Towards a Theory of Sustainability and Urban Quality
A New Method for Typological Urban Classification

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Planners and politicians are searching for action plans to increase the environmental quality and sustainability in the large cities. But the search is hampered by the lack of theory. The confusion over the issues of quality and sustainability stems from the fact that theories are formulated on a general and abstract level. What is needed is a theoretical framework to analyse the empirical observations on the existing urban environments. We need a systematic descriptive classification of the urban structure on the microlevel.

The paper outlines a methodology of classification of Swedish urban types. The classification is based on parameters that can be obtained from central data bases. The registration of objects will be implemented in a Geographical Information System (GIS). The result is (a) reliable descriptions (maps, data bases) of the existing urban structure in a given city and, (b) in the long term, new knowledge of the relationship between urban form and environmental capacity.

Keywords: GIS-system, sustainability index, urban density, urban quality, typology.

INTRODUCTION — THE LACK OF THEORY

Urban planning is in a crisis. Planners and politicians all over the world are aware of the urgent need for action plans to increase the environmental quality and sustainability in the large cities. The campaign for improved urban affects a broad field of action: influencing the attitudes and lifestyles of the inhabitants as well as developing alternative transportation systems, water processing systems, waste processing systems, as well as changing the urban structure, the land use pattern etc. It is clearly a formidable task, both in terms of time and money needed. But the greatest obstacle is probably the lack of an adequate theory.

Everybody will agree on the need to plan for the sustainable city. (See, for example, Green Paper on the Urban Environment, 1990). What would the ideal sustainable city look like? There is no definite answer today. On one hand, we have the proponents of the compact city. On the other, we have the proponents of the green city. The first implies a strategy of concentration and increasing urban density (in order to minimize the need for transportation). The second implies a strategy of deconcentration and spreading out, using the unbuilt land for local water infiltration and cultivation. So we are confronted with two strategies — seemingly irreconcilable — for the sustainable city. This may be called “the density paradox”.

The issue of urban quality and urban form is no less confused. The leading theorists of urban planning and design during the twentieth century (for example, Le Corbusier, Raymond Unwin, Lewis Mumford, Jane Jacobs, Kevin Lynch and Christopher Alexander) argue in favour of different ideal solutions: high-density developments or low or medium density developments. They argue for different urban models: some advocate high-rise buildings and large open spaces, others argue for traditional grid-iron plans, streets and compact blocks, still others argue for small-scale garden suburbs. There is evidently no consensus on the question of urban quality and urban form.

To sum up: there is a great confusion in the fields of quality and sustainability in urban planning. Much of this confusion stems from the fact that the theories are formulated on a very general and abstract level. We need empirical facts, observations. Above all, we need a theoretical framework for these empirical observations. We need a systematic descriptive classification of the urban structure on the microlevel in order to be able to process the ac-
cumulated information on existing urban environments.

**Sustainability and the density paradox**

Let us first look closer at the density paradox; the opposing strategies of the compact city and the green city. What are the theories behind these strategies?

The obvious merit of a compact high-density city would be the short distances from the centre to the periphery. Short distances would (at least in theory) mean less transport of goods and people and this in turn would mean a great saving in terms of time and energy, as well as less pollution from car traffic.

The theory of the green city is the following: Many of the environmental problems of today are caused by the lack of local recycling. The solid and fluid waste from the cities should not be flushed into the sea, burnt or dumped on a city waste dump. It should rather be recycled; in particular the organic waste ought to be brought back to fertile soil. This means we must provide more land, unbuilt land, for local infiltration and recycling of waste water and also for planting and cultivating. The resulting strategy seems to point towards a less dense, more spread out, city structure than today.

Both theories relate to general theories, related to abstract models of cities. The compact city or the green city are both stereotypes, they don’t exist. In reality, cities are not homogeneous. The urban density is not uniform. The modern city is an aggregate of small fragments, districts, blocks which differ from each other, in terms of urban density, in types of buildings, urban quality etc. We can identify some recurrent types of developments: the urban core, early twentieth century villa suburbs, the postwar large scale housing estates, the industrial enclaves, the urban blocks, or groups of buildings.

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**TOWARDS A THEORY OF TYPOLOGICAL CLASSIFICATION**

This project proposes that a new micro-level typological classification is the sort of theoretical framework that we need. The project is about how to develop such a typology. Before we move on to the practical methodology, we ought to comment on the meaning of typology.

Typology is by no means a novelty as such; it has been a part of the common practice in architectural analysis and design for a long time. However, we have relied almost entirely on building typologies and these typologies have been based on the functional content (see for example the works of architectural historian Nikolaus Pevsner). According to functional typology schools, hospitals, museums, residential buildings are studied as separate categories of buildings. Although functional typology may be quite productive for the design of buildings, it is much less useful for urban descriptions and urban analysis. Functional typology does not take into account the immediate surroundings of the building, the context. Nor does it take into account that functions often change over time, while urban forms are very stable.

A typo-morphological urban analysis (as
opposed to the functional typology) means that buildings are studied in context, together with the surrounding public and private spaces. The object of such analysis may be a group of buildings and open space (an urban block), the building lots, or the street-pattern.

Typo-morphological urban research can be traced back to the 1950s and 1960s. At this time, Italian architects were systematically studying building types in historical city centres in Italy. At the same time, British geographer M.R.G. Conzen studied the historical evolution of British medieval cities, from a somewhat different standpoint. Conzen developed a typological (or typo-morphological) study of the urban forms, the street-net, the urban blocks and the individual plots. Similar research has been done in a number of European cities, and in San Francisco (see Moudon, 1986; Lawrence, 1986). These historical studies demonstrate that urban elements (the urban block, the street pattern) are very stable over long historical periods. They also demonstrate that functions can change to a surprising extent within a traditional urban pattern, without breaking the pattern.

Typomorphological urban research is still only in the early stages; in the future it can be expected to develop along several lines (see also Moudon, 1987):

1. **As a tool for description of the existing urban structure.** The classification into urban types will provide a basis for description of the existing urban structure in a specific city, in terms of characteristic urban typologies.

2. **As a tool for analysis.** It can provide deeper insight into the “sustainability” of the different urban types: by gathering basic environmental data (for example annual energy flow per capita, consumption of water, production of waste, recycling capacity, capacity for local cultivation, potential of recycling building materials etc.). It will also be possible to evaluate the relative attractiveness of the different urban types, by gathering socio-economic data (for example annual turnover of inhabitants, average income, social interventions, signs of vandalism etc.).

3. **As a tool for planning and design.** In providing a deeper understanding of the urban types, of sustainability and quality, a better description of the existing built environment, it will pave the way for a better planning practice, on both the micro- and the macro-level.

**A TYPOLOGY FOR SWEDISH URBAN BLOCKS**

The basic methodology for typological classification should be essentially the same regardless of the country. The proper starting point should always be the history of urban development. We can expect to find specific regional and national characteristics in Swedish urban types, but — this is perhaps even more striking — we also find that Swedish urban types are very similar to the urban types of other European countries, for example Germany, Austria, Denmark, Norway and Finland. The historical periods have produced similar urban types over a great part of Europe.

In the case of Sweden, the following historical periods can be identified:

1. **The preindustrial period (before 1850)**
2. **The Haussmann period (1870–1905)**
3. **The period of Garden suburbs (1905–1930)**
4. **The functionalist period (1930–)**

**The preindustrial period (before 1850)**

The characteristic urban type was the traditional Swedish wooden town, with timbered houses of one or two storeys. The streets are narrow: 6–10 metres. The dwelling-houses are as a rule placed along the streets, wooden fences protecting the private courtyards and small planted gardens from the streets.

**The Haussmann period (1870–1905)**

High density blocks of flats in 5–6 storeys, with buildings in the back. The transformation of inner Stockholm (and other large Swedish cities) in the late nineteenth century followed the continental urban pattern (Paris, Berlin, Vienna). The Building Code of 1874 set the rules. Apartment buildings of 5–6 storeys lining broad streets (18 m). Urban density was very high (e=2,5–3.0). Public parks were laid out in order to compensate for the loss of private gardens.

Around 1900, low density suburban villa districts for the affluent were laid out along new electric tramways from the city centre.

**The period of Garden suburbs (1905–1930)**

Reformed inner city blocks of 4–6 storeys with large open courtyards. Following new building regulations that were introduced during 1910–30 back buildings were no longer permitted and new inner city blocks were designed with large, planted courtyards. The urban density was accordingly reduced.

New suburban developments were laid out following the pattern of English and German garden suburbs. Mixed developments (detached houses, semi-detached houses, row houses) with low or moderate urban density (e= 0,2–0,3)

**The functionalist period (1930–)**

The functionalist ideal of open blocks of flats in...
green space made its breakthrough in Swedish urban planning as early as 1930.

In Sweden, the most common type of block of flats during the period 1930–50 was the three storey “walk-up” (or lamella house). The traditional separation of private and public space was abandoned.

In the period 1955–1975, high rise blocks of flats became more common, with point blocks (6–10 storeys) or slab blocks (6–10 storeys). Traffic separation was introduced, separate roads for walking and biking were built apart from the regular network of roads for motor traffic.

After 1975, the era of high-rise blocks of flats came to an end; instead two-storey blocks of flats or terraced houses (in Sweden called “row-houses”) increased their share of the total. The traditional closed block of 4–6 storeys made a come-back in central areas of the large cities.

A preliminary typology would thus consist of eight basic types or classes. In each of these basic classes or types we can further distinguish between sub-types or variants.

Figure 1 a—d. Some examples of Swedish urban types. a) Preindustrial low-rise traditional blocks, b) High density inner city blocks of flats in 4—6 storeys, c) Suburban villas, large detached houses on large plots, d) Garden suburb, semidetached houses and 3-4 family houses on small plots.

1 High density inner city blocks of flats in 4–6 storeys.
2 Inner city blocks of flats with open planted courtyards.
3 High rise point blocks or slab blocks, 6–12 storeys.
4 Medium density blocks of flats, 3–4 storeys.
5 Low-rise, pre-industrial districts in city cores.
6 Garden suburbs, mixed developments with terraced or semidetached houses.
7 Detached houses ("bungalows") on small individual plots.
8 Detached houses or villas on larger plots. These basic types are illustrated by Figure 1 a–h on these pages.

**On modernist and traditional urban patterns**
The eight basic urban types differ from each other in many aspects. They were built during different historical periods; the architecture, building materials and techniques are different. Some have a quite central location, others have peripheral locations. Some are rented, others owner-occupied. But the primary interest in this project is in the morphological characteristics, that is, the urban form and how the form affects the quality and sustainability.

As a first step, we must distinguish between two radically different urban patterns: the traditional urban pattern and the modernistic urban pattern which has dominated the post-war period.

The traditional urban pattern is made up of small-scale elements, individual building plots, that are aggregated into blocks, along streets. The modernist urban pattern is made up of large elements, large buildings with surrounding unbuilt space.

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**Figure 1 e—h. Swedish urban types.**

- **e)** Inner city blocks of flats with planted courtyards.
- **f)** 3-4 storey blocks of flats, "walk-ups".
- **g)** Small detached houses on small plots.
- **h)** High-rise developments, point blocks or slab blocks 1950s—70s.
The basic urban pattern — traditional or modernistic — is very important. It influences the way that a certain area can adapt to changing demands and changes in functions and lifestyles. The traditional urban pattern can easily and gradually adapt to external changes. The buildings on individual plots can be enlarged, transformed internally or even be pulled down to be replaced by new buildings. In the modernistic urban pattern, gradual adaption is not feasible. Rebuilding often affects the entire housing estate and is often quite radical.

**On classification of urban density**

The other parameters that are used for classification of the urban types in the project are following:

- residential density, \( e = \text{ratio of total residential area to area of land} \)
- building height, \( n = \text{average number of storeys} \)
- percentage of built-up area, \( v \)

The mathematical formula is as follows:

\[ e = v \times n \]

These parameters can also be analysed in a diagram (Figure 3). If we register a number of different urban blocks and place each block as a dot on the graph, (according to their urban density and number of storeys), we find that the individual observations of blocks (dots in the diagram) tend to cluster into a larger bubble. (Rådberg, 1988).
Figure 3. Urban density, building height and percentage of built-up area in eight Swedish urban types. (1) High density inner city blocks, 4–6 storeys. (2) Blocks with planted inner courtyards, 4–6 storeys. (3) High rise developments, point blocks or slab blocks 6–12 storeys. (4) 3–4 storey "walk-ups" (lamellas). (5) Preindustrial low rise traditional blocks. (6) Garden suburbs, mixed developments. (7) Small one-family houses (bungalows) on small individual plots. (8) Villas on larger plots.

**Project objectives**

The general objective of the project is to develop a typological urban classification system, as a basis for research, for descriptions (mapping) of the existing urban environment and as a basis for urban planning and design.

The classification system is primarily based on the Swedish urban environment, but the structure of the typology and the basic parameters should be adaptable to the urban types of other countries in Europe.

**THE PROJECT IS EXPECTED TO RESULT IN**

1. A new method for registration and analysis of the urban environment in a given city, on the basis of a typological classification system.
2. Descriptions of the existing urban structure in a given city, for example digitalized maps and/or databases.
3. New knowledge of the relationship between urban form and environmental characteristics, summarized in a sustainability index.
4. New knowledge of the relationship between urban form and quality (in terms of long-term attractiveness), summarized in an index of urban quality.
5. A method for identification and registration of historically and culturally valuable areas in given cities.

**Project methodology**

The project will proceed in five consecutive steps or project-parts. The first project-part,
(Step 1) concerns the formulation of the urban classification system. The basic parameters will be specified. Tests will be made on which parameters could easily be obtained from central data bases. The reliability of the given parameters will be studied. The classification system and the parameters will then be modified and tested in small-scale studies in parts of a selected city.

The registration of objects will be implemented in a Geographical Informations System (GIS). The primary source for information on urban elements (building lots, residential and other buildings) in Sweden is the Central Institute for Information on Real Estate (CFD) in Gävle. This centre has updated digitalized information on about 3 million units, almost every building in the urban areas of the country. This central data base comprises about 100 different parameters; the number of parameters is continuously enlarged. The central parameters in this project are (a) the urban form (given as coordinates), (b) the total area, (c) number of storeys (d) the built-up area in relation to open space (e) the ratable value. The CFD data base is the single most important source of building data in Sweden, but there are several other sources. The city planning offices often have digitalized maps with information of actual plans, regulations, roads, infrastructure etc.

A tailored GIS program will be designed as a tool for registration and classification of the urban elements. (See Agliulas, D & C. Harlow, 1990.) The registration and classification process will be semi-automatic, which means that the operator can intervene manually when a specific object cannot be identified according to the determined geometric conditions.

After the first step in the project, the selected parameters and geometric conditions will be evaluated and modified if necessary.

Step 2 will be a full-scale study of a selected city. The urban elements (blocks) will be classified, with the help of the GIS. The results will be illustrated in a detailed digitalized map showing the urban types, their extent and geographical location.

The elements (blocks) are also registered in a data base. This means that additional information related to each object (block) can be fetched from other data bases, using a geographical code as a link. Such additional information include: the number of households in each object, age distribution, income distribution, taxation, percentages of empty flats, social care, car ownership, the annual per capita consumption of electricity, production of waste water, an so on. The range of information available from other data bases is almost unlimited.

In the next stage of the project (Step 3), a typological catalogue for urban research will be created. This typological catalogue should consist of at least 300–500 objects (urban blocks) from different cities (large and medium sized) all over the country. The objects are selected by statistical methods to get a proportionality to the total population in each of the typological groups. The catalogue can be used as a reference selection for specialized studies of ecological problems. Such studies could be the study of the flow of material and energy, or evaluations of the opportunities or constraints for new ecological innovations in existing residential areas with different urban form. In the next step (Step 4), the accumulated information related to the objects in the research catalogue, (such as specific energy consumption, waste production, possibilities for local infiltration and cultivation etc.) will make it possible to construct a sustainability index. This index should be tailored as a tool for comparisons between existing areas.

In a similar process, the project will try to develop a quality index, (containing a mix of parameters based on social data and urban form). This index would also be used for comparisons between existing areas.

Finally, in Step 5, the project will develop methods to supplement the basic typological map with complementary information concerning culturally and historically valuable districts or objects, or valuable landscape elements etc.

REFERENCES (SELECTIVE LIST ONLY):

