Urban-Industrial restructuring and the built environment

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The present paper has a research programme concerning industrial areas in Metropolitan Copenhagen (the "SKEA" project, StorKøbenhavnske ErhvervsArealer) as its starting point. Within the framework of the paper, a brief description of the relationship between urban renewal and social development is given, and a method to estimate the potential possibilities of redevelopment, using the relationship between building value and land value, is presented.

Keywords: *Urban geography, Land-use, Planning.*

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The case of Copenhagen

The relationship between the built environment and social development is very pronounced within our big cities, and Copenhagen is no exception. Fig. 1 provides a brief outline of Greater Copenhagen, its built-up areas and urban structure. The CBD area is the original medieval and renaissance town, originally surrounded and restricted by the fortification (area marked 1). After the disappearance of the fortifications in 1852, a rapid development of high density mixed areas, containing working class housing and manufacturing industry took place; a development, primarily within the limits of what could be called a "pedestrian city" (area marked 2). The introduction of the first really efficient collective transport took place at the turn of the century. At that time, built-up areas had reached a line approximately 5 km from the city center, all within the boundaries of the "tram city" (area marked 3), where a number of large industrial areas had been established. From 1938 physical planning of industrial areas took place on the basis of The Urban Planning Act of 1938. After the second world war, growth changed from a massive urban structure to a planned suburban growth. A growth along the (since 1934) developing commuter railways, according to the "Finger plan" and its successors (area marked 4): the "commuter city".

The rapidly increasing number of private cars in the late 50s and the early 60s tended to dissolve the former finger-structure of the city, and the ideas of the "Regional Plan, 1973", reflect this. It proposes a multi-center structure, with future growth, both housing and industry, to take place along corridors of transportation and other infrastructure, far away from the existing built-up areas.

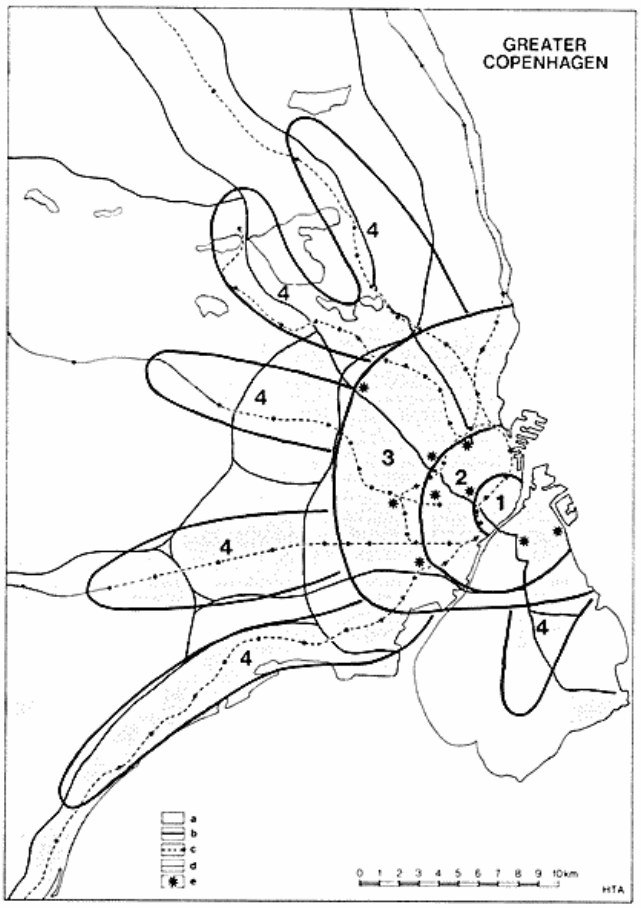


Fig. 1. Structural outline of the Greater Copenhagen region, a: Built-up areas, b: Primary roads, c: Commuting railways, d: Regional railways, e: Areas investigated within a project on industrial areas of Metropolitan Copenhagen (Andersen & Engelstoft 1987a).

Two distinctly different periods of functional and geographical changes may be identified within Greater Copenhagen in the post-war period. The first took place in the 1950s and 1960s. It was a period characterized by economic expansion, a large growth within consumption, an increasing public sector and an increase in the export orientation of manufacturing industries. The city was marked by increasing geographical and functional differentiation and demographic and social segregation, amplified by a simultaneous relocalization of the population to the suburbs (suburbanization). After a period of recession in the late 70s Copenhagen is again experiencing a period of rapid restructuring.

While the structural changes of the late 50s and the 60s, were dominated by consumption and public services, the structural changes of the 80s, have been concentrated within production and the private sector. It has been a restructuring involving new demands for qualifications

within the labour force, and has consequently led to considerable structural unemployment. During the later period employment within manufacturing industry has declined rapidly, and at the same time the number of jobs within services has been growing (fig. 2). The loss of jobs within manufacturing industry has primarily taken place in the parts of the city built before this century (area 2), even though job losses within manufacturing are found all over the region.

Old industrial areas, established at the turn of the century are characterized by their high density and polluting industries, an inexpedient mixture of housing and manufacturing, insufficient infrastructure and to some extent empty and deteriorating buildings. These areas constitute "industrial slums" and are an important spatial reserve for urban development.

Obsolescence and renewal of the built environment

Obsolescence of the old industrial areas is partly physical and partly economic (Andersen & Engelstoft 1987b). It is related to a geographical – as well as a temporal perspective on the formation of capital. Investments in individual areas have been constrained within specific periods and areas, and time-related phenomena have been the result. Each individual area is marked by the rationality of a certain epoch. Because of a misfit between, on one hand the longevity and "fixity" (immobility and immutability) of the built environment and on the other, the rapid restructuring of production, two kinds of decay are found. Contrary to physical (or absolute) decay, economic (or relative) decay is not directly observable. Sometimes of course, it is quite obvious that a certain economic activity is economically "inefficient". However, a study of the economic relations between the potential possibilities of a given site and the value of the actual buildings on it should give a more precise answer.

To implement the above concepts, of physical and economic decay within the built environment, in an analysis of possible future functional changes, it is necessary to understand the Danish property taxation system (Andersen 1987). Taxation of property involves land (site) taxation as well as property taxation (i.e. a taxation of value of site and buildings), and is based on valuation within 1,922 districts (vurderings-distrikter). Each year valuation is automatically computed as a "cash value", based on actual sales prices within the area in question.

At the time of the valuation, it is, for each individual property, attempted to estimate the capitalized value of the land (grundværdi) as well as the total property i.e. including the buildings (ejendomsværdi). The difference between the two, termed the differential value (forskelsværdi), is thus an expression of the value of the buildings presently situated on the land in question.

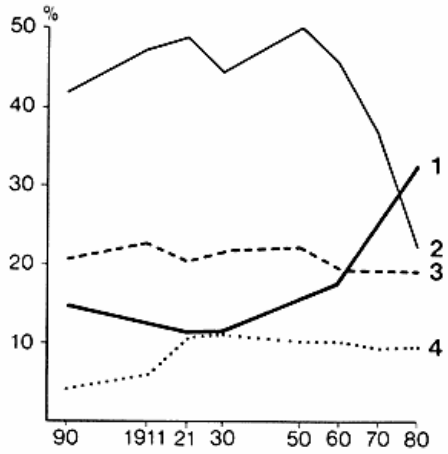


Fig. 2. Distribution of employment in Copenhagen 1890-1980. 1: Services, 2: Manufacturing, 3: Retail & wholesale, 4: Transport & communication (Andersen 1986).

The property value is estimated on the basis of assessed sales prices on an open market at the time of the valuation. The property value thus seeks to account for all conditions relevant not to the present, but to a probable future use of the property. This, of course, includes legal restrictions, including possible planning decisions. If, for instance, for obvious economic reasons, it would be expected that a future owner would parcel out the property into several individual properties, this will influence the sale price and hence the property value. Similar principles appear in the valuation of the land itself, however, with the important modification that the site value for non-residential purposes (excl. agriculture and forestry), depends on the actual type of use (e.g. offices, warehouses or manufacturing). Site value is consequently assessed as the probable "cash" price of the land on an open market, even though the economical best use might be demolition of the present buildings, this is not taken into account at the time of the valuation.

As a consequence of these principles for the valuation of land (site) and property, the changing relationship over time between the differential value and the site value should provide the answer to the question of economic decay within a specific property. If the relationship is high, it might be assumed that the buildings on the site are able to pay the value of the property i.e. no economic decay is found, on the other hand, if the relationship is weak, an inefficient use is present and economic decay is likely. The relationship may even be negative, a fact which is often found when buildings are totally worn out in relation to their original purpose (but not necessarily out of use)!

Industrial areas in Metropolitan Copenhagen

Preparing a new regional plan for the metropolitan re-

	Taxable land	Floor space	Floor space				
	total	total	total		housing		no use
	m²	m²	m²	units	m²	units	m²
Amager N	215.829	352.723	348.819	4479	229.906	4293	3.904
Amager E	586.161	336.849	301.659	226	1.932	21	35.190

Table 1. Land use.

gion, the Greater Copenhagen Council (Hovedstadsrådet) has been very interested in the potential possibilities for redevelopment within existing built-up areas, particularly the old industrial areas. In this connection it is important to stress that Danish planning legislation primarily is designed to set up a framework for private development (i.e. a zoning), and as such has no power to implement the plans in detail. It is thus possible to claim an area for a certain type of economic activity. However, existing activities will usually remain in existence until private development within the general social and economic development causes a change of activity, i.e. within the existing planning framework.

In collaboration between the Greater Copenhagen Council and the Geographical Institute a study has been designed to analyze the problems more thoroughly. The primary aim of the project is to construct selected scenarios for future industrial development within existing built-up areas (Andersen & Engelstoft 1987).

Nine areas within the central Copenhagen region, have been chosen for closer examination (the location of the selected areas appears in fig. 1). Approximately 4.5 mio. m^2 of taxable land (close to 2000 properties) containing 4.4 mio m^2 floor space, has been investigated. The average plot ratio of the areas is 98 %, varying between 160-200 % (in the old mixed areas from the end of the former century), to 50 % (in an industrial area from the 30s.) Present value of the ratio between buildings and property (%) in the old industrial areas is often as low as 30-50 % (in one of the areas 33 % of the properties have a value ratio below 0 %). The newer area typically has value ratios of 60-90 %, indicating a comparatively efficient land use.

The unit of the study is the individual property. Firstly, a land use study has been carried out in order to assess the present use. Secondly, a study of site values, property values and actual sales prices (according to information obtained in public registers) was made (Engelstoft 1987). Values for individual buildings, as well as their value as a percentage of the total property value have been computed. This percentage is used to select properties, potentially "ripe" for redevelopment, as it is assumed that it is the buildings themselves (the fixed capital) that determine the rate of return on the total property. If the building value of a certain property is low compared to the value of the total property, the possibilities of obtaining a satisfactory rate of return might consequently be improved by redevelopment.

As a result of a computation of the above variables: present land use and potential redevelopments, it is possible to estimate job losses as well as gains, using different assumptions, within the areas investigated.

In the following, two of the nine investigated areas of the SKEA-project, will be used to exemplify a method of predicting future potential (industrial) spaciousness within old urban areas.

The areas of Amager North and Amager East

A few introductory remarks of the two areas: Amager N and Amager E: Amager N is a typical mixed area from the turn of the century (fig 3.). Originally the area contained a number of firms within manufacturing industry; most of them have now disappeared and as such the area has undergone a phase of transformation within the last 10-15 years. Contrary to Amager N, Amager E is a proper old industrial area, dominated by manufacturing, developed within the first 20 years of the century, and at present the

	retail-sales	auto-service	indus.-service	institu-tions	public services	whole-sale	manuf.-industry	handi-crafts	con-struc.
	units	units	units	units	units	units	units	units	units
Amager N	90	10	6	5	17	3	1	7	5
Amager E	13	25	18	7	8	29	67	11	12

Table 2. The distribution of selected economic activities.

area is in transition between stagnation and redevelopment.

Tables 1 and 2 summarize some important figures related to the two areas. While the total floor space within the two areas is approximately the same, the total area (i.e. taxable land) of Amager E is almost twice the size of that of Amager N. Amager N is thus a dense area with a plot ratio exceeding that of Amager E. The latter may thus be described as an open area containing several large individual buildings (cf. fig. 3). This difference mirrors itself in the amount of multi storey housing within the two areas. Within Amager N more than 65 % of the floor space is classified as housing, while the same figure for Amager E only is 0.5 %. Furthermore the differences between the two areas are stressed by the fact that more than 10 % of the floor space of Amager E are out of use (the corresponding figure for Amager N is only 1 %) a typical sign of ongoing transformation (Engelstoft 1984).

A further illustration of the differences between the two areas is seen in table 2. As mentioned earlier, Amager N is dominated by housing. Being predominately a housing area, is reflected in the other types of economic activities present in the area: economic activities primarily within retail sales and public services i.e. consumer related activities. Contrary to this, Amager E is totally dominated by manufacturing industry, wholesale and activities related hereto, all space demanding economic activities. The maps (fig. 4 & 5) show the location of some selected activities in the two areas.

As mentioned in the preceding paragraph a key factor in the computations of future development potentials, is a low building value in relation to property value. The maps (fig. 6) are demonstrating this relationship. Furthermore relating these plots, to existing planning constraints, makes it obvious that Amager E is a typical area, potentially ripe for industrial redevelopment by private investors. In the following, a method to estimate the magnitude of a possible redevelopment is demonstrated.

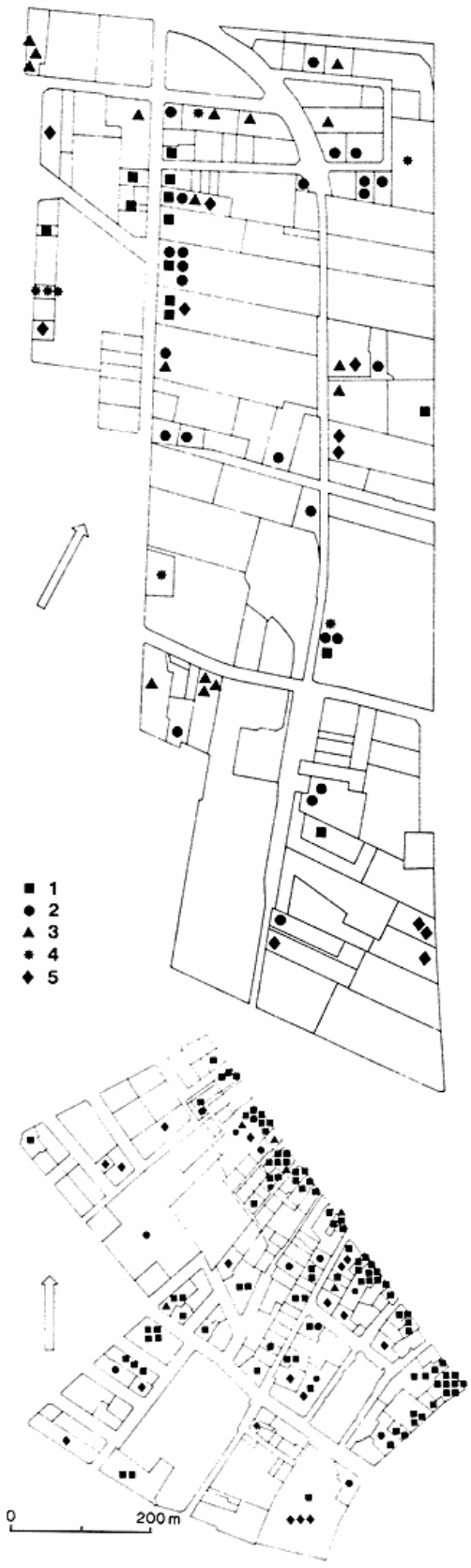
Estimates of industrial redevelopment

Three factors have to be considered. First, the magnitude of the expected demolitions of economically unsound buildings and succeeding redevelopments. Secondly, concerning possible further spaciousness (condensation) within the existing and economically sound buildings. Toge-

◀ Fig. 3. The areas of Amager East and North. (Stadskonduktøren 1978).

Fig. 4. Selected "consumer related" economic activities. 1: Retail sales, 2: Auto service, 3: Industrial service, 4: Institutions, 5: Public administration. ▶

Fig. 5. Selected "industry related" economic activities. 1: Wholesale, 2: Manufacturing industry, 3: Handicrafts, 4: Construction. ▶▶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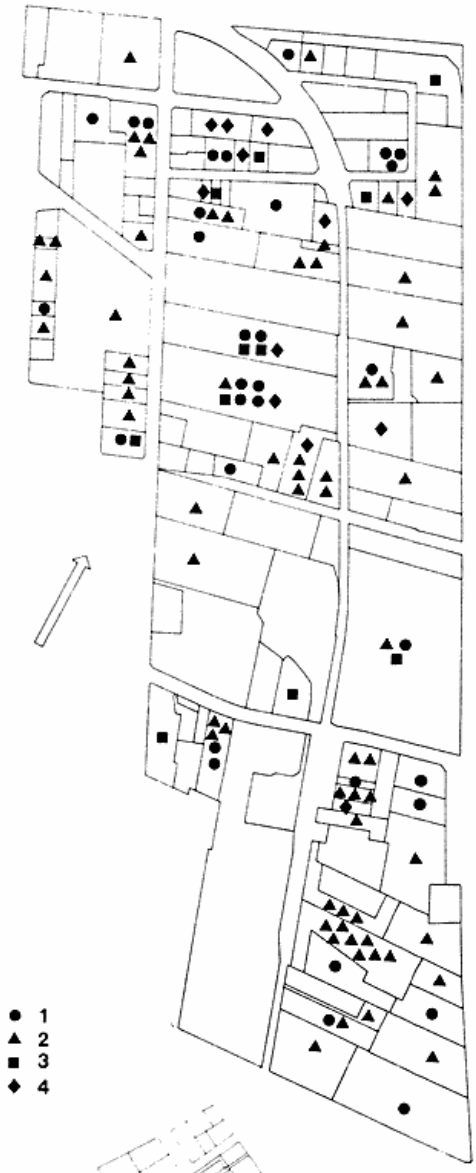
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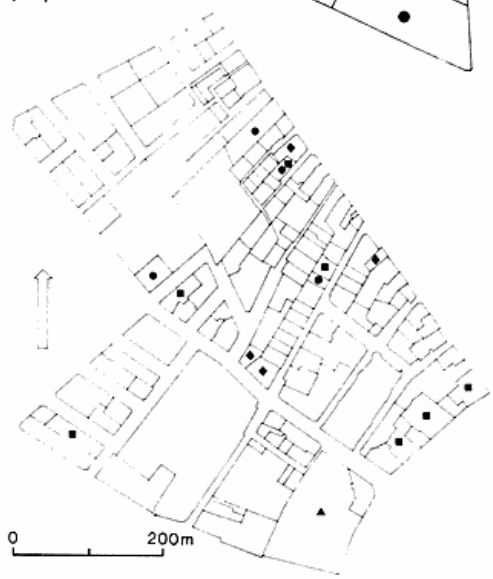
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Area	Scenario	Redevelopment (m²)	Condensation (m²)	Spaciousness (m²)
Amager N	1	-	5.941	5.941
	2	-	5.941	5.941
	3	-	5.941	5.941
	4	14.383	1.286	15.669
Amager E	1	170.103	243.169	413.271
	2	198.105	221.143	419.248
	3	208.541	212.804	421.345
	4	241.368	187.252	428.620

Table 3. Four scenarios for future industrial redevelopment.

	1970	1981	1970-1981
	m²/empl.	m²/empl.	pct.
Manifacturing	38	57	+50
Wholesale	230	260	+13
Office	20	27	+35
Retail sale	29	37	+28
Institutions	64	60	- 7
All types	38	46	+21

Table 4. The development within spatial demand (m^2/employee) for different activities (Hovedstadsrådet 1981).

ther these two factors constitute the potential industrial spaciousness of the given area. Thirdly, the existing planning framework including the maximum permissable plot ratios.

Four different scenarios have been set up.

Scenario 1: Given the existing planning constraints, all buildings, whose value is less than 0 % of the property value, are expected to be demolished and replaced by new buildings, according to maximum allowable plot ratio. All other properties, whose plot ratio is less than maximum, are expected to be further developed in order to ensure the best economic use of the property.

Scenario 2: As scenario 1 except all buildings with a value of less than 10 % of the total property are expected to be replaced.

Scenario 3: As scenario 1 except all buildings with a value of less than 20 % of the total property are expected to be replaced.

Scenario 4: As scenario 1 except all buildings with a value of less than 40 % of the total property are expected to be replaced.

Results of the computations on the four scenarios are seen in table 3.

Three points should be made. Firstly, it is remarkable to see, that the total spaciousness within first three of the four scenarios only varies slightly. This, of course, is due to the condensation factor and most obvious in the low density area of Amager E. Secondly, and as might be expected, the spaciousness of Amager E by far exceeds that of the high density area of Amager N. Thirdly, the consequences of a redevelopment, in terms of jobs, are highly dependent on the expected type of redevelopment.

This latter question, concerning type of jobs, is of great importance, as the spatial requirements between different activities vary highly. The average spatial demands (1970-1981) for different activities in Copenhagen (Hovedstasdsrådet 1981) are described in table 4.

In order to demonstrate the consequences of a growth in industrial spaciousness (cf. table 3) under different assumptions of changing industrial structure (cf. fig. 2), three possible combinations of future industrial structure have been computed. As an example table 5 illustrates these for the area of Amager E scenario 3.

The three combinations of employment, of which combination 1 and 2 are without empirical evidence whereas combination 3 is based on existing (1986) construction applications (Hovedstadsrådet 1987), are described below:

Scenario	loss	gain			total		
		comb.1	comb.2	comb.3	comb.1	comb.2	comb.3
3	491	5.995	8.738	7.048	5.504	8.247	6.557

Table 5. Employment growth 1986-95, Amager E.

Combination 1: 70 % office activities (28 m^2/employee) and 30 % manufacturing, wholesale and other industry (83 m^2/employee).
Combination 2: 90 % office activities (28 m^2/employee) and 10 % manufacturing, wholesale and other industry (83 m^2/employee).
Combination 3: 56 % office activities (28 m^2/employee) and 44 % manufacturing, wholesale and other industry (83 m^2/employee).
Furthermore an annual standard improvement (m^2/employee) of 0.8 % has been assumed.

DISCUSSION

The social development has changed since the early 80s. Whereas the public sector and consumption were "leading" sectors in most of the postwar period, it is now private enterprise and production that are in focus, guiding the structural development. Old obsolescent industrial areas have thus become of interest to private developers as a centrally located spatial reserve of development.

The purpose of the "SKEA" project consequently has been to design a method to estimate the possible size of this development, using social (planning), economic (property and building values) and physical (plot ratio) factors.

Assuming that the results represent "types" of areas within the inner city (cf. fig. 1 area 2), an expected growth of 65-70,000 jobs (excluding the CBD) will take place transforming old industrial areas. This will create huge traffic problems as the growth will take place far from existing public transportation systems.

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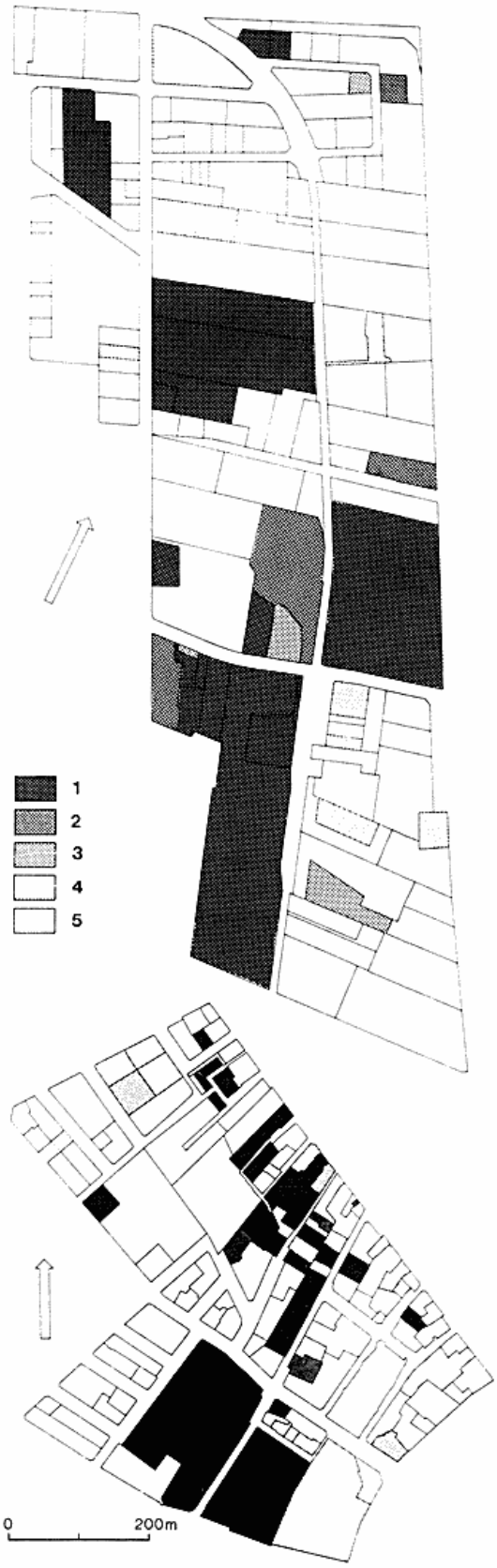

Fig. 6. Building value as a percentage of property value. 1: <0%, 2: 0-10 %, 3: 10-20 %, 4: 20-40 %, 5: > 40 %.

Combination 1: 70 % office activities (28 m^2/employee) and 30 % manufacturing, wholesale and other industry (83 m^2/employee).
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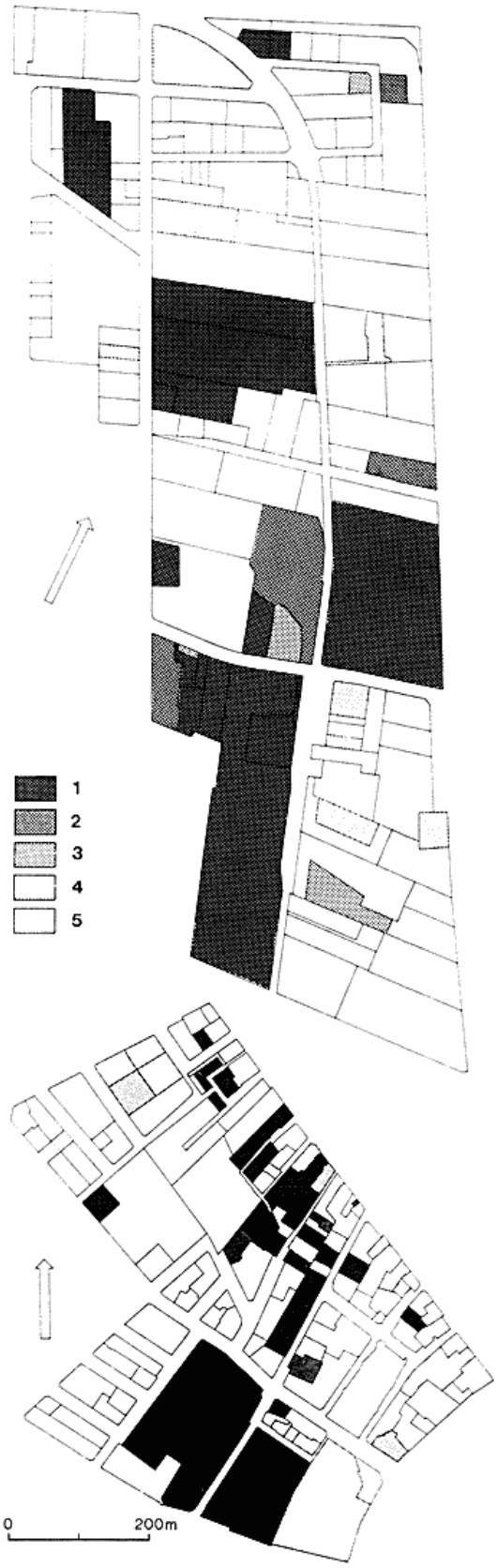

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