the main pedestrian road;
- to be within easy reach for the children and also for the mother to take care of them;
- to overlook without being overlooked by the larger neighbourhood gardens;
- to be protected from sun by the surrounding walls.

b) The larger neighbourhood garden, provided for 60 to 100 families, is a square focusing the main neighbourhood pedestrian roads. Its location makes it possible for direct connection with the other neighbouring gardens, and is direct connection with the major pedestrian road passing through the centre zone and within 100 metres the furthest neighbourhood houses.

c) The main centre is the core of the community where all kinds of people meet. All social life is concentrated within the 'street', lined by the different social meeting points. A ‘street’ of typical oriental character, with the busy markets, cafes and mosque and also with the municipal building giving an expression to the administrative authority of the community.

d) From the above three points we observe that the contact between the different income groups is relative to the zoning and size of the residential units. The smaller the size of the unit the more intimate and private is the core.
6. List of standards derived and method of calculation

### 1. Community areas (Sector 10)

**Division of community areas in percent, per family and per person**

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m² (TH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area (Plot area)</td>
<td>14.7</td>
<td>46.0%</td>
<td>126.5</td>
<td>25.3</td>
</tr>
<tr>
<td>b) 2 Greens and open spaces</td>
<td>5.6</td>
<td>17.5%</td>
<td>48.2</td>
<td>9.6</td>
</tr>
<tr>
<td>Parks and sports field</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gardens and playgrounds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) 3 Community services</td>
<td>4.0</td>
<td>12.5%</td>
<td>34.4</td>
<td>6.9</td>
</tr>
<tr>
<td>Schools</td>
<td>2.2 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td>0.4 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal and public buildings</td>
<td>1.4 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 4 Parking</td>
<td>0.55</td>
<td>1.7%</td>
<td>4.7</td>
<td>1.0</td>
</tr>
<tr>
<td>e) Roads</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Vehicular</td>
<td>1.60 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Pedestrian</td>
<td>5.55 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>32.00 *</td>
<td>100%</td>
<td>275.4</td>
<td>55.0</td>
</tr>
</tbody>
</table>

* Excluding external community roads (3 ha) (TH) = Theoretical number
2. Number of inhabitants per dwelling

Average number of inhabitants/dwelling = \( \frac{\text{total number of inhabitants}}{\text{total number of dwellings}} \)

Total number of inhabitants (theoretical) = 5810
Total number of dwellings = 1162

\[ \text{Total number of inhabitants (theoretical)} = 5810 \]
\[ \text{Total number of dwellings} = 1162 \]

5 persons per dwelling

3. Number of persons per room

Number of persons per room = \( \frac{\text{number of inhabitants}}{\text{number of rooms}} \)

Number of rooms = 4364

1.33 persons per room

4. Lodging coefficient

Lodging coefficient = \( \frac{\text{number of inhabitants}}{\text{number of blocks}^*} \)

Number of blocks = 92

63 or 64 persons per block

* block = housing block

\[ = 10 \text{ persons} \]
5. Total gross floor area and total built-up area of dwellings

<table>
<thead>
<tr>
<th>Total built-up area of dwellings</th>
<th>Total gross floor area</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.06 ha</td>
<td>11.50 ha</td>
</tr>
</tbody>
</table>

Net / gross = about 78.8%

6. Built-up and gross floor area per person

<table>
<thead>
<tr>
<th>Built-up area per person</th>
<th>Gross floor area per person</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.6 m²</td>
<td>19.2 m²</td>
</tr>
</tbody>
</table>

7. Percent number of tenants, grouping and dwelling types

Percent number of tenants in each type of grouping and in each type of dwelling related to the total number of inhabitants

<table>
<thead>
<tr>
<th>A types</th>
<th>B types</th>
<th>C types</th>
<th>A 02</th>
<th>A 13</th>
<th>B 15</th>
<th>B 22</th>
<th>C 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwls.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.3%</td>
<td>51.8%</td>
<td>26.9%</td>
<td>14.9%</td>
<td>6.4%</td>
<td>8.9%</td>
<td>42.9%</td>
<td>26.9%</td>
</tr>
<tr>
<td>(247)</td>
<td>(602)</td>
<td>(313)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pop.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.3%</td>
<td>51.8%</td>
<td>26.9%</td>
<td>14.9%</td>
<td>6.4%</td>
<td>8.9%</td>
<td>42.9%</td>
<td>26.9%</td>
</tr>
<tr>
<td>(1235)</td>
<td>(3011)</td>
<td>(1564)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 rooms</td>
<td>3 rooms</td>
<td>4 rooms</td>
</tr>
</tbody>
</table>
8. Percent of built-up areas

At overall density 182 persons per ha

At net density 395 persons per ha

Built-up areas (housing) = 28% 60%

9. Density

Overall

Net, over plot areas

182 persons per ha 395 persons per ha

10. Exploitation coefficient

At overall density 182 persons per ha

At net density 395 persons per ha

0.35 0.78
Chapter 6

The Hook satellite town proposition, London, 1957-1960; a study of the planning aspects and analysis of the residential unit, 'super-block'

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Introduction

The London County Council decided in 1957 to build a new town in order to decentralize population and industry from London. This decision was due to the calculations indicated in the 'London Development Plan' of 1951, which pointed out that there has been an overspill for 20 years, of 380000 people, of which only 69000 could be accommodated in the out-County areas.54

The Hook study had to cease in mid 1960 as a consequence of the decision to undertake, instead, large-scale town development at Andover, Basingstoke and Tadley, in the interest of harmonious relationships and speed.55

Planning studies for the proposed new town, which had reached an advanced stage, are analysed in this chapter, discussing the useful methodology in planning and the solutions and concepts to meet the different human, social and economical problems. Stress is mainly laid on analysing the points of view of the Hook study with respect to the neighbourhood unit principles.

1. Site selection, location and characteristics

a) Considerations in selecting the site

The Ministry of Housing and Local Government conducted the search for a suitable site within the area of south-east England, fig. 93. The considerations in selecting the site were that:

- it should not have too high an agricultural value;
- it must be adequately drainable;
- sufficient water should be produced conveniently;
- road and rail communications should be excellent;
- and mainly that the area should be attractive to the industrialists.

After examining a number of areas and locations, the search was later concentrated on the area south of London, this being favourable especially in that the majority of the new and expanding towns were north of London. It was hoped to site the town as far away as practicable and provided industrialists might be persuaded to move there.

b) Location

The site chosen is about 64 km (40 miles) south-west of London. Connections were proposed with Exeter motorway as well as with a railway reaching Salisbury to the west and Southampton to the south, fig. 85. These were considered a guarantee of the excellent communications demanded and as an attractive feature especially for industry.

c) Characteristics

The area contains a high proportion of agricultural land, but not of the highest quality. Its form is a gently undulating plateau with two higher features rising from it to the north and to the south.

2. The main aims and factors guiding the master plan

The main problem which the Hook study aimed to solve was how to plan a town environment where people can develop a community and how to satisfy their needs and meet the human and sociological problems.


After analysing the situation of the new towns built in England during the last 15 years, developed fundamental requirements were formulated to guide the planning and architectural design of Hook as well as the future new towns to be built in England. Four factors were considered as the most important:

Fig. 84 Site location of Hook town south-west London and existing and expanded towns around.

Fig. 85 The proposed rail and motorways as attractions of the Hook site.
The first factor is that the town should have an urban character with a coherent unified structure, i.e. that the elements of the town should be integrated to assist the design of the town as an entity. This factor was governed by the following principles:

- Compactness of the town should be achieved without sacrificing the standards of open spaces as gardens and play areas.
- The urban character should be achieved in terms of building, landscape and the relationship between them, with the predominance of horizontality in design.

To develop an overall density comparable with the other English new towns.

The second factor is the motor car; the town should be designed to meet estimated future demands – making possible:

- the capacity to absorb 1.5 cars per family;
- the separation between motor traffic and pedestrian traffic, ensuring safety as well as smooth traffic flow.

This factor was especially stressed after stating that in a typical town of similar size about 1500 accidents occur every year, of which 10 are fatal and over a hundred serious, and with the increase of car ownership comes an increase in traffic congestion.

The third factor is that the town should be distinguished from the surrounding countryside as well as being complementary to it.

The fourth factor is to achieve a balance of population in relation to age-groups, family structure and employment in order to avoid second generation problems.

3. The Hook aspect in meeting the social problem of the unbalanced age- and family-structure of new towns

a) Problem

Analysing the social conditions of some new towns, it was found that they face many social problems which stem directly from the unbalanced age- and family-structure caused by the lack of balance in the type of population whom they attract. Young married couples in their twenties or thirties usually form the majority of the families moving to the new towns. This brings difficulties arising from the urgent need for primary schools, followed by a secondary school bulge and then a need for work followed by need for homes for the second generation. When the first generation become older they require a rapid expansion of the social provisions.

b) Method and concept in meeting the problem

To meet the problem, an examination of the size, and age- and household-structure, for each stage of the town’s growth was proposed, aiming for a more balanced age-structure than in the new towns.

An immigrant model for Hook was proposed based on a comparison between the population of England and Wales, Crawley new town and a hypothetical stationary population, fig. 86.

The comparison shows that at Crawley there are two ‘peaks’ in the 0 to 9 and 25 to 35 age groups and ‘valleys’ in the 15 to 24 and over 50 age groups, while the national figures are more even, although they include the post-war bulge.

The Hook proposition for obtaining a more balanced age-structure than at Crawley consisted of the following points, which give the results shown in fig. 20.

1) To attract more older people, which was seen as possible by cooperation with industry and by the inclusion of a significant element of office employment. An increase of 5% was assumed over Crawley.

2) To increase the number of retiring-age people to 10% over the existing Crawley figures.

3) To lengthen the building period to be equivalent to a generation of about 30 years. This period was however found unrealistic; therefore a considerable measure of unbalance was accepted and the period reduced to 15 years (instead of only 10 years as in the existing new towns) – assuming that the longer the building period, the greater the degree of balance.

4. The position of the neighbourhood unit principle with respect to the Hook planning principle

The system developed was to coordinate with the aforementioned factors guiding the master plan and first of all to assure urbanity and assist the town as an entity. This led to a new system different from that which has been usually applied to the new towns or communities in England, fig. 87.

A new town was usually planned for 60000 to 80000 people and divided into a number of separate neighbourhoods grouped around a (concentric) centre, while each neighbourhood is grouped round a (concentric) sub-centre.
The whole pattern which emerged according to the aforementioned factors could only be visualized as a multiple of overlapping circles of various sizes. Each circle is centred around a focus of play areas, schools, shops or churches. Each focus is of a varying degree of interest and importance to particular types and groups of people. At the same time these overlapping circles increase in concentration towards the linear central area of the town.

The residential areas are divided, with respect to the aforementioned factors, into residential units variable in size and form.

The residential unit would accordingly be determined by a balance of several factors. In the inner town, at a net density of 175 p/ha, and a household structure of average 3.2 persons, one primary school is needed for 4000 to 5000 people. This number requires a gross area of about 32 ha, its length governed by 10 minutes or 800 metres walking distance from the town road to the central area, fig. 92. This means that it is roughly 400 x 800 metres, including the area of schools, social buildings, light industry and recreational areas.

The cul-de-sac housing group is the sub-division of the residential unit which measures between 100 and 400 households. The length of the cul-de-sac is proposed to be of maximum 200 metres, which delimits the residential group sizes, these being small enough to be recognizable both as a social and as a visual unit.

5. Traffic system

a) Vehicular traffic roads

As a basis for the study of the master road plan the following trends have been taken into account in determining the traffic flows:

i) Increasing of ownership and use of the private vehicle for all types of journey,

ii) The corresponding decline in the number of journeys made by public transport and by bicycle.
iii) The continuing desire for shorter and uniform working hours.

iv) Increasing use of commercial vehicles for industrial purposes.

The road design is meant to absorb the number of cars assumed in 50 years time, when it might reach 1.5 cars per family.

The master road plan, fig. 96, shows the proposed location of the types of roads which are designed and classified according to their functions as follows:

i) The national Exeter motorway and South Wales motorway are meant for medium and long journeys, fig. 93.

ii) Regional roads (A 30, B 3011, B 3016), fig. 94, which are meant for the journeys between the neighbouring settlements and to provide links between the town and the motorways.

The main consideration in planning the regional roads was to prevent them acting at the same time as main roads carrying the major town traffic flows. This has been recognized from the following factors:

- Conflict between locational requirements of regional roads and town roads, as shown at fig. 97 (a), which indicate the desire lines for each major movement.

- Conflict between the requirements of access for regional roads within the town (which are at infrequent intervals) and town roads (where frequent access points are necessary).

- Conflict between the capacity and speed requirements of regional roads (high speed) and town roads (low speed).

The regional pattern of roads as a whole was meant to conform to the principle that the major destination zones, i.e. the places of work of industrial areas, central area and neighbourhood sub-centres, and the railway station, should be directly served by the regional road system, fig. 94.

iii) The internal roads for the internal circulation within the town which consist of:

- Main arteries of circulation (town collector road). These would carry a very large volume of local traffic (3000 vehicles an hour), fig. 98.
iii) The continuing desire for shorter and uniform working hours.

iv) Increasing use of commercial vehicles for industrial purposes.

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(The width of line indicates the number of persons travelling in peak periods.)
Distributor roads in the residential areas, industrial areas and the central area. These are connected to the town roads and would carry about 500 vehicles per hour.

To form a junction between the distributor road and the main artery with such difference in traffic load two solutions were proposed:

The solution shown at fig. 98(a), which is applied to the master plan, involves the collector road in two portions; the ground level portion collects the residential distributor road allowing for turning, while the elevated portion allows the non-turning traffic free flow. The other solution, fig. 98(b) is a multi-level junction at every other intersection with a residential distributor road. The ground-level intersections permit only left-hand turns.

The distributor roads are classified according to their functions as follows:

1) In the residential areas they are proposed to be 6 m wide, where flow might be below 250 vehicles per hour.

2) In the industrial areas they are proposed to be 10 m, including three lanes, according to estimated flow of 1000 vehicles per hour.

Service roads, which are classified into three types:

1) Residential culs-de-sac, 4 m, and loop roads, 5 m, both branching from the distributor road, fig. 99(a).

2) Industrial service roads where the width would depend on flows from car parks and the types of commercial vehicles.

3) Central area service roads where the width is assumed to be of minimum 6 m and would depend on flows from car parks. They connect with the central distributor road at one end for local traffic and at the other end for regional traffic, fig. 99(b).

b) Footpaths

1) Aim and analysis of the requirements

Special importance has been laid on planning the residential paths, owing to the principle of locating the central area within 10 minutes walk from the dwellings. According to the estimated movement and parking of 8150 cars through the central area the aim was two-fold:

To enable people to walk freely and safely, clear of motor traffic.

To design pedestrian ways so as to encourage pedestrian movement, in order to reduce the need to use cars for as many journeys as possible.

Journeys from dwellings to various destinations have been analysed by stating basic assumptions for a residential unit. It is found that the largest number of journeys per family per week are into the centre. Next in importance are visits to local social facilities including corner shops, primary schools and public houses; then the visits to public open spaces and playing fields.

According to this analysis of the pedestrian movements the main lines for the pedestrian footpaths are determined.

The main factor governing the design of the footpath system is the location of the primary school. Children are not tempted to cross major roads on their way to schools.

2) Description of the footpath system

As shown in fig. 96 the main footpaths radiate from the central area to the perimeter of the town central to the residential units.

In the central area and the high density zone around it, it is sought to achieve complete vertical separation between pedestrians and vehicles.

From the main footpaths of the residential units branch smaller footpaths reaching the housing groups.

Parallel to the central area and linked to it run footpaths underpassing the distributor roads. These are so laid out as to produce long paths connecting the whole town. In the outer neighbourhoods the main footpaths are focussed on the sub-centres in order to encourage walking to them.

Comment

This way of planning the main pedestrian ways would greatly help in developing direct connections between the social activities and encouraging social contacts and urban outdoor social life.

c) Cycle tracks

The aim in planning cycle tracks was to provide quick and direct routes between home and work and between home and secondary schools, as shown in fig. 100.

Cycle tracks and footpaths are designed to travel parallel where appropriate and use the same underpasses.
d) Bus routes

On the same main roads system a bus service is envisaged connecting industrial areas and the town centre, fig. 101. It has been considered essential to have town public transport, even when car ownership is high, for the following reasons:

Over 20% of the families would not have cars.

School children, disabled and aged persons or those who need not have a car or use it in this town.

Although the majority of families would have cars, each car cannot be used for more than one journey at a time.

It was considered that the provision of a bus service might help to restrain the rate of increase in car ownership.

6. Zoning

General idea

A study has been made for deciding the total area of the town before settling its shape. First the areas required for industry, open spaces, main roads, public utility services, hospital, central area, and secondary, further education and primary schools were calculated, measuring about 1040 ha (2600 acres). These areas were considered fixed whatever the residential densities. Then it was found that if the residential areas were developed at an average of 100 p/ha (accepting that this is the minimum net density), they would occupy about 1000 ha (2500 acres); if developed at an average of 250 p/ha (accepting that this is the maximum density), they would occupy 400 ha (1000 acres). Accordingly the total area of the town could range between 1490 and 2040 ha (3600 to 5100 acres) with respect to the maximum and minimum density, which also means that the non-residential areas are never less than half the total town area.
If the minimum residential density was increased from 100 p/ha to an average of 175 p/ha, about 430 ha would be saved. If it was increased by a further 75 people to the hectare, only 92 ha more are saved. This shows that an increase of the average density above say 175 p/ha would not greatly decrease the total area of the town, while many other difficulties would be met with, fig. 103.

The town with its linear centre zone takes the form of a centralized town and is classified into an 'inner town' and an 'outer town', closely linked to each other.

The rectangular shape of the inner town is roughly $2 \times 4.8$ km, i.e. about 31% of the total area, which is about 30.46 km$^2$.

The inner town ought to absorb about 60000 people (60%), while the other 40000 people (40%) ought to live at the three outer neighbourhoods, fig. 105.

a) Centre zone

The centre is the main focus of social life, and also contains specialised amenities and services for the town and region.

To meet the complex of servicing, of the delivery and dispatch of goods, and of people coming to the centre by bus or car or on foot, the centre is planned on two main levels with a separation between motor traffic and pedestrian traffic. This arrangement enables the centre to be intimate and be closely integrated with the residential area around, and not be separated by heavy traffic ways or by car parking.

In designing the two levels the conception was to express the function of each as shown at fig. 112 and 113.
Office and public buildings are to be distributed along the length of the central area forming with the retail shopping a distinct and rich architectural character and assisting as means of identification at any point within the central area.

The secondary schools, the College for Further Education, libraries with cultural groups containing art gallery, museum and central library – are all meant to serve as a whole the region reached by means of the regional bus system (15 miles radius of influence).

Special housing groups in the central area are planned to comprise about 1000 dwellings grouped in point blocks.

The lower level and traffic organization

The main function of the lower level, which covers the whole area of the platform on the upper level, is to absorb the estimated number of 20000 vehicles, including the regional consumers, which might converge on the shopping peak from 2 to 5 on Saturday afternoons. About 22.5 ha are provided for the parking of 8150 cars, i.e. about 27 m² per car. This number has been assumed according to an average turn-round of one car per hour.

The roads network is based on having the spine road as the main road distributing the traffic. Parallel to it are one-way distributor roads which are linked by two service roads, one on each side of the centre all forming a gridiron plan. Car parks, elevators and lifts to the pedestrian level, staircases, ramps and escalator, to take the people upstairs – are all within the island of the gridiron, fig. 113.
b) Residential zones (26.5%, 821 ha including services)

According to the system of realization, the residential areas ought to absorb 70000 people after 15 years, when immigration has to stop. It has been assumed that this number would increase to 100000, by year 50, and this is the maximum number that the residential areas ought to include.

In year 15, the total number of dwellings will be 20746, of which 5422 (26.14%) will be 1- to 4-room dwellings in 3- to 6-storey blocks of flats and maisonnettes, 14579 (70.28%) in 1- or 2-storey single-family houses and 744 (3.58%) 1- or 2-room dwellings for old persons distributed all over the residential zones.

The sizes of the dwellings range from one to seven rooms. The single-room flats make up 3.28% of the total number of dwellings (468 or 2% adults and 212 or 1% for old persons). The two-room flats make up 15% (2582 or 12.5%, for adults and 532 or 2.5% for old persons). The predominant types are the 4-room flats (6977 or 29%) and the 5-room flats (5149 or 25%). The 6-room flats account for 5% (1074) and the 7-room flats for 4% (790).

In year 50, the total number of dwellings will be 31480 of which 12590 (40%) will be 1- to 4-room dwellings in 3- to 6-storey blocks of flats, maisonnettes and point blocks, and 18890 (60%) 3- to 7-room dwellings in 1- or 2-storey single-family houses. The flats for old persons make up 9% (2820) of the total number.

The predominant type is the 4-room flat; these form 24.5% (7720). Then come the 2-room dwellings = 21% (4390 for the adults and 2190 for old persons); the 3-room dwellings = 20.5% (6430); the 5-room dwellings = 20% (6280); the single rooms = 5.5% (1140 or 3.5% for the adults and 630 or 2% for old persons); and finally the 6-room dwellings = 5% (1570) and the 7-room dwellings = 3.5% (1130).
From the above comparison we find that the housing needs change considerably from period to period, which is carefully allowed for in the Hook study.

For example, through all the periods of execution the need for 4-room dwellings is predominant, but the percentage decreases successively from 35.5% in year 5 to 32%, 29% and 24.5% in years 10, 15 and 50.

Also we find that the percentage of dwellings for old persons is generally constant until the year 15 (3 to 3.5%), while at year 50 it rises to as much as 9% of the total number of dwellings.

Distribution of the residential zones

i) The central residential zone (81.7 ha, 9.8% of the total residential area) is proposed to have a net density of 250 p/ha and an overall density of 190 p/ha with an average household size of 2.3 persons. This zone includes about 18% of the population and is meant to be an integral part of the centre zone and to create an urban character in the town as a whole. It contains about 60% of the dwellings grouped in 4- to 6-storey building, while the other 40% are grouped in 1- or 2-storey single-family houses.

ii) The inner residential zone (312.5, 37.6%) has a net density of 175 p/ha and an overall density of 140 p/ha. It includes about 45% of the total population with an average of 3.2 persons per household. This zone is proposed to include about 20% of the dwellings in 3- or 4-storey blocks, while the other 80% would be in the form of two-storey houses with gardens.
iii) The outer residential zone (421.4 ha, 51.1\%) is proposed to absorb 40\% of the population at a net density of 100 p/ha, and an overall density 85 p/ha, with an average of 3.7 persons per household. Only 15\% of the dwellings would be grouped in 3- or 4-storey blocks. It is proposed that a variety of private development could be incorporated in this zone (85\% of the dwellings are houses with gardens).

iv) The special groups (12.1 ha, 1.5\%), which are proposed to consist of small dwellings grouped in high blocks, which are meant as landmarks identifying the different parts of the town. These zones have a density of 250 p/ha with an average household size of 1.8 persons, and are designed to absorb 2\% of the total population.
Examples of primary studies showing conception of compact housing with gardens and outdoor rooms

Fig. 120  Stepped section housing with ground level.

Fig. 121  Upper level gardens and rooms.

Fig. 122  Gardens and upper outdoor rooms.
'Compact housing', as it is called by Hook study. 

NB: We find that the perspectives presented express the idea of Hook study more than the layout plans of the housing blocks. This is clearly seen by comparing figures 123, 124 and 125 to the layout plans figures 126 and 127 (there seems to be discrepancy between plans and perspectives).

Fig. 124 Interior of a flat with ground-level garden.

Fig. 125 Interior of a flat with upper-level outdoor room.
7. The residential unit

In the following the residential unit fig. 126, being typical for the Hook pattern, will be analysed.

1) Size

The residential unit comprises about 5000 inhabitants, which is the number derived from the proposed overall densities: 140 p/ha the inner residential zone and 190 p/ha the central residential zone. (Of the 5000 inhabitants 30% ought to live in the central residential zone and 70% in the inner residential zone.)

2) Residential unit areas

The total gross area lying between the central area and the main town road is about 33 ha, of which 45% (14.9 ha) is net housing area, 25.8% (8.41 ha) greens and open spaces, 12% (4.0 ha) community services, 9% (2.97 ha) vehicular roads, and 8.2% (2.72 ha) pedestrian ways.

With an average number of persons per household of 2.9, to each person there are 29.8 m² net housing area, 16.82 m² greens and open spaces, 8 m² community services including light industry area, 5.94 m² vehicular roads including parking areas and 5.4 m² pedestrian ways. For each family the corresponding areas are 86.42 m², 48.77 m², 23.2 m², 16.73 m² and 15.58 m².

The residential unit area per person is about 66.0 m² and per family about 190.70 m². Considering the central residential zone only, which ought to include about 1480 people, we find that the overall residential area per person is only 50.6 m² and per family (2.3 p/household) only 116.38 m². In the inner residential zone only, i.e. that lying within the residential unit, which ought to include about 3530 people, the area per person is about 72 m² and per household (3.2 p/household) about 230 m². This difference in areas expresses the household structure, the needs of the respective inhabitants and the densities proposed.

3) Density

The overall density including the distributor road, greens and community services is about 150 p/ha. Excluding the distributor road and the community services, i.e. net residential area, the density is 190 p/ha, while over the net housing area the net density is 340 p/ha. (See method of calculation page 175.)

4) Exploitation coefficient

The total gross floor area per person in the central residential zone is about 33 m² and in the inner residential zone about 30 m². The average floor area per person of the residential unit as a whole is about 31 m². According to the aforementioned densities (150, 190 and 340 p/ha) the exploitation coefficients are 0.46, 0.60 and 1.05 at the overall, net residential and net housing area as explained on page 175.
8. Social and human factors and aspects

1) Social grouping and social relationships with respect to size, density and form of the residential groups and residential units

The proposed residential groups at Hook vary in size between 100 to 400 households and are kept physically small by the 200 m maximum length of the cul-de-sac. The Hook study pointed out that it is not intended or assumed that these housing groups, though kept small in physical and numerical size to have meaning as visual and social groupings, should function as exclusive social units. Patterns of social relationships are not simply determined by the planned relationships of buildings or the spaces between them; they can however be deeply influenced by them for better or for worse.

We comment that the layout and spatial grouping of buildings would largely influence the development of social relationships.

A static single-housing block would not help for social relationships. When it is related to another block or group of blocks, it gains or loses its significance in space. We think it is the same with social relationships, which can gain or lose by the layout of houses and their relation in space.

Analysing the layout of the Hook cul-de-sac group we find that (fig. 127):

a) The group of houses on the eastern side would not as a whole give positive results with respect to social relationships, especially in that each housing block has the front private gardens of the others as its back-yard.
b) The layout of housing blocks on the western side would give better results than the eastern layout. The blocks form a space which would encourage social relationships among the number of families living around—without curtailing the privacy of private gardens. Moreover, it is easier as compared to the east part to keep an eye on the toddlers who are better supervised from the surrounding dwelling; this would also include children in need of recreation outside the home as well as those in need of care. In short we think, as shown in the sketch, that the layout (a) would give negative results and (b) would in concept give positive results.

The residential unit core:

The primary school forms the focus of the residential unit ‘super-block’. It would form with the other social meeting points the social and architectural core of the unit. All are grouped along the main pedestrian thoroughfares, with the bus stop and local industry served by the town road at its outer end.

The idea of grouping the social building along a main pedestrian way is similar to that of sector 10, Baghdad, page 137.

The core of the residential unit is not a common with large green areas, but a ‘street’ where people can meet and get together within its intimate space, while children can play on the doorsteps in safety and care.

This is a recognition in planning the core of the neighbourhood, which is similar in concept to the ‘street’ of the middle-age town where it was—and still has an influence as—the focus of social life.

The pedestrian movements coming from the housing groups are all directed towards the main pedestrian ways leading to the social meeting points.

We believe that such an arrangement of minor urban centres would give positive results in developing social relationships within the residential units.

As a means of developing social life at the core, a high density is proposed (without loss of privacy at home). This means that if the density becomes higher, there is a correspondingly increased possibility and frequency of accidental or intentional encounters through the concentration of the pedestrian movements and local social buildings. However, as pointed out in the social studies of Hook, higher density does not force sociability on any one, but does increase the choice of available shops, schools, etc., as already discussed in page 154 (see comparison with sector 10, page 178).

2) Local variety and identity in residential areas

It is not sought to give each neighbourhood or residential unit an artificial individuality; it is recognized that this could have a disruptive effect and would result in monotony. The aim was therefore to create ‘a sense of place’ by exploiting functional diversity to the full without disrupting the unity of the town as a whole. ‘The problem therefore is to establish a local diversity of function as a basis for diversity in form and character.’ Factors helping to give identity to the residential areas are variety in size, structure and need, together with variety in shape, local topography and the special characteristics due to the position of each unit in the town.

As explained on page 154 we see that the community services are not evenly distributed; those that occur in one residential unit would not in the next (e.g. clinics or other community buildings).

Also, as regards the three outer neighbourhoods, each has a distinctive sub-centre different in its function, character and form from the others:

The south neighbourhood has its centre based on the town’s railway station which is a natural focus of shops, meant to draw life from the traffic of the station as well as from the local residents.

The north-east neighbourhood is meant to group about the existing core of the village of Hartley Row, which contains about 40 shops, but is disrupted by the through traffic of the existing road A 30, fig. 95. It was planned at the first stage of the Hook plan to divert A 30, creating a spacious, quiet, ready-made shopping centre to serve the first-established new residential areas during 3 to 5 years before establishing the new town centre.
The north-west neighbourhood is meant to derive its own distinctive form and character from its unique topography. It stands on the highest point overlooking the town and the extensive view.

3) Recreational activities with respect to age-groups

To satisfy the needs of the different age-groups, three kinds of play spaces are provided within the residential unit, classified in order that each group might not spoil the fun and games of the others.

Within the housing groups, near the homes, play-lots for toddlers are provided. They are located near to the minor paths leading to the central area, away from the older children on bicycles or scooters.

Play areas are provided for the juniors aged 6 to 10, located at intervals along the central pedestrian way. To reduce noise nuisance to nearby houses, it is planned to form 'lay-bys' off the path with screen walls and planting.

For older children who need sizeable, enclosed, hard play areas, at least one enclosed area for ball games of about 0.9 ha is proposed to be provided for each residential unit. Besides these major, open spaces are provided at the town’s periphery, also to meet their needs.

For the adults, playing fields outside the built-up area are provided on a standard of 2.4 ha (6 acres) for each 1000 people, which makes a total area of about 240 ha (600 acres). These are intended to include the secondary school playing fields, which are not provided within the built-up area, since this would conflict with the town’s basic principles of urbanity and compactness.

The chain of new lakes proposed includes a large one of area about 20 ha (52 acres) and 1.6 km (one mile) long. This size is meant to be large enough to accommodate major water sporting events.

Allotments are proposed to be on a standard of 0.2 ha (½ acre) per 1000 people, i.e. about 20 ha in all.
9. List of standards deduced and method of calculation

1. Town areas

Divisions of town areas in percent, per family and per person

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Residential</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td>819.4</td>
<td>26.5%</td>
<td>257.29</td>
<td>81.94</td>
</tr>
<tr>
<td>Central</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Greens and open spaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscaped roadside</td>
<td>404.8</td>
<td>13.3%</td>
<td>130.65</td>
<td>43.5%</td>
</tr>
<tr>
<td>School playfields</td>
<td>57.8</td>
<td>1.8%</td>
<td>19.22</td>
<td>6.4%</td>
</tr>
<tr>
<td>Public playfields</td>
<td>242.9</td>
<td>7.9%</td>
<td>78.31</td>
<td>25.6%</td>
</tr>
<tr>
<td>Public open spaces</td>
<td>93.1</td>
<td>3.0%</td>
<td>30.37</td>
<td>9.8%</td>
</tr>
<tr>
<td>Lakes</td>
<td>93.1</td>
<td>3.0%</td>
<td>30.37</td>
<td>9.8%</td>
</tr>
<tr>
<td>Allotments</td>
<td>20.2</td>
<td>0.6%</td>
<td>6.72</td>
<td>2.1%</td>
</tr>
<tr>
<td>3 Community services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central area</td>
<td>73.1</td>
<td>2.4%</td>
<td>24.34</td>
<td>7.7%</td>
</tr>
<tr>
<td>Neighbourhood sub-centres</td>
<td>8.1</td>
<td>0.2%</td>
<td>2.66</td>
<td>0.8%</td>
</tr>
<tr>
<td>Second, schools (ten)</td>
<td>14.9</td>
<td>0.5%</td>
<td>4.90</td>
<td>1.5%</td>
</tr>
<tr>
<td>Hospital</td>
<td>12.1</td>
<td>0.4%</td>
<td>3.97</td>
<td>1.3%</td>
</tr>
<tr>
<td>4 Industry</td>
<td>229.1</td>
<td>7.5%</td>
<td>71.93</td>
<td>22.90</td>
</tr>
<tr>
<td>5 Agricultural areas</td>
<td>416.0</td>
<td>13.8%</td>
<td>130.65</td>
<td>41.61</td>
</tr>
<tr>
<td>6 Cemetery</td>
<td>12.1</td>
<td>0.4%</td>
<td>3.97</td>
<td>1.3%</td>
</tr>
<tr>
<td>Existing development</td>
<td>157.8</td>
<td>5.1%</td>
<td>51.95</td>
<td>16.99</td>
</tr>
<tr>
<td>7 Major roads (2.3%)</td>
<td>68.4</td>
<td>2.2%</td>
<td>22.80</td>
<td>7.2%</td>
</tr>
<tr>
<td>Railway land</td>
<td>40.4</td>
<td>1.3%</td>
<td>13.47</td>
<td>4.24</td>
</tr>
<tr>
<td>Heliport</td>
<td>2.0</td>
<td>0.1%</td>
<td>0.67</td>
<td>0.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3046.0</strong></td>
<td><strong>100%</strong></td>
<td><strong>956.42</strong></td>
<td><strong>304.6</strong></td>
</tr>
</tbody>
</table>
2. Residential unit areas

Divisions of residential unit area in percent, per family and person

Total area = 33 ha

<table>
<thead>
<tr>
<th>Functions</th>
<th>Area in ha</th>
<th>Percent</th>
<th>Area per family in m²</th>
<th>Area per person in m² (TH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 1 Net housing area</td>
<td>14.9</td>
<td>45.0%</td>
<td>86.42</td>
<td>29.8</td>
</tr>
<tr>
<td>b) 2 Greens and open spaces including children's play areas and playgrounds</td>
<td>8.41</td>
<td>25.8%</td>
<td>48.77</td>
<td>16.82</td>
</tr>
<tr>
<td>c) Residential unit services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Nursery</td>
<td>0.39 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Primary school</td>
<td>0.72 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Youth club, church, public house, club room, clinic, shops, petrol and service station</td>
<td>1.45 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Light industry</td>
<td>1.44 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Roads</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Vehicular</td>
<td>2.97 ha</td>
<td>17.2%</td>
<td>32.31</td>
<td>11.38</td>
</tr>
<tr>
<td>8 Pedestrian</td>
<td>2.72 ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33.00</td>
<td>100%</td>
<td>190.70</td>
<td>66.00</td>
</tr>
</tbody>
</table>

(TH) = Theoretical number
3. Total gross area and net housing area

a) Total gross area = area of residential unit

b) Net housing area

1. Primary school
2. Playground
3. Nursery
4. Church
5. Shops
6. Public buildings
7. Clinic
8. Light industry

---

///: 2-storey single-family houses
\:\\: 3- to 6-storey blocks of flats
4. Number of inhabitants per dwelling

Number of inhabitants per dwelling = \frac{\text{total number of inhabitants}}{\text{total number of dwellings}}

Total number of inhabitants = 5011
Total number of dwellings = 1722

2.9 persons per dwelling

5. Number of persons per room

Number of persons per room = \frac{\text{number of inhabitants}}{\text{number of rooms}}

0.86 persons per room

6. Lodging coefficient

Lodging coefficient = \frac{\text{number of inhabitants}}{\text{number of blocks}}

Number of blocks = 60

83 persons per block

= 10 persons
7. Total gross area of floors and total net area of dwellings

<table>
<thead>
<tr>
<th>Total net area of dwellings</th>
<th>Total gross area of floors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total theoretical number of</td>
<td>Total theoretical number of</td>
</tr>
<tr>
<td>inhabitants × net floor area</td>
<td>inhabitants × gross floor area</td>
</tr>
<tr>
<td>per person =</td>
<td>per person =</td>
</tr>
<tr>
<td>5000 × 23</td>
<td>5000 × 31</td>
</tr>
<tr>
<td>= 11.5 ha</td>
<td>= 15.5 ha</td>
</tr>
</tbody>
</table>

Net / gross = 75% (assumed)

8. Net and gross floor area per person

<table>
<thead>
<tr>
<th>Net floor area per person</th>
<th>Gross floor area per person</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 m²</td>
<td>31 m²</td>
</tr>
</tbody>
</table>

9. Percentage of tenants, grouping and dwelling types

Percentage of tenants in each type of grouping and in each type of dwelling related to the total number of inhabitants

<table>
<thead>
<tr>
<th></th>
<th>1-2-storey</th>
<th>3-6-storey</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwls.</td>
<td>54.3%</td>
<td>45.7%</td>
<td>4.2%</td>
<td>2.2%</td>
<td>15.1%</td>
<td>7.5%</td>
<td>12.5%</td>
<td>10.7%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Pop.</td>
<td>69.2%</td>
<td>30.8%</td>
<td>1.5%</td>
<td>0.7%</td>
<td>9%</td>
<td>4.5%</td>
<td>10.4%</td>
<td>10.3%</td>
<td>4.6%</td>
</tr>
</tbody>
</table>

- Single-family houses
- Old persons
10. Percent of built-up areas, density and exploitation coefficient

<table>
<thead>
<tr>
<th>Built-up areas</th>
<th>Overall</th>
<th>Net residential</th>
<th>Net housing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>17.2%</strong></td>
<td><strong>23%</strong></td>
<td><strong>37%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Density</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>150 p/ha</strong></td>
<td><strong>190 p/ha</strong></td>
<td><strong>340 p/ha</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exploitation coefficient</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>0.46</strong></td>
<td><strong>0.60</strong></td>
<td><strong>1.05</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total gross residential unit area</th>
<th>Excluding services and outer roads</th>
<th>Housing plot areas</th>
</tr>
</thead>
</table>
Leer - Vide - Empty
Conclusion

A. Critical comparison

B. A proposition for the future reconstruction and extension of Cairo based on community and neighbourhood planning
<table>
<thead>
<tr>
<th>Neighbourhood units</th>
<th>Dessau project</th>
<th>Kolo, Warsaw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1933 Germany</td>
<td>1945 Poland</td>
</tr>
</tbody>
</table>

### Diagram

#### Number of inhabitants
- **Dessau project**: 15000
- **Kolo, Warsaw**: 10000

#### Area in ha
- **Dessau project**: 100
- **Kolo, Warsaw**: 40

#### Divisions of neighbourhood area in percent and per person

<table>
<thead>
<tr>
<th></th>
<th>Dessau project</th>
<th>Kolo, Warsaw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% A/P</td>
<td>% A/P</td>
</tr>
<tr>
<td>Net housing area</td>
<td>43.0 26.6</td>
<td>40.0 16.66</td>
</tr>
<tr>
<td>Greens</td>
<td>37.2 24.8</td>
<td>40.4 16.84</td>
</tr>
<tr>
<td>Community services</td>
<td>6.8 6.0</td>
<td>9.6 4.0</td>
</tr>
<tr>
<td>Roads</td>
<td>11.0 7.26</td>
<td>10.0 4.16</td>
</tr>
<tr>
<td>Total</td>
<td>100% 66.66</td>
<td>100% 41.66</td>
</tr>
</tbody>
</table>

#### Grouping of dwellings

<table>
<thead>
<tr>
<th></th>
<th>Dessau project</th>
<th>Kolo, Warsaw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Single-family houses</td>
<td>70</td>
<td>2.6</td>
</tr>
<tr>
<td>3- to 6-storey blocks</td>
<td>30</td>
<td>90.8</td>
</tr>
<tr>
<td>10- to 15-storey blocks</td>
<td>100%</td>
<td>6.6</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

#### Floor area per person
- **Dessau project**: 23 m² per person
- **Kolo, Warsaw**: 17 m² per person

#### Occupancy ratio
- **Dessau project**: 1 p/room
- **Kolo, Warsaw**: 1.7 p/room

#### Overall density and exploitation coefficient
- **Dessau project**: 150 p/ha, 0.34
- **Kolo, Warsaw**: 240 p/ha, 0.42
Alexanderpolder Rotterdam
1953
Holland

Alexanderpolder Rotterdam
1956
Holland

Noord Kennemerland
1958
Holland

4000
5650
10000

16
40
57

% 50.6 22.4
24.5 10.8
13.6 6.0
11.3 4.9
100% 44.1

% 37.4 27.4
54.1 40.0
4.7 3.0
3.8 2.4
100% 72.8

% 31.5 18.0
55.5 31.7
7.0 3.9
6.0 3.4
100% 57.0

% 6.5
77.5
16.0
100%

% 4.0
79.4
16.6
100%

% 13.3
59.5
27.2
100%

23 m² per person

29.8 m² per person

27.5 m² per person

1 p/room

0.9 p/room

0.9 p/room

250 p/ha

140 p/ha

175 p/ha

0.57

0.41

0.48
### Sector No. 10, Baghdad
1959
Iraq

<table>
<thead>
<tr>
<th>Outer traffic road</th>
<th>Main pedestrian roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 m</td>
<td>800 m</td>
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</tbody>
</table>

### Hook residential unit
1960
England

<table>
<thead>
<tr>
<th>Distributor road</th>
<th>Central area</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 m</td>
<td>800 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5810</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>%</th>
<th>A/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.0</td>
<td>25.3</td>
</tr>
<tr>
<td>17.5</td>
<td>9.6</td>
</tr>
<tr>
<td>12.5</td>
<td>6.9</td>
</tr>
<tr>
<td>24.0</td>
<td>13.2</td>
</tr>
<tr>
<td>100%</td>
<td>55.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>%</th>
<th>A/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.0</td>
<td>29.8</td>
</tr>
<tr>
<td>25.8</td>
<td>16.82</td>
</tr>
<tr>
<td>12.0</td>
<td>8.0</td>
</tr>
<tr>
<td>17.2</td>
<td>11.38</td>
</tr>
<tr>
<td>100%</td>
<td>66.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19.2 m² per person</th>
<th>31 m² per person</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.33 p/room</th>
<th>0.86 p/room</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>181 p/ha</th>
<th>150 p/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.35</td>
<td>0.46</td>
</tr>
</tbody>
</table>

- Nursery
- Kindergarten
- Primary school
- Secondary school
- Public building
- Shops
- Church
- Mosque
- Light industry

A/P = area/person in m

1 m²
50 persons
A. Critical comparison

1. The integrated neighbourhood units

The examples discussed in the three parts presented indicate the development of the
neighbourhood principles in the last thirty years.

A constructive starting point is the Dessau project of Rudolf Steiger and the CIAM group
of Switzerland. In this project the neighbourhood is a basic integrated unit in planning
the residential community of 15000 people. The system of units which underlies the
design follows a hierarchical relation between the community population and the
number of children of school age. The primary school children (9% to 10%) represent
3800 to 4000 inhabitants who compose the neighbourhood unit population.

A characteristic of this scheme is that the neighbourhoods do not have artificial individu¬
ality but are integrated with each other, giving a chance to the inhabitants to benefit
from a number of neighbourhood services of the same kind within walking distances,
i.e. providing freedom of choice and movement.

The same concept was applied thirty years later to the Hook town with a more construc¬
tive method. The Hook town rejects the idea of separate neighbourhoods within the
inner town. Instead it consists of integrated residential units which are different in form
and layout from the units at Dessau project. Density, household structure, walking
distances to schools, shopping, playing fields and the other social meeting points are
the important factors determining the planning system.

The residential unit is determined by a balance of several factors. In the inner town at
a net density of 175 p/ha, with household structure of 3.2 persons, a primary school is
provided for 4000 to 6000 people. This number requires a gross area of about 32 ha. Its
length is governed by 10 minutes walk from the central area to the main road delimit¬
ing the inner town. This means it is roughly 400 × 800 metres including the area for
schools, social buildings, etc., which are all grouped together along a main central
pedestrian way. In the Dessau project on the other hand, the units are focussed around
the primary school while shops are located isolated along the highways.

The Hook arrangement gives more possibility for busy cores where the central func¬
tions can benefit from each other economically and where social relationships can better
develop. At the same time, in order not to give artificial individuality to the units, the
shops, schools and other social meeting points are dispersed within the residential
areas; all are focussing overlapping circles of influence within walking distances.

Also they are not provided evenly in each residential unit. Those which occur in one unit,
such as clinics and churches, are not necessarily repeated in the next.

2. The separate neighbourhood units and the artificial individuality

Contrasted with the Hook system is the planning of the three Dutch examples of
Alexanderpolder 1953, 1956 and Kennemerland schemes. Here the communities
consist of separate neighbourhood units of repetitive form and character. Each unit
includes the same services provided in the other. This system gives disruptive effect
and causes monotony.

However, the three schemes show a continuous development of neighbourhood planning.

The Alexanderpolder project of 1953, provided for 36500 people, consists of 8 neigh¬
bourhood units, separated by green belts meant to create determined neighbourhoods
having defined boundaries. Each neighbourhood contains 4000 inhabitants for which a
primary school, shops and workshops are provided. The remaining 4500 people are
grouped in 3 blocks of flats located in the central area in order to give unity to the
community as a whole.

The 1956 project, provided for 22500 inhabitants, consists of larger neighbourhood units
each containing 5650 inhabitants, separated by agricultural land and large open spaces.

To each unit are related two primary schools and a shopping centre.

In the third Dutch example of Kennemerland scheme (Alkmaar), the neighbourhoods
number 7000 to 10000 people grouped in 2 or 3 residential units (living units) in a repe¬
titive manner. To each living unit, which contains about 3500 inhabitants, are related
2 kindergartens, 2 primary schools, 10 shops in 2 units, 2 playgrounds and 2 play-lots.

3. Behaviour of people and the prescribed patterns

The neighbourhood centre at Alexanderpolder project of 1953 is not located centrally
in the unit but is meant to be directly connected to the other centres and to the com¬
munity centre, "a".

The same purpose governs the location of the neighbourhood centres at Alexander¬
polder 1956. They are central to the units along a main axis, "b".

At Kennemerland, the living unit centres form together a longitudinal central neigh¬
bourhood core connected to a central community centre, "c".
These locations of the centres are such that the maximum number of people would pass by them, especially on their way to work; this is intended to give social and economical benefits.

Our point of view, regarding the aforementioned arrangements, is that the actual behaviour of people does not necessarily fall into such prescribed patterns.

4. Population structure as determining the planning system

The Polish example gives an idea of how the population structure affects the planning and system of units of the residential areas. The child and the mother affect the size and area of the units. A hierarchy starts from the small residential unit whose number of inhabitants is determined by both the number of children of kindergarten and nursery age related to the percentage of women working (30% to 60% of the total population in Poland). In the neighbourhoods where 30% to 60% of women go to work, 10% to 20% of children are of nursery age, and 40% to 60% are of kindergarten age, while the percentage of the children who ought to go to the primary school is variable in relation to the number of women working. Relating the number of the children to the total number of the neighbourhood population we find that in Poland generally 7 to 9% of the inhabitants are of the nursery age, 8 to 10% are of the kindergarten age, and 12 to 16% are of the primary school age (7 to 13 years old).

In Warsaw the smallest residential unit is 1000 to 2000 inhabitants who can support a kindergarten (120 children) which should be reached within 250 m. The neighbourhood unit is 5000 inhabitants who can support a primary school (640 children), which should be reached within 500 m. As a basic unit in the general plan, the neighbourhood is recommended to be of 10000 inhabitants, who can support 2 primary schools. The Kolo neighbourhood is of this size, divided into four separate residential units and delimited by the main thoroughfares surrounding its area.

5. Social groupings in the residential neighbourhoods

Sector number 10, Baghdad, shows an important aspect in social groupings, in the residential neighbourhood, which has proved successful. The sector is provided for 5810 inhabitants including three social groups. The residential zone is divided into residential units containing types of dwellings relative to a special income group. The lower the income the higher the density and the less floor area per person.

The housing block containing 75 to 100 inhabitants (community class I) includes one income group. The residential group containing 300 to 500 inhabitants grouped in 3- or 4-housing blocks (community class II), also includes one income group. The residential group of 1500 to 2000 people (community class III), i.e., a small neighbourhood, includes two income groups. The sector as a whole (community class IV) includes the three income groups. Social meeting points are concentrated within one major core where social life and social relationships can develop among all the social groups.

6. Neighbourhood standards

Comparing the neighbourhood standards of the different examples we find that they express the zoning pattern, the general layout, the system of grouping the dwellings, and the different local social and economic conditions.

In Kolo neighbourhood, Warsaw, the density (240 p/ha), the exploitation coefficient (0.42), the small floor area per person (17 m²) and the high occupancy ratio (1.7 p/room) express a standard of living lower than the other European examples of Holland or England, or even the standards of Dessau project which was planned 12 years before. (Overall density 150 p/ha, exploitation coefficient 0.35, occupancy ratio 1 p/room, and floor area 23 m² per person.)

The divisions of neighbourhood areas in percent and per person show that both Dessau and Kolo are more or less similar in percent while the neighbourhood areas per person are much lower at Kolo than at Dessau (16.6 m² net housing area, 16.84 m² woods, 4.0 m² services, and 4.16 m² roads at Kolo; compared to 28.6, 24.8, 6.0, 7.26 m² respectively at Dessau. The total neighbourhood area per person at the former is 41.66 m² compared to 66.66 m² at Dessau.)

The standards of the Dutch neighbourhood examples are visibly different from each other, especially those of Alexanderpolder 1953 compared to the other two examples of Alexanderpolder 1956 and of the Kennemerland scheme. Where there is an overall density of 250 p/ha (445 p/ha net) in the former project, there are 140 p/ha (360 p/ha net) and 175 p/ha (555 p/ha net) respectively at the other two. The decrease of the overall density is due to the provision of large greens and open spaces within the neighbourhood area (54.1% of the total neighbourhood area in the 1956 project, 55.5% at Kennemerland compared to 24.5% in the 1953 project). The recreational area per person
of greens and open spaces is accordingly 10.8 m² in the 1953, 40.0 m² in the 1956 and 31.7 m² in the last mentioned scheme.

As against these standards we may consider those of Hook residential unit, where it is proposed to provide the playing fields outside the unit area (within 10 minutes walk), in order to assure compactness and urbanity of the town. (The neighbourhood recreational areas at Hook form 24.8% of the residential unit area and measure 16.82 m² per person. Also where the overall density is 150 p/ha we find that 54.3% of the dwellings are single-family houses and 69.2% are grouped in 3- to 6-storey blocks.)

Where as at Alexanderpolder 1956, which has an of overall density (140 p/ha) lower than that of Hook, only 4% of the dwellings are single-family houses, 79% in 3- to 6-storey blocks and 16.6% are in 15-storey blocks.

Comparing the Hook residential unit to sector No. 10, Baghdad, we find that each expresses a different character and meets different demands.

At Hook, where the density is intended to be higher than at the former new towns in England (in order to increase the possibility and frequency of accidental or intentional encounters through the concentration of the pedestrian movements and local social buildings), it is still lower than at sector 10 Baghdad. At sector 10 the density reaches 180 p/ha even though 100% of the dwellings are single-family houses. This shows a solution of a problem in a high density country of still low standard of living where single-family houses are demanded.

Although the playing fields and parks are provided within sector 10 area, the recreational area per person is only 9.6 m² compared to 16.8 m² per person at Hook. This is due to the local conditions, layout and system of grouping the dwellings.

The standard of living is also visibly expressed in the two schemes by the comparable floor area per person (19.2 m² at sector 10 compared 31 m² at Hook) and the occupancy ratio (1.33 p/room compared to 0.86 p/room respectively).
B. A proposition for the future reconstruction and extension of Cairo based on community and neighbourhood planning

1. Problem

After analysing the different planning aspects and putting each planning organism under our microscope, we should like to apply our ideas with respect to community and neighbourhood planning to our most serious problem in Egypt: Cairo. As a capital city Cairo attracts immigrants, because it gives more chance for better jobs and a higher standard of living. According to the last census, of 1960, Cairo's population reached 3,346,000, about 13% of the total population of Egypt (26,059,000) and about 39% of the total urban population (8,599,470). Around 1953 the responsible authority in Egypt recognized the necessity for developing a master plan for the unplanned Metropolis of Cairo. The municipal council approved in July 1953 the constitution of the 'Cairo Planning Commission', which was charged with the task of a fifty-year program. As solutions to control the growth of Cairo, the planning commission proposed to encourage the formation of self-contained satellite towns outside the boundaries of Cairo to absorb any increase of population above 3 1/2 million. As auxiliary solutions, it was proposed to form new centres, as sub-magnets of attraction for large industries, in upper Egypt as well as in the other parts of the country. The redistribution of Governmental departments all over the country was also proposed to reduce the opportunities of Government employment in Cairo. In spite of these useful recommendations, the population of Cairo is increasing at a rate which needs more constructive and dynamic solutions.

Analysing these recommendations we find that:

1) The proposed satellite towns, as a solution, are inadequate to meet the numerical and physical growth of Cairo, and after a short period of time these satellite towns will be absorbed (see page 126).

2) The industrialization movement will cause the reduction of the rural population and the increase of the urban population. This will affect the big centres, especially Cairo, more than the other centres. This is already visible from world average statistics (see fig. 133).

3) According to the average annual percentage of increase (3.2%) the population of Cairo will be more than 10 millions after forty years. It is estimated that the population of Cairo might reach 7 millions after forty years; even with the assisting means of control, absorption of satellite towns depends on distances, natural zones directed in between, provisions to prevent excess births and the new location of industries.

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Fig. 133 Table shows the rate of increase of big cities and urban population, compared to the rural population.

Fig. 134 Increase of Cairo population.

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61 The master plan of Cairo, 1955/56.

62 However, absorption of satellite towns depends on distances, natural zones directed in between, provisions to prevent excess births and the new location of industries.

63 After Document R-GA 212, Doxiadis Associates.
### Population growth in Egypt and Cairo.

<table>
<thead>
<tr>
<th>Census Year</th>
<th>Egypt Number</th>
<th>%</th>
<th>Cairo Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1882</td>
<td>6 705 825</td>
<td></td>
<td>398 683</td>
<td></td>
</tr>
<tr>
<td>1897</td>
<td>9 634 752</td>
<td>2.9</td>
<td>589 573</td>
<td>3.2</td>
</tr>
<tr>
<td>1907</td>
<td>11 189 978</td>
<td>1.6</td>
<td>678 433</td>
<td>1.5</td>
</tr>
<tr>
<td>1917</td>
<td>12 718 255</td>
<td>1.4</td>
<td>790 939</td>
<td>1.7</td>
</tr>
<tr>
<td>1927</td>
<td>14 177 864</td>
<td>1.1</td>
<td>1 064 567</td>
<td>3.5</td>
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<tr>
<td>1937</td>
<td>15 920 694</td>
<td>1.2</td>
<td>1 312 096</td>
<td>2.3</td>
</tr>
<tr>
<td>1947</td>
<td>18 966 767</td>
<td>1.9</td>
<td>2 090 654</td>
<td>5.9</td>
</tr>
<tr>
<td>1950</td>
<td>26 590 000</td>
<td>3.1</td>
<td>3 350 000</td>
<td>4.7</td>
</tr>
</tbody>
</table>

2. Proposition

Our proposition to meet the problem of growth is to replan a future Cairo that can freely and dynamically extend, assisted by the other solutions – the creation of urban centres and the redistribution of the Governmental departments. Also other social means, such as the control of the birth rate, should be put into effect on a large scale. (The existing data show that the percentage of birth rate generally in Egypt is 4.0% compared to a death rate of 2.0%).
Factors governing the shape of the proposed city plan:
The proposed plan, fig. 143, is roughly linear, freely developing along the river Nile. Its shape and direction of extension are governed by the following factors:
- The Moquattam hills and the contour lines which determine the eastern limits, considering that large-scale development would be expensive to extend there, as also recognized by the commission.
The agricultural land to the north and west which supplies the city with the necessary agricultural products, vegetables, etc.

The city is already extending to the south, reaching the existing suburbs of Maadi and Helwaan.

Moreover it will extend in this southern direction owing to the growth of the emerging industrial centres of iron, copper and steel at Helwaan (25 km from the city centre), El-Taabin (5 km south of Helwaan) and El-Hawamdiya, as a centre for canning and agricultural products, on the western side of the river about 18 km south of the city centre.

To the northeast, the city is extending at Heliopolis and Ein-Shams. This side might grow at a lower rate than to the south owing to the greater attractiveness of Maadi, Helwaan, El-Taabin and El-Hawamdiya, fig. 135 and 136.

Hierarchical structure of the city and its system of units

The structure of the city is based on divisions and sub-divisions corresponding to hierarchy of functions.

The major urban unit makes provision for 400,000 to 500,000 inhabitants, corresponding to its function as a largely self-contained community focussed by a governmental
department, local major administration and business centre, higher educational and cultural institutions (theatre, main community hall, etc.), major department stores with restaurants, major hospital and religious centre with large mosques and churches. This means that the major urban unit is focussed by a major civic and business centre. Principally the unit corresponds to the major city thoroughfares delimiting its boundaries and passing through the whole built-up area of the city as well as reaching its regional highways.

The community unit is the sub-division of the major urban unit. It makes provision for 100,000 to 120,000 inhabitants and corresponds to a minor centre including the main community bazaar, office buildings, service industry, further education, secondary and technical schools and a cultural centre including a community centre with small theatre and a meeting hall.

The neighbourhood cluster consists of four integrated neighbourhood units. It comprises 25,000 to 30,000 inhabitants and corresponds to three secondary schools, neighbourhood sports centre, shopping centre, market with restaurants and cafes, service industry, administration building, minor religious buildings and health centre. It also corresponds to the main internal thoroughfares passing through the major urban unit. The neighbourhood unit comprises 6000 to 7500 inhabitants corresponding to the number of children of elementary school age (13.3% of the population in Cairo), 54500 girls and 500 boys, of maximum 400 m radius of influence.

It corresponds also to a neighbourhood market, shopping unit, workshops with cultural centre for children, health centre, local administrations, local religious building and local neighbourhood gardens and playgrounds.

The neighbourhood group measures 1500 to 2000 inhabitants corresponding to a nursery school (determined according to the need of the inhabitants), neighbourhood gardens and play-lots for children less than 10 years old.

The neighbouring-family groups measure 400 to 500 inhabitants corresponding to smaller neighbourhood gardens and toddlers play-lots. This unit could also be divided into 2 to 4 units (say housing blocks), measuring 100 to 200 inhabitants.

Zoning

The schematic zoning plan is an application to the hierarchical structure and system of units proposed. We only mention the important points which are in direct relation to the subject of this thesis.

a) Major city centre zones

The existing centre of Cairo grew by 42% between 1937 and 1947 and by 16% from 1947 to 1956, causing conflict with the other city functions. The overall density of the total central area reached 660 persons per ha in 1947, and in some districts, such as Boulak, it reached about 1500 p/ha in 1960, fig. 140 and 141. This shows the bad living conditions of overcrowding caused by such uncontrolled expansion.

The idea of the proposed centre is largely based on the concept of Dynapolis. The centre develops on a free linear expansion along the main thoroughfares delimiting the major urban units. At the old centre the new areas are absorbing the district of

Fig. 139 Location of the existing city centre of Cairo and its relation to the built-up area (after Rida, Stadt- kern von Kairo).

**The master plan of Cairo, 1955–1956.**

Fig. 140 Boulak district in the city centre of Cairo, overcrowded and inhuman living condition.
Boulak, which is one of the worst problems in Cairo and is already considered within the old city centre area, fig. 141.

Then is extends to the east along Al-Azhar Street passing through Al-Ataba square and Al-Mousky which are also already within the city centre zone. From Al-Ataba square to the northeast it extends along the Gaish-Street, Gaish square and Abbasia Street including Ain-Shams university.

To the south it extends as far as the old centre of Masr Alkadima, where it is proposed to continue to the east and to the west including the already existing centre of Gizah. At this point local considerations should be checked, especially with respect to the new settlements along Alharam Street. This centre already exists as a famous amusement centre for Cairo and for tourists. It extends to the Pyramids, including the famous hotels, restaurants, casinos, night clubs, etc.

To reduce the load on the middle city centre we propose the erection of a new centre for major regional, national and international functions. This would be near the Maadi suburb, intermediate between the old city centre and Helwaan serving as a sub-centre for the southern part of Cairo.

This sub-centre is also planned as a major business-industrial focus of this part of Cairo where the heavy industries are located.

b) Residential planning

Approach in solving the housing problem

Our recommendation is to start social and economical studies to evaluate the local conditions not only in Cairo but all over the country.

This should be followed by architectural studies to determine the extent to which suitable homes for the different classes of people and in the different geographical regions could be developed. The types of homes should meet the needs and desires of the different social groups.

The population should be classified into social groups according to income in each region. Solutions and prototypes must be discussed and determined by the people who are to live there. Otherwise the solutions will not be organic and satisfactory to develop a healthy living environment.

Each neighbourhood might include 2 or 3 social groups, and never only one group, in order to avoid social split. The neighbourhoods should meet developing human needs;
Cairo Master Plan

Proposition

Fig. 142
The major urban unit

The plan shows a schematic diagram explaining the system underlying the design. The urban unit consists of four community units I, II, III and IV, each of 100,000 to 120,000 inhabitants. Each community unit is divided into four neighbourhood clusters (a), (b), (c) and (d), 25,000 to 30,000 each, which are also divided into four neighbourhood units, each 7500 inhabitants (n).

For social, economical and human benefits, the centres of the different units are arranged. They are connected continuously in a longitudinal compact zone: a spine of life integrated with the residential area. All overlapped circles of influence giving freedom of choice between the available meeting points of social, educational, cultural or amusement. All centres are within walking distances; even walk to major civic centre could be managed by a considerable number of people living at the other limits. Walking distances must be related to the different age groups. Children less than 10 years old need community services and recreation within 5 minutes, those a more than 10 years need them within 10 minutes and the older group need them to be within 15 minutes.
dwellings should be provided to suit the growing standard of living of the different groups. Studies should assist in distributing the residential zones with respect to density. All-in development costs at different densities should be based on the average size of dwellings. This is to determine the overall net density which if studied would lead to an economical development for the whole nation.

These approaches and other contributions must guide residential planning in order to meet as soon as possible the great shortage of suitable homes for our poor people.

Schematic diagram of a major urban unit

The major urban unit, fig. 143, is south of Maadi on the eastern side of the Nile. It is delimited by the sub-city centre to the north, the industrial zone to the east and Helwan to the south, which itself will develop as a major urban unit. According to our classification of the hierarchical structure of Cairo, it is also delimited by its main thoroughfares, which connect it directly with the regional road network.

Divisions and density zoning

The primary studies, fig. 143, represent our recommendations on community and neighbourhood planning. The major urban unit is sub-divided into four community units grouped about its longitudinal central civic centre which is at maximum 3 km from the outer limits. The sub-centres of the community units are within overlapping circles of influence of radius ½ mile or maximal 1 km, i.e. within 10 to 15 minutes walk. This coincides with our proposed densities, which are generally classified only to explain the planning aspect; bearing in mind that these densities must be related to the net residential densities determined by the economical studies.

The net residential density is proposed to range from 200 to 400 p/ha and maximum of 500 p/ha. For social and economical benefits, higher densities should be provided at the residential zones around the major civic-business (as well as around the main city centre) zones, but not higher than the maximum density proposed.

This means that the neighbourhood cluster (a) would have the higher density. Neighbourhood cluster (d) would be of the lowest density and might develop to include a percentage of single-family houses larger than the other units. The four neighbourhood clusters (a), (b), (c) and (d) are planned at overall densities ranging from 100 to 250 p/ha. The neighbourhood units might range from 25 to about 42.5 ha each, i.e. the neighbourhood area per person might range from 40 to 55 m². This shows that the densities proposed are adequate to human standards and could suit local conditions. Besides, they allow for overlapping circles of influence of the different central functions within the neighbourhood; providing the possibility of choice between the available schools, shops, etc. These densities would help to develop busy cores and social life through concentrating the pedestrian movements and social buildings in the neighbourhood units.
Traffic System

Pedestrians:

**Humanity:** No crossing between pedestrians and vehicular traffic. Safety for all.

**Social relationship:** Encouraged by pedestrian ways leading to the social meeting points at the cores with opportunity and freedom of choice between a number of activities.

**Economy:** Time and effort are spared because of the direct connections between dwelling and services within short walking distance.

**Hierarchy of scale:** The greater the number of pedestrians at the core, the more the space for movement respectively.

Vehicular traffic:

**Major parking areas:** No empty boxes exploiting areas needed for recreation and services, economy of land use. Parking is at a lower level than the pedestrian level.

**Hierarchy of scale:** The more the frequency required and traffic load, the larger the dimension of roads.

- Culs-de-sac reaching the dwellings
- Outer neighbourhood roads
- Major urban unit inner roads
- Highways connecting the urban unit with the whole city and region

Connections on two levels to achieve direct and easy traffic flow.

Fig. 146 Community unit III.
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Die Nachbarschaft als Einheit in der Planung neuer Städte und Stadterweiterungen

Gegenstand dieser Arbeit ist ein Beitrag zur Analyse und zum Studium der Nachbarschaftsprinzipien. Das Ziel besteht darin, Daten sowie Grundbegriffe und Richtlinien zu finden, welche für das Planen einer integrierten Nachbarschaft empfohlen werden können, wobei die beeinflussenden Faktoren und das Verhältnis einer solchen Nachbarschaft im Rahmen der Stadt und ihrer Erweiterung berücksichtigt werden.

Der erste Teil

enthält eine analytische Studie über Nachbarschaftsplanung, welche in zwei Kategorien eingeteilt ist.


Im zweiten Projekt von 1956 werden vier größere Nachbarschaften gebildet, wovon jede etwa 5500 Einwohner auf einer Fläche von ungefähr 40 ha umfasst (Gesamtdichte etwa 140 Einwohner pro ha einschließlich Grünflächen, Gemeinschaftseinrichtungen usw.). Der Vergleich der in den beiden Kapiteln analysierten Beispiele von Planungssystemen ergibt im Projekt von Dessau eine charakteristische Integration der Einheiten untereinander, während die Projekte von Alexanderpolder durch eine klare Trennung der Nachbarschaftseinheiten gekennzeichnet sind.

Der zweite Teil

enthält eine analytische Studie über verwirklichte Entwürfe, welche auf der Nachbarschaftsplanung basieren und in zwei Kategorien eingeteilt sind.

Die Kolo-Nachbarschaft, entworfen von den Professoren H. und S. Syrkus (1947 bis 1950), wird als Beispiel der frühen Nachkriegsentwicklung aufgeführt und spiegelt die polnischen sozialen und wirtschaftlichen Verhältnisse jener Zeit wider (Gesamtdichte 250 Einwohner per ha). An der Technischen Hochschule in Warschau wurden die Auffassungen und Erfahrungen von Prof. Syrkus 10 Jahre nach dem Experiment von Kolo in einem Projekt (Mlociny-Nachbarschaft) ausgewertet, das ebenfalls in diesem Kapitel Erwähnung findet (Gesamtdichte 350 Einwohner per ha).

Anschliessend an dieses Kapitel befinden sich Angaben über den für die Jahre 1961 bis 1965 für Polen empfohlenen Nachbarschaftsstandard (Gesamtdichte 300 bis 400 Einwohner per ha), der mit denjenigen von Kolo und Mlociny verglichen wird.


Als Beispiel für das analytische Studium diente uns die Gemeinschaft südlich von Alkmaar (etwa 50000 Einwohner). Die Grundfläche besteht im System der getrennten Nachbarschaftseinheiten, welche je 7000 bis 10000 Einwohner umfassen und in 2 oder 3 Lebenseinheiten (je etwa 3500 Einwohner) aufgeteilt sind. Der Generalplan ist durch ein Seriensystem (ribbon system) in Form einer kompakten Gruppierung getrennter Nachbarschaftseinheiten um ein längsförmiges Zentrum gekennzeichnet.

Dritter Teil
Hier werden zwei Planungsprinzipien analysiert, die im Zusammenhang mit der Nachbarschaftsplanning stehen.

Kapitel V. Das Planungssystem von «Dynapolis» stellt eine theoretische Studie des griechischen Planers C.A. Doxiadis über die Grundprinzipien der Stadt der Zukunft dar. Diese Prinzipien, welche später im Detail aufgeführt werden, sind, kurz gefasst, folgende:

1. Planen und Bauen sollten alle menschlichen Bedürfnisse befriedigen.
2. Die Ordnung und die Hierarchie der Funktionen sind unentbehrliche Elemente für das Überleben unserer Städte.
3. Die Stadt muss die Freiheit besitzen, sich dynamisch zu entwickeln. Dem Zeitfaktor als der vierten Dimension sollte grösere Bedeutung zugestanden werden.
4. Die Stadt der Zukunft muss nach verschiedenen Massstäben gebaut werden, das heisst für Menschen, Autos, Flugzeuge und sogar Raketen.


Wir wählen dieses Beispiel, weil es die Planungsmethode zeigt und das Wohnproblem in einem orientalischen, tropischen Lande behandelt.


Sektor Nr. 10, der eine Grundeinheit im Generalplan von Baghdad darstellt, dient 5810 Einwohnern auf einer Fläche von 32 ha (Gesamtdichte etwa 180 Einwohner per ha). Ein wichtiger Aspekt besteht darin, dass sich die Mischung verschiedener Sozialgruppen innerhalb einer Nachbarschaft erfolgreich erwiesen hat.

Die Stadt soll 100000 Menschen aufnehmen, eine Größe, welche die bisherigen Stadtgründungen (new towns) in England übersteigt (bisher etwa 60000 Einwohner) und auch Gemeinschaftseinrichtungen wie Rathaus, Kinos, Konzertsaal, kleines Repertoiretheater und Regionspital ermöglicht.

Dichte, Veränderung der Familienstruktur während einer Zeit von dreissig Jahren, kurze Wegstrecken zur Schule, Einkaufsläden und gesellschaftliche Treffpunkte sind die wichtigsten Faktoren, die das Gliederungssystem dieser Stadt beeinflussen.

Aus der Hook-Studie geht hervor, dass eine Erhöhung der Bevölkerungsdichte (ohne dass das Privatleben im Hause darunter leidet beziehungsweise verlorengeht) ein größeres Angebot an zentralen und insbesondere auch kulturellen Institutionen erlaubt, wodurch eine Ausweitung der persönlichen Freiheit zustande kommt.

Die Wohneinheit (residential unit) in Hook wird infolgedessen von verschiedenen Faktoren bestimmt; z.B. im Stadtrinnern erweist sich bei einer durchschnittlichen Dichte von 175 Einwohnern per ha und einer Familiengrösse von 3,2 Personen eine Elementarschule auf eine Zahl von 4000 bis 5000 Einwohnern als notwendig.

Dies bedingt eine Fläche von 32 ha pro Wohneinheit. Die Länge dieser Fläche wird durch die 10-Minuten-Gezeit vom Zentrum zur Hauptstrasse, welche die Innenstadt abgrenzt, bestimmt. Dies ergibt eine Grösse von 400 x 800 m einschliesslich Flächen für Schule, soziale Gebäude, Leichtindustrie, Erholungsflächen für Kinder sowie Grünflächen.

**Vorschlag**

Als Abschluss unserer Studien soll ein Vorschlag zur Rekonstruktion und zur Erweiterung der Stadt Kairo, basierend auf Gemeinschaftsplanung, unterbreitet werden.


Unser Vorschlag zur Lösung des Wohnungsproblems besteht in einer Reorganisation des zukünftigen Kairo, welches sich frei und dynamisch ausbreiten soll; dieser Plan wird durch andere Lösungen, welche die Entwicklung und Gründung von urbanen Zentren in alten Stadtkernen betreffen, sowie durch eine Verteilung der Regierungsstellen über das ganze Land unterstützt. Auch anderen sozialen Mitteln wie Geburtenkontrolle muss grösere Aufmerksamkeit geschenkt werden.

Der vorgeschlagene Plan ist ungefähr linear und wird durch die geologischen Bedingungen und das natürliche Wachstum der Stadt in den gegenwärtigen Verhältnissen bestimmt.

Die Struktur der Stadt basiert auf Teilung und Unterteilung gemäss der Hierarchie der zentralen Funktionen.

Die grössere Stadtseinheit (major urban unit) umfasst 400000 bis 500000 Einwohner und ist eine selbständige Gemeinschaft; deren Regierungsdepartement und hohe zentrale Funktionen bilden den Brennpunkt des Zentrums. Diese grösseste Stadtseinheit entspricht im Prinzip den Hauptdurchgangsstrassen, welche durch das ganze Stadtgebiet direkt zu den regionalen Strassen führen und die Stadtseinheit so begrenzen.

Die grössste Stadtseinheit wird wie folgt unterteilt:

- Gemeinschaftseinheit (community unit) 100000 bis 120000 Einwohner;
- Nachbarschaftsdistrikt (neighbourhood cluster) 25000 bis 30000 Einwohner;
- Nachbarschaftseinheit (neighbourhood unit) 6000 bis 7000 Einwohner;
- Nachbarschaftsgruppe (neighbourhood group) 1500 bis 2000 Einwohner;
- Nachbarschaftsfamiliengruppen (neighbourhood family groups) 400 bis 500 Einwohner;
- Nachbarschaftsfamiliengruppe (neighbour family group) 100 bis 200 Einwohner.

Es ist darauf hinzuweisen, dass die Schaffung eines 'Heimes' für alle vorerst ein genaues Studium der sozialen und wirtschaftlichen Verhältnisse bedingt, damit so die lokalen Bedingungen erkannt werden können; dies gilt nicht nur für Kairo, sondern für das gesamte Land. Die verschiedenen Sozialgruppen sollten hinsichtlich ihres Einkommens differenziert werden, wodurch Lösungen und allgemeine Prototypen gefunden werden können, welche für jede Gruppe passen.

Die vorgelegte detaillierte Studie bringt die Idee und das Verhältnis der verschiedenen Funktionen von der kleinsten Nachbarschaft bis zur Metropole zum Ausdruck.

Die Studie basiert auf den lokalen Verhältnissen in Kairo und zeigt gleichzeitig die allgemeine Planungsmethode.

Es wird ferner gezeigt, wie auf menschlicher, sozialer und wirtschaftlicher Basis eine Lebensumwelt zu gestalten wäre, die den Grundstein für eine funktionelle und organisie Architektur bilden würde.
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