International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Population, Land Use, and Housing Trends in The Netherlands Since 1950

van Diepen, A.

IIASA Working Paper

WP-95-063

July 1995

Working Paper

Population, Land Use, and Housing Trends in the Netherlands Since 1950

Albertine van Diepen

WP-95-63
July 1995

International Institute for Applied Systems Analysis ☐ A-2361 Laxenburg Austria

Telephone: +43 2236 807 ☐ e-mail: info@iiasa.ac.at ☐ Telefax: +43 2236 71313

Population, Land Use, and Housing Trends in the Netherlands Since 1950

Albertine van Diepen

WP-95-63
July 1995

International Institute for Applied Systems Analysis ☐ A-2361 Laxenburg Austria

Telephone: +43 2236 807 ☐ e-mail: info@iiasa.ac.at ☐ Telefax: +43 2236 71313

ABOUT THE AUTHOR

Albertine van Diepen is from the Department of Physical Planning and Demography, University of Groningen, P.O. Box 800, NL-9700 AV Groningen, the Netherlands. This paper was written while she was a Guest Research Scholar with the Population Project.

ACKNOWLEDGMENTS

The author would like to express her thanks to the Dutch National Foundation for Scientific Research (NWO) for the financial support that made her visit to IIASA possible.

ABSTRACT

From a spatial point of view, the topic of environmental quality deals with the mutual adjustment of different societal claims in the spatial setting, aiming at the development and/or maintenance of adequate conditions for quality of life. Since 1950, the population, and in particular the number of households, in the Netherlands have increased considerably, postulating large demands to housing and residential land use. In this paper, major demographic, land use, and housing trends in the Netherlands since 1950 are outlined in order to discern the magnitude and importance of these changes at the present time. Attention is paid to changes regarding the availability of residential space in general, and of living space within the house.

TABLE OF CONTENTS

POPULATION, LAND USE, AND HOUSING TRENDS IN THE NETHERLANDS SINCE 1950

Albertine van Diepen

INTRODUCTION

Since the Second World War, important demographic changes have taken place in the Netherlands. The number of inhabitants as well as the number of households in the Netherlands have increased considerably and, consequently, the country has increasingly become densely populated. These demographic developments have their roots in the previous century. At the beginning of the 19th century, the Netherlands could be described as a rural country. About 66% of the population lived in rural areas. Poverty was everywhere, although poverty was most striking in the urban zones. In the 19th century, some important developments emerged, which have had a deep impact on society. First, the population started to grow as the rates of birth and death were no longer in balance. The crude death rate, i.e. the number of deaths per 1,000 inhabitants, decreased as a result of better personal hygiene and improved medical treatment. In particular, cities benefitted from these improvements and became centers of population increase. Second, somewhat later than in surrounding countries, in 1870 the Industrial Revolution took off in the Netherlands. With the invention of the steam engine, a new mode of production was introduced, which had a deep impact on social life. In the new context of processes of industrialization and urbanization, traditional family routine as the base of existence began to crumble, since it was no longer necessary to live in extended families. The establishment of nuclear family units increased and its societal meaning as well.

One of the consequences of the growth of the population and the number of households concerns the increase in spatial claims. More space has become necessary for residence, leisure, mobility, etc. Furthermore, a growing population implies larger demands for consumption that will generate additional spatial claims. The Netherlands, however, deals with a scarcity of space. Physical planners are confronted with a large variety of spatial claims that have to be carefully weighed to preserve the quality of the environment in an already very densely populated country. Environmental quality and related topics, such as liveability, have become important issues in the current planning policy (MVROM 1991). The necessity to bring all kinds of land use together in the limited space, while different types of land use cannot bear other's closeness, postulate high demands from the physical planning practitioners in order to develop and/or maintain adequate environmental quality.

This paper will present some of the major trends in population, land use, and housing in the Netherlands since 1950. The focus will be on a description of available data. In the next section population processes are discussed, with a special interest in household developments. From a spatial point of view, more than the population at large, households are seen as entities of paramount importance. In the third section attention will be paid to changing land use throughout time, as societal processes are assumed to be reflected in spatial developments. In the fourth part of this paper, the housing stock is considered since housing forms the meeting point of household development and issues of land use. Spatial implications of housing not only refer to the absolute size of the residential area, but are also related to the people's demands and desires concerning the space within dwellings. Finally, a few concluding observations about the spatial implications of household changes are given.

DEMOGRAPHIC DEVELOPMENTS

In the past up to 1971, regular censuses of the traditional type were held in the Netherlands and carried out by the Dutch Central Bureau of Statistics (CBS) in order to obtain information on population issues. Those censuses form an important source of information on the number of people living in the country and the way they lived. Since the 1970s the CBS relies on different sources for these data, i.e. population statistics registered by municipalities, the Labor Force Sample Survey and the Housing Demand Survey, both surveys conducted by CBS.

Population Developments at Large

Population growth endured after the Second World War. Whereas in 1950 the Netherlands counted about ten million inhabitants, nowadays the population size approximates 15.5 million persons, a population growth of more than 50% within 45 years. Consequently, population density rose from 309 inhabitants per square kilometer in 1950 to 445 inhabitants in 1994. Due to some land gains on the sea, population density did not increase at the same rate as the population size.

Population growth has not been equally distributed over the country. In particular, the provinces in the eastern part of the country, as well as the province of North-Brabant, were confronted with a large population increase in the period 1950-1991. The western provinces, as well as the two most northern provinces, showed a much slower population growth. In Table 1 the developments of the population per province are shown.

Table 1. Development of the population in provinces, 1950-1991 (1950=100). Source: CBS 1989.

Province	1960	1970	1980	1991
Groningen	103	112	120	121
Friesland	103	112	126	129
Drente	111	130	149	158
Overijssel	116	128	153	154
Gelderland	118	140	158	169
Utrecht	118	140	156	179
North-Holland	111	122	125	130
South-Holland	113	125	129	136
Zeeland	106	114	129	133
North-Brabant	120	144	165	178
Limburg	122	138	148	154
The Netherlands	114	129	141	150

Because the population in the western part did not grow as fast as in other parts of the country, the proportion of the population living in the provinces of Utrecht, North-Holland and South-Holland decreased slightly. Still, over 40% of the Dutch population are inhabitants of these three provinces. Successively, these provinces are the most densely populated provinces: 756, 899, and 1130 people per square kilometer in 1991, respectively.

Also, the process of urbanization continued after the Second World War. The proportion of people living in urbanizing environments increased significantly in the period 1947-1993. Table 2 shows the distribution of the population according to the degree of urbanization of the municipality. In 1947, about 29% of the population lived in a municipality that could be described as rural, and more than 50% of the Dutch inhabitants lived in urban areas. During the 1950s and 1960s, many municipalities in the countryside became urbanized and attracted many people to their neighborhoods at the expense of the typically rural communities. In particular, municipalities inhabiting many commuters showed a strong increase during the 1960s, reflecting the outmove from the old cities toward the growing smaller towns in the intermediate zone. In 1993, the share of the population living in rural municipalities declined to 11%. Regarding urban municipalities, their share in the total population has remained on the same level. About half of the Dutch population still lives in urban areas. From this perspective, the trend occurring over the last four decades can well be described as an urbanization of the rural area.

Table 2. Population according to degree of urbanization, in percentage of total population, 1950-1990. Source: CBS 1989.

Municipalities	1947	1960	1970	1980	1993
Rural	29	22	11	12	11
Urbanized rural	11	16	21	22	23
Particularly commuting	5	7	13	14	15
Urban	54	55	55	52	51

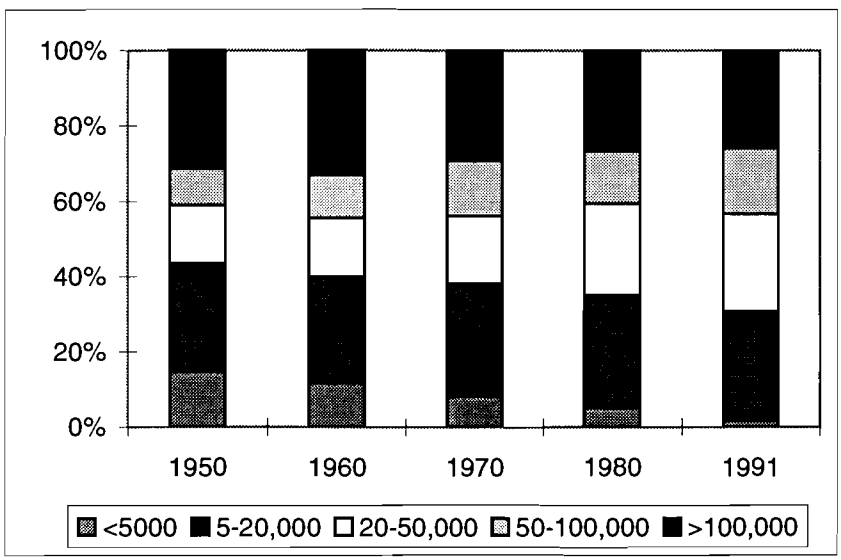

Figure 1. Population distribution by municipality size, in percentage of total number of inhabitants, 1950-1991. Source: CBS 1989.

Figure 1 also presents this urbanizing trend in rural areas. In 1950, 15.6% of the total population of the Netherlands resided in municipalities of between 20,000 and 50,000 people; in 1994 this was increased by 26.2%. In 1950, 9.5% of the total population lived in municipalities of between 50,000 and 100,000 people, as compared to 16.8% in 1994. In particular, small municipalities with

a population of less than 5,000 people lost their significance. In 1950, they accommodated nearly 1.5 million people, which was about 15% of the total population. In 1994, these communities all together were inhabited by only 244,000 people, or 1.4% of the total population. The number of municipalities with more than 100,000 people increased from 11 in 1950 to 18 in 1994. The number of people living in their neighborhoods increased by 24% to approximately four million people in 1994. However, at the same time, the proportion of the population living in these large municipalities declined, from 31.4% of the total population in 1950 to 27% in 1994.

Developments in the Household Structure

The introduction of the term "household" in Dutch governmental statistics stems from the 1947 census. Different from a family, mutual relationships between persons within the households, like kinship or marriage, are not of any importance in the conceptualization of a household. Still, a family was usually the premise in analysis. Since 1960 the household has become the point of departure in CBS inventories. "Household" is defined as a housekeeping unit, comprised of two or more persons living together under one roof, sharing a living room, and having at least one meal together daily. People living alone, whether sharing the same dwelling or not, are also seen as a separate household, in the event that they do not share a living room and meals daily with other people.

The growth of the population has been substantially exceeded by the increase in the number of households. In 1950 there were about 2.6 million households, whereas nowadays, the number of households abundantly amounts to six million units. Figure 2 shows the growth of the population as well as the increase in the number of households for the period 1960-1993; for the 1950s, data on the number of households are not available. The number of households nearly doubled during this period, whereas the population grew at about 35%. Consequently, the average number of persons per household declined. In 1950, households consisted of approximately four persons on average; in 1993 this average was dropped to 2.4 persons. This process of more but smaller households is often referred to as "household dilution."

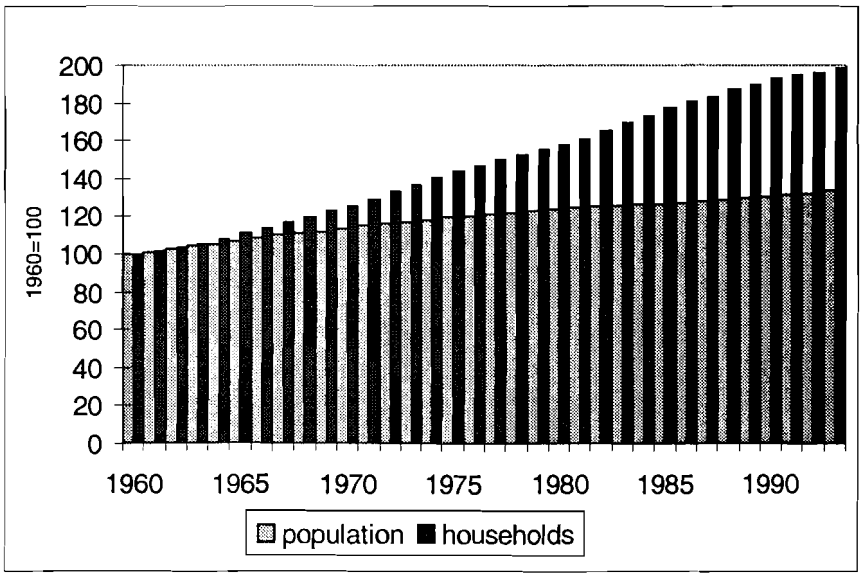

Figure 2. Population and household development, 1960-1993 (1960=100). Source: CBS 1989.

This "household dilution" process is also recognizable when the development in the composition of households is observed. In Figure 3, the development in the distribution of households is demonstrated according to household size between 1947 and 1992.

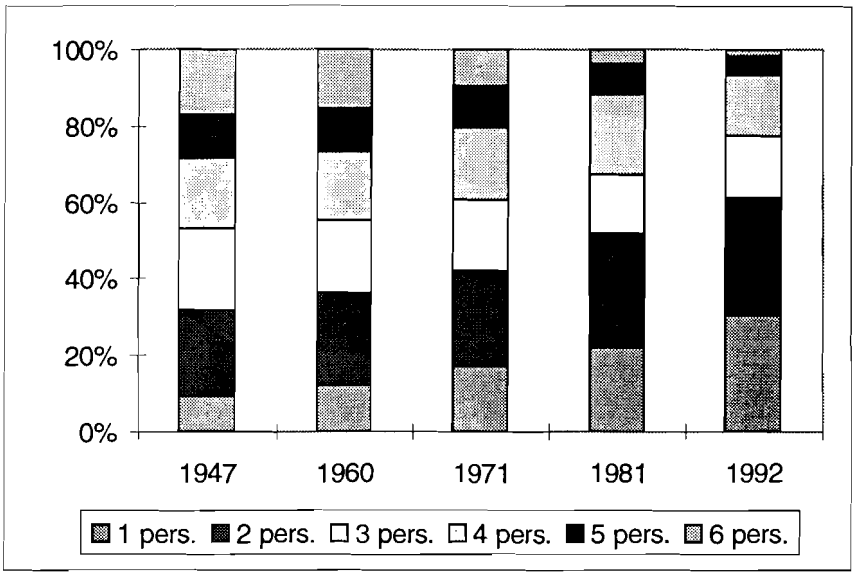

Figure 3. Household distribution by household size, in percentage of total number of households, 1947-1992. Source: CBS 1989, 1993.

One-person and two-person households have become large household categories. In particular, the one-person household has taken a dominant position in the Netherlands. In 1947 approximately 10% of all households consisted of just one person, compared to 30% in 1992. With reference to the total population size, in other words, more than 12% of the Dutch population lives alone. The proportion of the two-person households increased from 23% in 1947 to 31% in 1992. Nowadays, about two-thirds of all households consist of not more than two persons. Households with three and four members demonstrate a more or less constant share in the total distribution of households by size between 1947 and 1992. Their proportions declined by 5% and 2%, respectively, to about 16% in 1992. The share of larger households dropped at the same time. In 1947, 27% of the Dutch households counted more than five persons. By 1992, this percentage had declined to 6%. Six-person households nowadays represent only 1% of the household sector.

Three developments have played an important role with respect to the decline of the household size in the 20th century. First, with the appearance of the processes of industrialization and urbanization, the traditional family formation, i.e. the extended family including several generations within one household, was no longer the most appropriate organization of family life supporting the acquirement of a household income. With the emergence of the welfare state, the necessity to live together with relatives was reduced. The rise of affluence has enabled people to live on their own. From a financial point of view, sharing a household became unnecessary. Second, the family life cycle has become more differentiated since more stages in a life cycle are being distinguished. On the one hand, leaving the parental home and setting up one's own household have become more common at earlier years of age, whereas on the other hand, at older ages, people still live on their own. This contributed to a decrease in the average number of people per household. Third, decreased fertility and mortality rates have resulted in a

changing age structure of the population and to smaller household units. For example, in 1960 29% of the population was under 15 years of age; in 1992 this percentage dropped to 18%.

To what degree are household changes driven by demographic trends? A crude approach to answer this question concerns the comparison between population growth and the increase in the number of households. During the period 1960-1992, the population grew by 32.5% and the number of households by 95.7%, an increment of 3.1 million households. If the number of households had grown at the same rate as the population, 1,030,575 more households would have been formed since 1960. Therefore, one-third of the household changes between 1960 and 1992 can be explained by population growth. Such a calculation, however, does not take other considerations into account.

In particular, the changing age structure is of paramount importance regarding the household formation process. The impact of age structure changes can be isolated by the application of the 1960 age-specific headship rates to the 1992 population age structure. Headship rates are formulated as the proportion of the population that is head of a household, usually distinguished by sex and age. The results are interpreted as the impact of shifts in size of distinguished age cohorts on the number of households by equal rates of people per age cohort heading a household. Therefore, changes in household numbers have to be decomposed into changes in the age structure as well. For this calculation, six age cohorts are distinguished, subdivided by sex. Application of this headship rate approach results in a 60.2% increase in the number of households between 1960 and 1992. As the population growth responsible for 34% (32.5 divided by the total household increase) of the household changes, 29% of the household changes can be attributed to shifts in the age structure (60.2% minus 32.5% population growth, divided by the total household increase). Especially the enlargement of particular age cohorts contributed to the increase in the number of households, because at certain ages, people undergo changes regarding their household situations. For example, the age group between 25 and 34 years represented 13% of the total population in 1960 and 17% in 1992.

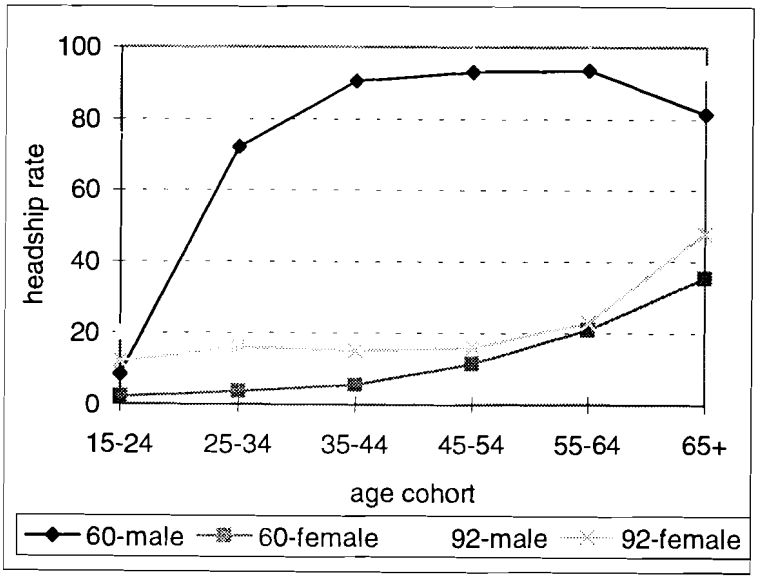

Figure 4. Headship rates by age and sex in percentages, 1960 and 1992.

The residual of 37% household changes represents changes in the headship rates themselves, implying the increased number of persons per age group by sex heading a household. Between 1960 and 1992 an overall increase in headship rates took place as shown in Figure 4.[1] For both men and women, headship rates rose significantly for people under 45 and over 65 years of age. These developments reflect the differentiation in the household formation process toward more independent lifestyles. Societal changes with respect to, among others, leaving the parental home at earlier ages, couples splitting up, and living outside old people's home at older ages, have led to the formation of extra households.

In conclusion, population growth in the Netherlands has been accompanied by a rising population density and an urbanization of the countryside. Particularly striking is the increase in the number of households, and a reduction of the average household size. Besides population growth, a changing age structure and the increase in headship rates contributed to this increase. The finding that per age group more people are heading a household suggests a trend toward more individual lifestyles as far as living arrangements are concerned.

LAND-USE DEVELOPMENTS IN THE NETHERLANDS

Have those demographic processes delineated above been reflected in changing land use? In the previous section, the rise of the population density was mentioned. Over the past 50 years, although the Netherlands has gained some land on the sea, an increase in the share of residential area can be expected as a result of the important growth of the population and the increase in the number of households. Data on land use have been collected by the Dutch Central Bureau of Statistics (CBS). Sufficient longitudinal data on land-use changes in the Netherlands are, unfortunately, not available because of many definition inconsistencies throughout time. Since 1950, at least four different time series on land use can be distinguished, e.g. 1950-1966, 1967-1976, 1960-1976 (data released by CBS but not officially published), and 1977-1989; the 1989 inventory is the most recent (CBS 1994). Some differences between those time series are classification shifts and changes in measurements and methodology. Also within each time series some changes in classification took place. In this section, trends in land use, based on CBS data, will be examined in more detail.

General Trends in Land Use

Because of all the changes in registering land use, a comparison of land use throughout time is rather ambiguous. By rearranging the distinguished classifications into comparable groups, some general developments can be described. In order to give an impression of some general shifts in land use, Table 3 shows some data on land use for the period 1950-1989, according to some general categories.

The table shows a rise in the total amount of land in the Netherlands between 1950 and 1989 by nearly 18%. Because an increase of 200,000 ha took place after 1985, and between 1985 and 1989 no large land gains on the sea took place, this must be ascribed to changes in methodology and/or measurements. Of all the land-use categories, the share of water area showed the largest growth. In 1989 the share of water was nearly six times higher than in 1950. Also, growing categories of land use were areas for recreation and the built-up area, enclosing residential area as well as all kinds of business areas. Since 1950 the built-up area was extended by more than

[1] Based on UN (1987) and CBS data, EUROSTAT held a Joint Work Session on Demographic Projections in 1994.

50%, from 5.3% to 8.3% in 1989. The share of land for infrastructure dropped between 1950 and 1970. After 1970 its share rose quickly to 3.4% of the total amount of land. The proportion of forest area increased until 1970, after which its proportion decreased to 7.6% of the total land. According to Table 3, a decline in land use took place with regard to uncultivated land and agriculture.

Table 3. Land-use developments in the Netherlands, 1950-1989, in percentage of total amount of land incorporated with municipalities.

	1950	1960	1970	1981	1989
Built-up area	5.3	5.9	6.6	8.6	8.3
Infrastructure	2.8	2.4	1.8	3.5	3.4
Recreation	0.1	0.2	0.4	1.9	1.9
Agriculture	74.0	70.6	69.7	64.7	59.8
Forest	7.2	7.4	8.1	7.9	7.6
Uncultivated land	8.1	6.5	5.6	4.3	3.8
Water	2.6	6.9	7.8	9.1	15.0
Total area (in 1,000 ha)	3385.0	3613.0	3662.0	3731.0	3986.0

For the purpose of this paper, water areas are not of interest and can, therefore, be excluded in further analyses. When the water area is not taken into account, more emphasis can be put on land-use developments with respect to the extent and nature people use the available area. In Table 4 the outcome of this calculation is shown.

Table 4. Land use in the Netherlands, in percentage of total amount of land, excluding the water area, 1950-1989.

	1950	1960	1970	1981	1989
Built-up area	5.4	6.3	7.1	9.5	9.8
Infrastructure	2.9	2.6	2.0	3.8	4.1
Recreation	0.1	0.2	0.4	2.1	2.2
Agriculture	76.0	75.9	75.5	71.1	70.4
Forest	7.3	8.0	8.8	8.7	9.0
Uncultivated land	8.3	7.0	6.1	4.8	4.5
Total area (in 1,000 ha)	3297.0	3363.0	3378.0	3393.0	3387.0

The large increase in the total surface as expressed in Table 3 almost disappears when water areas are excluded. Compared to 1950, in 1989 the total area increased by 2.7%. Some land gains on the sea have contributed to this rise. In 1958 and in 1968 the reclaimed parts of the IJsselmeer were added to the total amount of land in the Netherlands. Nowadays, these areas

belong to the province of Flevoland. Furthermore, similar trends in land use as indicated in Table 3 can be distinguished, although the magnitude has changed. From the total amount of land excluding water, the proportion of agricultural and uncultivated land decreased in favor of the proportion of the built-up area, infrastructure, recreation, and forest. In this view, the share of the built-up area rose from 5.4% of the total in 1950 to 9.8% of the total in 1989. The size of the built-up area itself increased by 86% during this period. This category, however, is very broadly defined, hiding more specific data on the expansion of residential area in particular.

Trends in More Detail

Data on land use, as in Tables 3 and 4, are shown at a high scale of aggregation. Therefore, those data hide information with respect to, and changes within, specific categories. Long-term time series of data on land use regarding more specific spatial developments are hardly available. However, some trends can be identified, particularly with regard to the nature of the statistics collected.

In 1950, as far as human activities are concerned, land-use statistics were divided into six categories, i.e. the built-up area, three categories referring to infrastructural land use, parks, and agricultural land. Altogether, these land uses occupied about 84% of the total amount of land (water excluded), of which 76% was agricultural area. In these 1950 statistics, about 16% of the total amount of land concerned natural land use, consisting of five categories of which some were further subdivided into distinct kinds of soils and vegetation. For instance, the category "uncultivated land" was subdivided into eight types, among others dune, moor, and swamp. Due to this elaboration of natural land use, natural diversification was stressed.

Since the early post-war period, new categories of land use were increasingly enlisted, particularly referring to the built-up area. In 1955 "future building area" became a separate group. In 1961 for the first time "residential area" was mentioned, but in fact, this was only a change in name since other kinds of built-up areas were not reported separately. In 1967 a further distinction was made by identifying industrial and harbor area, and residential area was considered separately. In the first part of the 1970s, more attention was paid to land use for waste storage, when dumping grounds and storage for disposed cars became special categories. Also with respect to recreational activities, increasingly more information was taken into account in land-use statistics. In 1967 "recreation accommodation" became a separate category, followed by "sporting facilities" in 1973, and "allotments" in 1974.

Some kinds of land use which were described in detail in 1950 lost their specification during the 1960s and 1970s. In particular, (sub)categories of natural land use were omitted. From 1960, for example, holm and coppice were no longer distinguished from other kinds of forest area, and in the 1970s the distinction between deciduous woods and pine forest was dismissed.

Land-use statistics were thoroughly reassessed in 1977, resulting in a modification of the classification of different kinds of land use. Several categories were added at once, concerning mainly a further specification of the built-up area. New categories introduced in 1977 were, among others, "mixed residential-business area," "culture-supporting facilities," "trade," and "mining." The category of "future building area" was split into "area supplies for industry" and "for other activities," i.e. residential area. Hence, what was called "built-up area" in 1950 consisted of at least ten categories in 1977. Also since 1977, with regard to recreational activities, more detailed information has been released. Some parts of "forest area" have been characterized by their recreational functions, as well as separating "area with day facilities for recreation."

"Agricultural land use" in general, the largest category since 1950, saw hardly any elaboration. Only "greenhouse-agriculture" has been mentioned separately since 1977. New in this inventory was the special treatment of water surfaces. Water reservoirs, such as the North Sea, the IJsselmeer, and the Waddensee, were listed separately. With respect to nature, the trend towards more aggregate, less but larger categories was continued from 1977. Only four groups of natural land use could be distinguished, i.e. forest, wet natural terrain, dry natural terrain, and other area, whereas in 1950, sixteen kinds of natural land use were mentioned.

Until 1989 data were collected by municipalities who indicated changes in land use on charts. This method was very time-consuming. The last inventory made this way took place in 1985. In 1989 the CBS changed its working method fundamentally. By making use of aerial photography, data could be obtained, digitalized on a geographical scale of 500 by 500 meters and, moreover, without the cooperation of municipalities. The 1989 inventory consisted of 33 land-use categories which approximated the 1977 classification. Three groups just recently included were deleted: mixed residential-working area, trade, and forest with recreational function. Only one group was added: water for recreation. However, a comparison within the period 1977-1989 is not fully unambiguous because 1) classification shifts took place within the existing categories--some types of land use were moved from one category to another (already existing)--and 2) national border corrections took place between 1985 and 1989, resulting in an increase of about 200,000 ha in the total amount of land. This increase concerned mainly water areas, such as Eems and the North Sea.

Between 1977 and 1989 residential land use increased by 14%, from 187,000 ha to 213,000 ha. Taking into account the whole period in which residential area is distinguished separately, an increase of 22% has taken place since 1967. The increase in residential area is also reflected in the increase in the share within the total land use. In 1977, 5.5% of the total amount of the land's surface concerned residential area; in 1989 this share was 6.3%. The size of business areas showed an increase of 17% in the period 1977-1989. The share of business area in the total land use increased from 2.1% to 2.4%. Furthermore, a rise of 13% in land use by dumping grounds took place, although its proportion in total land use on the national level can be neglected, amounting to not even 0.1%. Agricultural area decreased by 2% during this period. Traffic area for paved roads grew by 19%, whereas the amount of area occupied by unimproved roads dropped by 24%. The amount of railway terrain remained at almost the same level.

Before finishing this section with some concluding remarks, some comments should be made on these data. In the first place, the choices for methodology and the mode of measurements are products of their time. These choices are made within a context of the prevailing insights and ideas of the people, as well as with regard to technic and skills on which they are dependent. Of course, these choices must be seen as improvements in the quality of data. However, long-term time series based on the same methodology and assessment are, therefore, very rare, in particular when more detailed information is desired. Secondly, mutual shifts in land use are only observable to a certain extent. Shifts in land-use distribution can take place without any obvious changes in data. Over a certain period of time, the total amount of land use for a certain category can remain unchanged, although large exchanges with other categories could have been developed, but would have resulted in a net mutation of zero. Therefore, those--aggregate--data are not sufficient to draw conclusions with respect to the precise exchanges between different categories. Thirdly, data are presented at the national level. Some of the land-use categories mentioned refer to a very small part of the total amount of land, for instance, dumping grounds, i.e. 0.1%. On lower geographical scales of perception, these types of land uses can, however, represent large spatial claims.

To recapitulate, regarding the classification of collected data on land use since 1950, a shift took place from a diversification of natural land use toward land use relating to human activities. The man-made environment has been increasingly emphasized as more and more categories characterizing human intervention have been distinguished. In some cases their shares in the national land-use statistics are even negligibly small. Since the 1970s more attention has been paid to land use concerning spatial-environmental implications of production and consumption activities. This can be observed by the introduction of categories of, for example, dumping grounds and water reservation area. At the same time, the variation of natural land use has lost its significance in data presentation.

The urbanizing of the countryside, as outlined in the second section, is reflected in the increase in residential area. The absolute increase in the built-up area between 1950 and 1989, which includes not only residential area but business area as well, amounted to 86%. Data on the development of residential area in particular are not obtainable over this entire period, but an increase in residential area by 22% could be observed between 1967 and 1989.

The number of households nearly doubled since 1950, a trend that was accompanied by a decrease in the average size of households. From a spatial point of view, this raises questions concerning the dwelling density and dwelling design. First, has the declining household size led to smaller newly-built dwellings and, secondly, has the trend of the increasing number of households had an impact on dwelling density in residential neighborhoods since spatial claims and population density at large are already very high in the Netherlands? The focus will be on these topics in the next section.

HOUSING DEVELOPMENTS

In the previous sections some major trends were traced regarding population and land-use development in the Netherlands. Those trends come together when the spatial implications of housing are taken into consideration. In this section, data will be shown on housing developments with respect to the number of dwellings, the dwelling density, and some characteristics of design. In order to trace some tendencies in housing, annually-compiled data on dwellings seem to be the most sufficient since annual data immediately reflect the prevailing knowledge and insights applied in the housing construction of its time. Newly-built dwellings amount to about 2% of the total housing stock yearly; their overall impact, though, is only observable in the long term. Therefore, longitudinal data on the total housing stock show whether or not, and to what extent, these trends have finally influenced the composition of the total housing stock.

Housing Stock and Household Sector

Since 1950 the housing stock in the Netherlands has increased significantly. The number of dwellings grew from two million in 1950 to six million in 1992. Figure 5 displays both processes, showing a steady growth of both the number of households and the number of dwellings. In the period 1960-1993 (data on the number of households in the years 1951-1959 are missing), the housing stock developed in correspondence with the increase in the number of households. The difference between both curves became smaller.

In Figure 6, the annual addition to both the total number of households and dwellings is shown for the period 1960-1993. During the 1960s, an increase took place with regard to both the housing production and the formation of new households, peaking in the early 1970s. The increment to the dwelling stock in 1973, 160,000 dwellings, was nearly twice as much compared

to 1960. After the oil crisis, building production as well as the increase in the number of households dropped enormously. Between 1979 and 1982, a short but very strong recovery was experienced, followed by a gradual decline during the 1980s. Remarkable is the small increment of households in the early 1990s. During the 1960s and 1970s, more dwellings were constructed than households were formed.

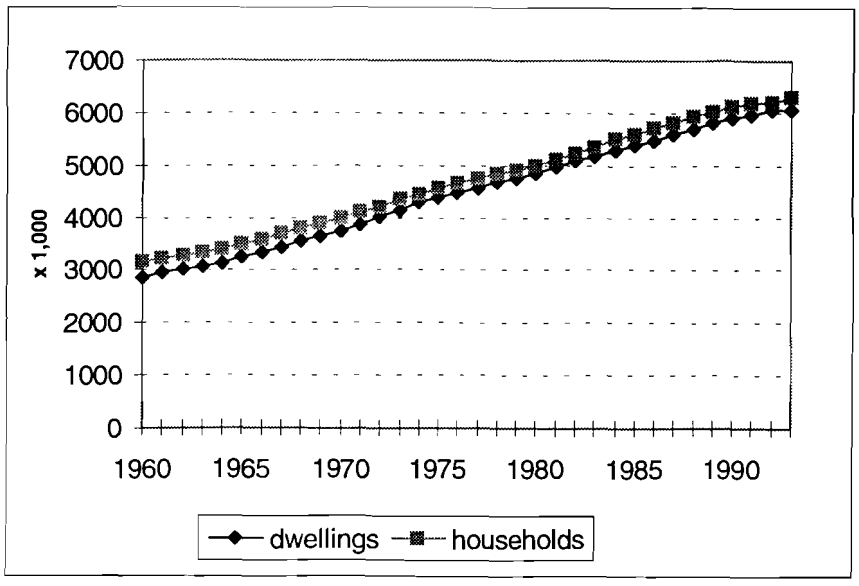

Figure 5. Development of the housing stock and the number of households, 1960-1993 (x 1,000). Source: CBS 1989, 1993.

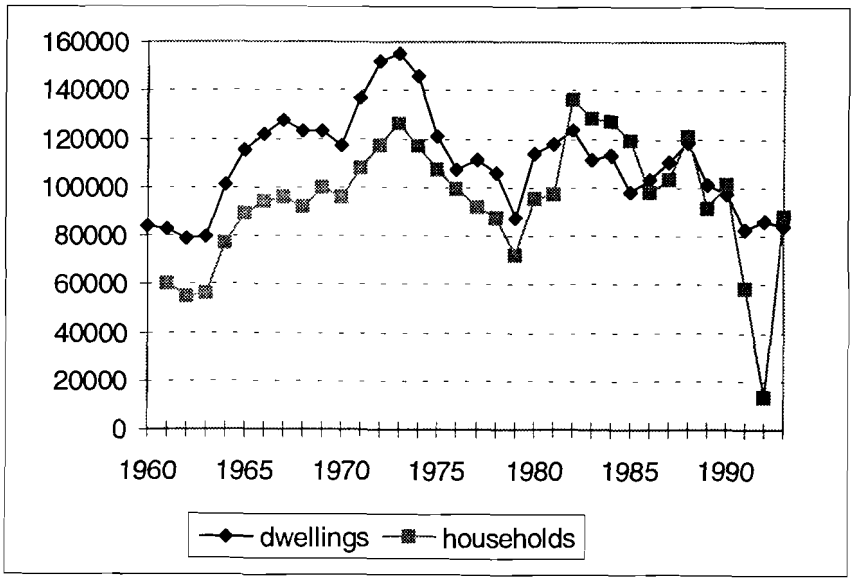

Figure 6. Annual increase in the number of dwellings and the number of households, 1960-1993. Source: CBS 1989, 1993.

The definition of a household, given in the first section of this paper, allows the possibility of having two or more households residing in the same dwelling. Figure 5 shows the occurrence of more households than dwellings throughout time, indicating that some dwellings are occupied by more than one household. However, the difference has become smaller since 1960, when on

average a dwelling was occupied by 1.11 households, compared to 1.03 in 1992. Nowadays, two or more households rarely share the same dwelling. Hence, households can be perceived as dwelling units as well. These findings, extracted from statistical sources, give rise to the conclusion that the size of the housing stock represents the household sector, quantitatively considered, rather well.

Dwelling Density

Densities in residential areas, representing the number of dwellings per ha, vary according to place, location and time. Data on dwelling densities are, therefore, not unambiguous. Land prices are of paramount importance; the higher the land prices, the higher dwelling densities are achieved. According to the 1989 data collection on land use, the most densely-built municipalities were found in Randstad, enclosing the agglomerations of the four largest cities in the Netherlands, i.e. Amsterdam, Rotterdam, The Hague, and Utrecht. Clearly distinguished from these dense residential areas is the so-called Green Heart, located in the center of this Randstad area. Furthermore, high percentages of densely-built residential areas in municipalities can be found in the southeastern part of the country and in the province of North Brabant. In Table 5, some dwelling densities are formulated according to type of neighborhood and time period.

Table 5. Dwelling densities in neighborhood plans according to time period and type of neighborhoods in number of dwellings per ha. Source: Heimans 1966; Brandes 1980; MVRO 1975.

Type of neighborhood	1950s	1960s/1970s	1970s	early 1980s	1980s
Low-rise development	25-55	25-42	25-55	38-57	
Mixed	47-91		13-48		
Expansion areas				30-37	40-50
Intensive land use in existing urban areas				58-185	

Several studies generated data on dwelling densities in several kinds of neighborhoods. First, as far as low-rise neighborhoods are concerned, densities were found for several time periods. In the 1950s, densities varied from 25 to 55 dwellings per ha, with frontages decreasing simultaneously from 9 to 5.5 meters. A study carried out by the Ministry of Physical Planning in 1975 found densities for dwellings built in the late 1960s and early 1970s diverging from 25 to 42 dwelling per ha. Thereafter, dwelling densities varied from 38 to 57 dwellings per ha. Second, in mixed neighborhoods, densities varied in the 1950s from 47 to 91, in the 1970s from 13 to 48, and in the early 1980s from 21 to 40 dwelling per ha. Third, neighborhoods within the large expansion areas for residence showed dwelling densities diverging from 30 to 37 dwellings per ha in the early 1980s to 40-50 dwellings per ha in the late 1980s. Finally, in the urban areas where intensive land use is achieved, extremely high densities were accomplished because of the lack of neighborhood facilities in these small projects. Densities were found varying from 58 to 185 dwellings per ha in the period 1980-1984. In the large cities of Amsterdam, Rotterdam, and The Hague, densities were usually above 100 dwellings per ha. The available data on dwelling density show very broad ranges according to time period and type of neighborhoods. Except for mixed areas, a slight increase in the dwelling density can be observed from the early 1980s.

Some Background Features

Although some characteristics do not directly contribute to the understanding of the spatial implication of housing construction, they clarify some underlying developments at work. It is often assumed that dwellings in multi-story development, i.e. apartments, as well as tenure houses, and dwellings financially supported by the government, are smaller in comparison to single-family dwellings, owner-occupied dwellings, and unsubsidized dwellings, respectively. In Figure 7, percentages are given of the number of dwellings annually completed, according to building type, tenure status, and financing source.

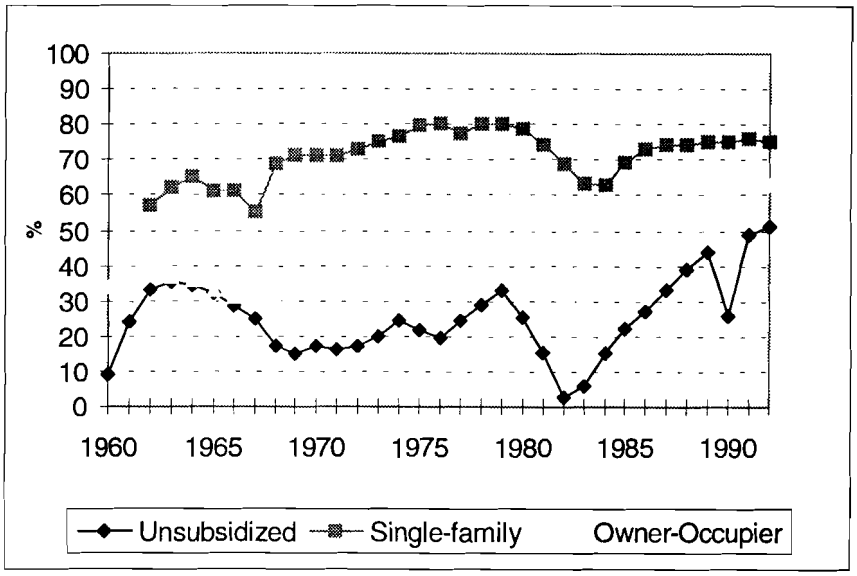

Figure 7. Proportion of unsubsidized dwellings, single-family dwellings, and owner-occupied dwellings of dwellings annually completed, 1960-1992. Source: CBS 1989, 1993.

Because of a distinction in single-family houses and multi-story apartments, longitudinal data series have been available since 1962. A single-family dwelling is referred to as all living quarters concerning the whole building, including free houses and two houses under one roof. Until the end of the 1970s, there was an increasing share of single-family dwellings, from 55% to 80%. In the early 1980s, this percentage dropped suddenly. Recently, a constant level of three out of four newly-built dwellings are single-family dwellings.

Until 1974 between 30% and 40% of the dwellings annually constructed were owner-occupied. This percentage gradually increased to a level of 64% in 1979. By 1982, this percentage was again at a level under 30%. After this short but very strong revival, the proportion of owner-occupied houses rose again in the 1980s.

With regard to the way dwellings have been financed, we can distinguish a general decrease in the proportion of dwellings privately financed during the second half of the 1960s. Afterwards, the share of dwellings annually completed and not subsidized by the government increased from 15% in 1969 to 33% in 1979. In 1982, this percentage fell dramatically to 3%. From then, an increasing percentage of the dwelling stock has been completed without any governmental support--up to half of the total annual addition to the present housing stock.

The current housing stock is the outcome of the practice of housing construction and demolition in previous times. Figure 8 demonstrates the composition of the present housing stock according to type of dwelling and year of completion. In 1990, more than 25% of the housing stock was built before 1945. In this figure we recognize the growing building production after the Second World War (see Figure 6) until the early 1970s. The first half of the 1970s had the largest impact on the current housing stock, its share amounting to 13%. Since then, every five-year period has contributed to about 10% of the present housing stock. The share of apartments within the total number of dwellings completed per time period fluctuated between 27% and 38%, except for the second half of the 1940s and 1970s, when its share did not go over 20%. By 1990, apartments were amounting to 31% of the total housing stock. The current annual addition is 25%, which contributes to a diminishing of the proportion of apartments in the housing stock to the benefit of single-family dwellings. In comparison, the existing urban area accommodates nearly two-thirds of the total housing stock. Of all these dwellings, one-third was constructed before the Second World War. Thus, it is not very surprising that the urban areas at present can be characterized by a relatively old dwelling stock. After-war developments are less suitable to urban areas.

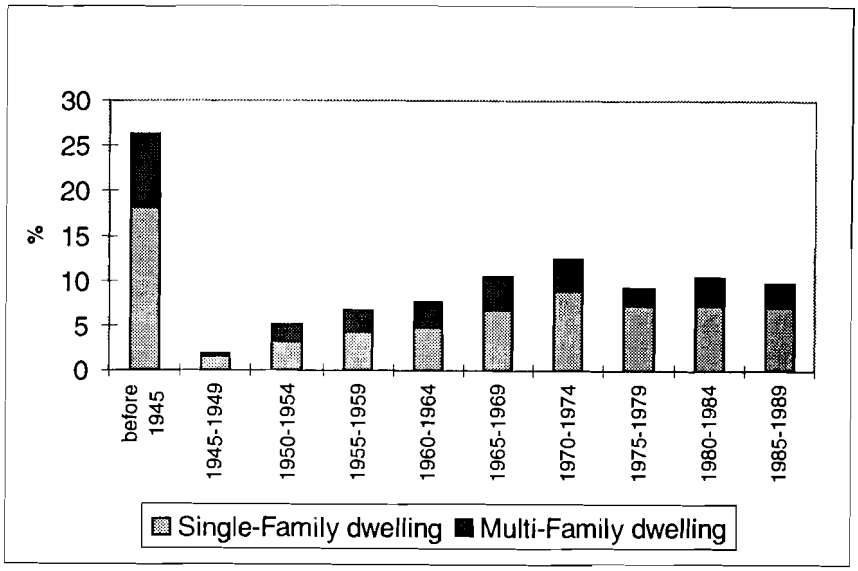

Figure 8. Housing stock according to year of construction and type of dwelling, in percentage of total number of dwellings, 1990. Source: CBS 1993.

Dwelling density appeared to increase in the early 1980s, but the data so far do not give way to a very obvious tendency. Neighborhoods of low-rise development and expansion area, comprising predominantly single-family dwellings, show the lowest number of dwellings per ha. From the mid-1960s we can observe a trend toward increasing rates of single-family dwellings, owner-occupied dwellings, and financially-unsupported dwellings, which are expected to be relatively large in size. Between 1979 and 1982, trends in building practice according to building type and financing were deeply disturbed, but recovered quickly afterwards. The size of the housing stock and the number of households have been converged during the last three decades and, at present, few households share the same dwelling unit. In the second section we saw that changing lifestyles according to living arrangements explained a substantial part of the household formation process. To what degree are household changes and changing lifestyles accompanied by changes in dwelling design?

DWELLING DESIGN

On the spatial implications of dwelling design, different indicators at different scales of analysis can be distinguished. Already mentioned is the dwelling density of neighborhoods and the building type, i.e. single-family dwellings and apartment dwellings. From the perspective of dwellings themselves, the size can be considered with reference to space calculated in square meters and the number of rooms.

Dwelling Surface

Figure 9 shows the trend in the average floor space of newly-built houses according to building type. Unfortunately, data on floor space within dwellings are only available from 1956 to 1982 (CBS 1956-1984). The average number of square meters in newly-built dwellings started to increase in 1961, but whereas apartments peaked in 1967, single-family houses reached their top ten years later. After 1967, a diverging trend emerged between both dwelling types. Regarding single-family dwellings, between 1961 and 1978 the average number of square meters increased from about 90 m^2 to 124 m^2, a growth of 33%. From the end of the 1970s, a decline took place to nearly 100 m^2 in 1982. Concerning apartments, an increase in the total floor space occurred between 1961 and 1967, from 83 m^2 to 103 m^2. Then the floor space decreased gradually until below 80 m^2 in 1982.

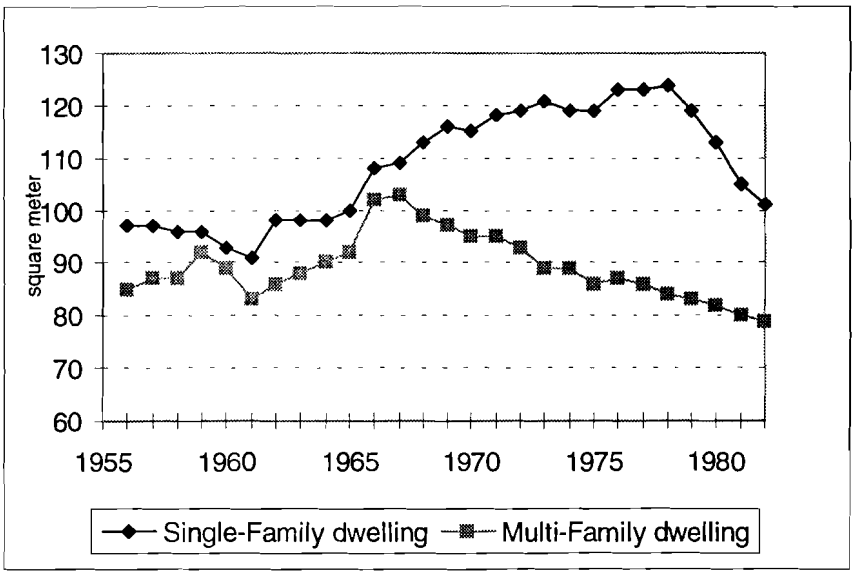

Figure 9. Average floor space in square meters of dwellings annually completed by building type, 1956-1982. Source: CBS 1956-1984.

A similar indicator on dwelling size concerns the measurement of only the space within rooms, including the kitchen, often referred to as the living space. Space of corridors and the so-called wet compartments are not considered. These parameters give insight in the distribution of indoor dwelling space over different kinds of rooms. Figures 10 and 11 show the development of the living space--kitchen, living room, and bedrooms--and the surplus space, respectively.

For single-family dwellings, the average floor space could increase due to both the average living space and surplus space. Both indicators showed comparable developments as the average floor

space. In 1978, 36% or 45 m^2 of the total amount of space concerned extra space besides rooms and kitchen space.

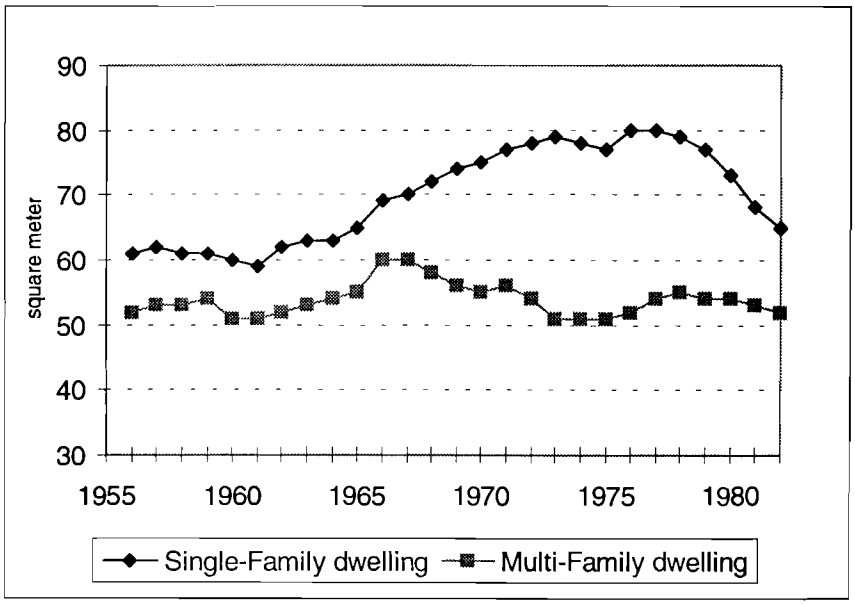

Figure 10. Average living space in square meters for dwellings annually completed by building type, 1956-1962. Source: CBS 1956-1984.

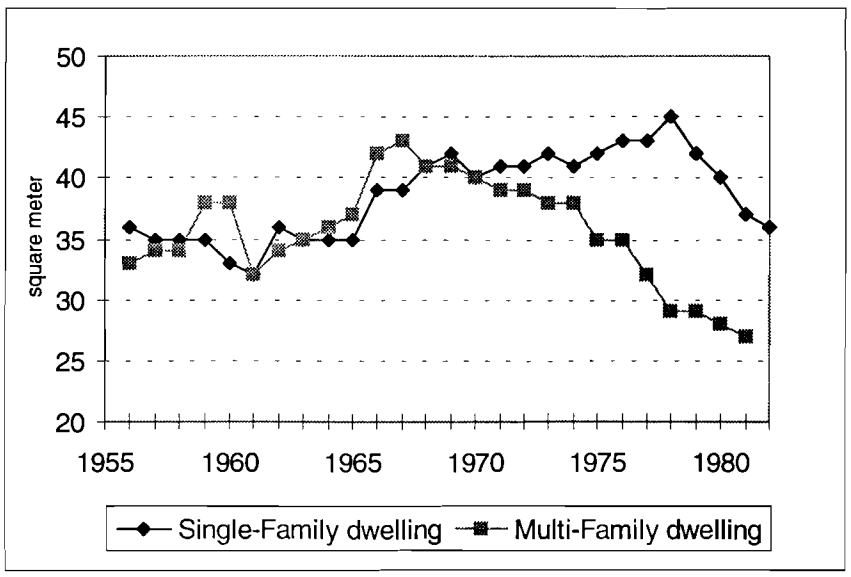

Figure 11. Average surplus space in square meters for dwellings annually completed by building type, 1956-1982. Source: CBS 1956-1984.

The average floor space in completed apartments developed differently. Between 1956 and 1982 the average living space fluctuated between 50 m^2 and 60 m^2. The amount of surplus space in apartments diminished from 43 m^2 in 1967 to 27 m^2 in 1981. Therefore, the decline in the average floor space in apartments after 1967 must be attributed to a reduction of surplus space

in apartments. An apartment built in 1967 had about 40% more surplus space on average than one built in 1982. Furthermore, compared to a multi-family dwelling, a single-family dwelling completed in 1982 claimed about 10 m^2 more surplus space.

For dwellings annually completed, sizes for single-family dwellings and multi-family dwellings developed closely and correspondingly until the late 1960s. Since then, up to 1982, size differences between single-family dwellings and multi-family dwellings have become greater, mainly due to more space for wet compartments, corridors, etc., in single-family dwellings.

Single-family dwellings are indeed significantly larger than multi-family dwellings in terms of indoor space. From the 1960s until the late 1970s, the size of single-family dwellings became increasingly larger, as did their share in the total building production. Hence, we can conclude that regarding indoor space availability, a growing use of space took place in this period. Because of a lack of data on dwelling surface over the last ten years, we cannot extend our concluding findings to the last ten years. Moreover, information on the current housing stock according to dwelling surface was not found.

Number of Rooms

Trends in dwelling size can also be indicated by referring to the number of rooms in dwellings according to different time periods. A large time-series is obtainable from 1956 through 1993. This data set was recomputed since kitchens were only included up to 1976. After 1975 the so-called "open kitchen" construction in dwellings became widespread, and kitchens were no longer considered separate rooms. Figure 12 shows the distribution of the number of dwellings added annually, according to the number of rooms (excluding the kitchen).

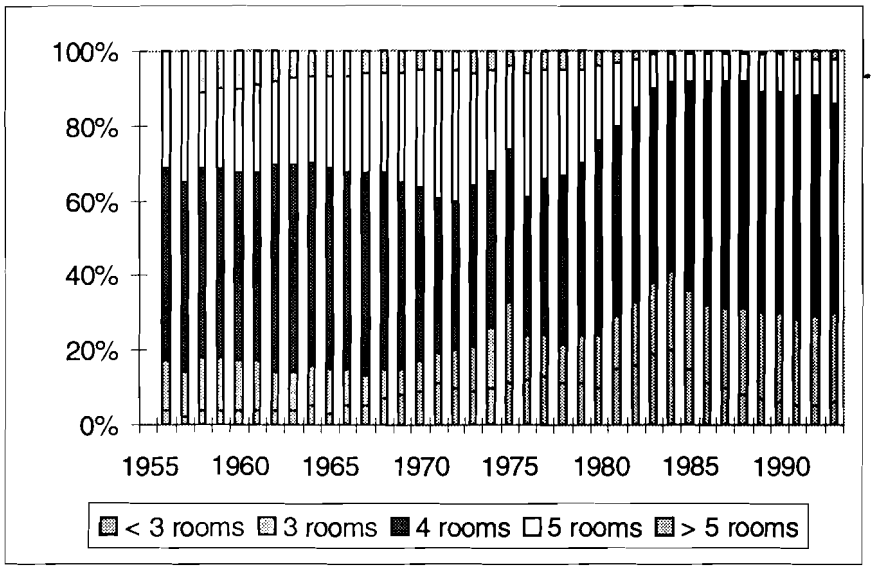

Figure 12. Dwellings annually completed by number of rooms, percentage of total 1956-1993. Source: CBS 1989, 1993.

Until the end of the 1960s, the distribution of dwellings according to the number of rooms did not change much. Then the proportion of dwellings consisting of one or two rooms increased, achieving a top level of 20% of the total number of dwellings in 1984. The building of so-called HAT-apartments contributed largely to this growth. These HAT-apartments had to cover the

enormous demand for accommodation. Since they were particularly designed for one-person households, these apartments were rather small. Since 1984, the share of small houses within the total number declined gradually to 5% by 1993. The proportion of dwellings containing three rooms rose slowly from the late 1960s, achieving a level of 24% by 1993. The four-room dwelling is the most frequently-occurring category in the newly-built houses during the past four decades. In general, more than 50% of all dwellings were built with four rooms. Dwellings with five or more rooms became less common. In the mid-1950s, more than 30% of the dwellings were provided with five or more rooms; in the early 1990s, this figure dropped to about 10%. Between 1982 and 1989, the proportion was clearly below 10%.

To what extent has the composition of the housing stock been adjusted by the trends observed in the last four decades? According to CBS data, four-room apartments won a significant proportion in the housing stock, from 24% in 1947 to 38% in 1989. This increase took place at the expense of the small (one or two room) apartment. Their share represented 21% in 1947 and 12% in 1989. In 1989, about 33% of the entire dwelling stock counted five or more rooms, compared to 36% in 1947. On average, the number of rooms per dwelling increased from 4.78 in 1947 to 5.04 in 1985. Therefore, we can conclude that housing trends concerning the number of rooms have only slowly contributed to a change in the housing stock. Whereas dwellings have become larger, the average number of persons per household has declined from about 4 persons in 1950 to 2.54 persons in 1985. The number of persons per room has decreased consequentially from 0.9 to 0.5 on average. Although data on the distribution of households according to household size and dwelling size are not available, data presented in this paper clearly give rise to the conclusion that people nowadays have more dwelling space per person than 40 years ago.

SPATIAL IMPLICATIONS OF HOUSEHOLD CHANGE

This paper has indicated some major trends regarding developments in the population, land use, and housing in the Netherlands since 1950. Within the context of environmental quality, population growth and the increasing need and desire for space in an already densely-populated country, it must be stressed that high demands are placed on physical planners.

Land-use changes show the spatial expression of these societal processes. With respect to the collected data on land use, we found a shift in the classification from an orientation on specific natural land use toward land use referring to different kinds of human activities. More and more categories characterizing human intervention have been distinguished, although their shares in total land use were sometimes negligibly small. With respect to natural land use, many specifications were abandoned.

The emphasis on the man-made environment has been accompanied by shifts in land use itself. Between 1950 and 1989, the increase in the total built-up area, including not only residential but business areas as well, amounted to 86%. The change in the outlook of the country is also suggested by the urbanizing trend of the countryside. In 1989, 63% of the country's surface was residential area. Within residential neighborhoods the number of dwellings is the lowest for low-rise development, consisting of single-family dwellings, which form the largest part of the building practice. Data on dwelling density is not sufficient to draw conclusions about space use of residential area throughout time. However, since the early 1980s, a slight increase in the number of dwellings per ha is observed; this points to a larger awareness and reticence with regard to the scarcity of space in the Netherlands.

Since the Second World War, the size of the population has risen considerably, but this growth contributed only one-third of the enormous increase (96%) of the number of households

observed between 1960 and 1992. Besides population growth, the establishment of new households can be attributed to the changing age structure of the Dutch population and the increase in the number of people heading a household. The growing number of people in age groups likely to form households and the change in lifestyles with regard to living arrangements have led to the formation of households in addition to population increase. This trend is also reflected in the decrease in the average household size and the shifts in the composition of the household sector according to size toward high proportions of one- and two-person households. In 1992 two-thirds of all households consisted of one or two persons.

The housing stock has developed in close connection with the increase in the number of households. Until the early 1980s more dwellings were annually added to the dwelling stock than new households were added to the total number of households. In 1960, a dwelling was occupied by 1.11 households on average, compared to 1.03 in 1992. Thus, nowadays, households defined as housekeeping units more or less coincide with dwelling units.

Whereas households have become smaller on average, newly-built dwellings have not become more compact. On the contrary, the single-family dwelling has been most dominant in building practice throughout time, up to 75% of the annually-built dwellings. As far as single-family dwellings are concerned, until the late 1970s, the average floor space within dwellings annually completed has been enlarged. The increase in space for wet compartments and other surplus space within the house contributed largely to the increase in indoor space. Unfortunately, for the period after 1982, data were not found, and there were no data found on housing stock by floor space. Therefore, we cannot extend our conclusion to the current practice. Furthermore, the average number of rooms in a dwelling annually completed has increased since 1950, resulting in a gradual adjustment of the dwelling stock.

The findings of this quantitative approach to the issue of environmental quality suggest an increase in space consumption for housing purposes until the late 1970s, and that since the 1980s, more attention has been paid to reducing space consumption for housing purposes as the dwelling density in plans of the early 1980s showed a slight increase compared to the preceding period. Our findings suggest that over the last few decades, on average, the availability of indoor space has risen per newly-built dwelling and, because of the decreasing household size, per person in particular. Nowadays, people have more indoor space at their disposal. Apparently, the availability of space inside the home has increasingly gained attention, pointing at a mutation of the importance and standards concerning the home in people's lives.

References

Brandes, E.E.A. 1980. *Stedebouwkundige inrichting nieuwbouwwijken* (Urban Development in New Housing Estates). The Haag: Rijksplanologische Dienst.

CBS. 1956-1984. *Maandstatistiek Bouwnijverheid* (Monthly Statistics of the Building Industry). The Hague: Central Bureau of Statistics.

CBS. 1989. *90 Years of Statistics.* The Hague: Central Bureau of Statistics.

CBS. 1993. *Statistical Yearbook.* The Hague: Central Bureau of Statistics.

CBS. 1994. *Bodemstatistiek 1989* (Soil Statistics 1989). The Hague: Central Bureau of Statistics.

Heimans, A. 1966. *Bebouwingsdichtheid en grondgebruik voor de woningbouw in stadsuitbreidingen* (Building Density and Land Use in Newly-Built Dwellings in the City Expansion Area). The Hague.

MVRO. 1975. *Stedebouwkundige kwaliteiten en grondgebruik* (Quality of Urban Development and Land Use). The Hague: Ministry for Housing and Physical Planning.

MVROM. 1991. *Vierde Nota Ruimtelijnke Ordening Extra* (Fourth Policy Document on Physical Planning Extra). The Hague: Ministry for Housing, Physical Planning and Environmental Management.

UN. 1987. *Demographic Yearbook.* St/ESA/Ser.R/17. New York: United Nations, Statistical Office, DIESA.