ROLE OF SCALE LEVELS, UNITS AND LAYERS OF BUILT ENVIRONMENT IN PLANNING PROCESS

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Abstract:

Gradual changes in social sphere, politics and economics (in context of Czech Republic accentuated in last twenty-five years of rapid growth following neo-liberal shift in planning policies and urban management) have serious impact on transformation of forces that are shaping our cities nowadays. Notable increase in range of project sizes (often including large portions of public space), varying typology and forms of development, shift in periodicity of changes in urban structure results not only in ambiguity in current notion of "public" and "private" both in spatial sense and division of responsibility, but as well in disconnection between planning tools and real processes in built environment, thus increasing instability and "fuzziness" in roles and responsibilities within the system.

In this context, the master planning system can hardly be derived only from institutional responsibility. The paper therefore explores alternative point of view on decision making process in urban planning and architecture, based purely on built environment and its parameters. The layers of urban environment (public spaces, built mass, infrastructural systems, programmatic pattern etc.) are examined and systemized using case studies of different urban setting and theoretical models. The research sets up a comprehensive framework of singular planning decisions that consequently form the urban structure by studying syntactic units of built environment and their role in different scale levels. In today's situation demanding flexibility in decision-making process, the results can serve as a ground for optimization of urban planning processes, standards and legislation.

1. Introduction

Gradual changes in society and economics have significantly influenced the mechanisms that shape the form of contemporary cities. The significant enlargement of projects size diversity, the expansion of building typology range or the shift in the periodicity of changes in different layers of built environment have all led to a lower predictability of development, and greater demands placed on the tools of urban planning. Construction of public systems (including even such matters as public space) frequently comes under the control of the private sector. As a result, we find an increased ambiguity between public and private responsibilities, further accompanied by a loss of compatibility among urban-planning methods and other processes within the framework of urban development and the organisation of built environment in general.

The situation in the Czech context has, moreover, been accelerated by developments over the past 25 years, related to the sweeping political and economic changes in society since 1989. Radical shifts in property and particularly land ownership, along with significant urban growth, have been accompanied on the other side by a significant limitation of the role of the public administration in organising built environment, significantly below the level common in Western Europe.

For orientation within this context and the search for adequate strategies for the possible redistribution of responsibilities, it is essential to abstract from the current institutional framework of the system of urban planning and to examine the organisation of built space in terms of its physical essence and internal organisation. The theme of the presented work is henceforth the systematic description of the components of built environment and the issues connected with the organisation of its development and management within a hierarchy of proportional scales and units derived from the actual organisation of the environment. Specifically, the goal is to describe the relation of components of the built environment to their various scales, in other words how are the individual subjects of regulation related to scale levels and spatial units, how are they described within these units, how the methods of working with them have changed and on what scale they manifest themselves spatially. Equally the aim was to show the tie between the scale levels of the built environment and key decisions for the shaping and regulation of the city.

The paper describes the phenomena that are related to the given scale in general, i.e. without direct specification of the interface between public and private (responsibilities). This interface, it must be noted, varies dramatically with the amount of investment, method of construction, and needs for coordination in each specific locality. A great many of the themes described below could, therefore, be the subject of private decision-making, yet this does not mean that they can be omitted from the process of organising built space – only that the responsibility for them in a specific situation is entrusted to individual developers.

Presented in the text are partial results of a broader research assignment *The local plan in the system of urban planning in the Czech Republic* under preparation at the CTU Faculty of Architecture in Prague. The research is primarily oriented towards themes connected with larger cities, though nonetheless selected parts have been verified, in terms of the broader scope of description specifically with regard to urban and land-use planning systems, for smaller settlements. The work primarily concerns the common residential and mixed-use environment. At the same time, it also focuses on specific types of structures (large enclosed compounds, major industrial facilities etc.) and the expansion into the rural area and descriptions of themes related to the organisation of the landscape.

2. Units of the Built Environment

The presented text is based on the assumption that the built environment is structured into units that roughly correspond to the following descending classification:

- town
- district
- neighbourhood
- block
- plot / house
- flat
- room

These units are derived from common terminology used to describe parts of the built environment. Various methods are used to address them, from legislation regarding land use to a broad palette of theories of the built environment – from the Central place theory and it'shierarchies (Christaller, 1933) through the hierarchical structure of individual settlements (Doxiadis, 1966) up to the levels of the Open building system(Kendall, 2000).

In turn, these units (at least at the lower levels of the hierarchical system that the user commonly encounters immediately) are graspable by human senses (i.e. usually visible) and consciously distinguishable (i.e. usually commonly conceivable). In addition to being a physical whole, each

unit also reflects the social image and shared concept of a community (Kohout, 2010). At the same time, this scale of units is bounded by the parameter of the lifespan and periodicity of replacement of the individual elements (Kendall, 2000). Invariably, it holds that the lifespan of the elements on the lower hierarchical levels tends to be significantly lower than the lifespan of higher elements (typically the arrangement of space in a room changes on a scale of single-digit years, the arrangement of rooms within a dwelling changes on a scale of decades, the arrangement of urban blocks on a scale of centuries, etc.). The organisation of the environment on the level of neighbourhoods and blocks regularly implies decisions with a lifespan stretching across generations (Habraken, 1998).

No less important than the delineation of the units themselves is the question of their mutual hierarchical relations (Kohout, 2011). Each unit of a selected scale contains all units of a lower scale, as well as its own specific elements – tare (Berghauser Pont, 2010). In turn, these specific elements of each scale organise the units of lower scale (e.g. the communicative spaces in a building determine the position of living units; a standard street defines the organisation of its houses etc.). These specific elements are usually represented by a selected type of shared space (in the event of lower hierarchic stages) or of public space. And, in succession, these connecting elements then become the image (Lynch, 1960) of the units of the urban fabric – i.e., the space where these units can be "grasped", "lived" and "comprehended" (e.g. the organisation of a building can best be understood from the main communication area, typically the staircase; the overall setting of a district can be best understood from its central square or main boulevard).

Units of Built Environment and Scale Levels

Though in connection with the previously noted concepts we speak primarily about units – which may be ascribed certain attributes and in a certain sense may be treated individually as units – their mutual relations and capability to bind together the individual attributes of the components of the built environment in a comprehensible manner and in a hierarchical succession with precisely ensuing dependencies is – primarily on the higher stages of the scale, i.e. from the neighbourhood upwards – ambiguous (Alexander, 1965). The same principle holds true as well for the mechanism of organising the entire system into a hierarchical arrangement of mutually logically ensuing units. For this reason, the paper deals with these elements more in terms of their scale levels, i.e. stages in which there usually occurs a qualitative change in the method of approaching the components of the environment.

No less important is drawing attention to the relations of the scale level to the size of the unit. In this sense, the scale level is defined in the paper as the level of detail that corresponds to reasonable operation within the framework of the given unit. Hence, the size of the unit generally implicates the size of the smallest area with which it is logical to work on this given level. In common practice, though, this area can be (and often is) much larger. Typically, the scale level of the block represents the detailed work with attributes linked to individual plots. Logically, these could be effectively prepared for a single block, yet it is more common that these details are addressed in coordination for a territory over the size of several blocks.

For the requirements of the following text, which addresses the field of urban planning and construction coordination, specific focus is devoted to the units / scale levels between the district and the block, or if necessary the individual plot.

3. Components of the Built Environment

Components of the built environment represent the basic thematic lineage for the organisation of environment'sphysical elements. Bearing in mind their direct connection to the actual environment, it is not possible to view them as mutually equivalent independent layers of the plan, even though they do form a suitable analytical reference framework for investigating and practicing urban

planning. They can have a structural or infrastructural character, and their delimitation for the purposes of the present text is derived from the common, conventional descriptions of city organisation in relation to urban planning. In the city (i.e. a primarily built-up area), we can discern specifically:

- public spaces / street network (their delineation and arrangement of the parterre)
- built mass (as a spatial structure, including open spaces that contain both spatial and functional parameters)
- transportation and technical infrastructure
- civic and commercial infrastructure
- landscape infrastructure

From the nature of the system, it ensues that the individual components overlap, which means that systematic individual elements of the environment will repeat in differing contexts – e.g. a school represents both civic infrastructure as well as part of the built mass with spatial parameters.

Methods of description / prescription

From the standpoint of planning, the components of the environment and their individual elements become the subjects of regulation. The urban plan treats the differing subjects of regulation on various levels of scale in different ways. In this respect, the key factors are both the character of the subject of regulation as well as the level of abstraction and of detail with which the given subject and the given parameter are affected. Similar tools to those used for the regulation of elements of the environment and its parameters ("inscription") can be used as an analytical instrument for registering the qualities of the elements of the environment in the given site ('reading") – i.e., both in a descriptive as well as prescriptive sense.

Included in the determination of the elements is the definition (registering/setting) of their existence, their localisation within the given territory and the stating of their parameters (scope and qualities). In this respect, it is possible to divide the principles for the determination methods as follows:

- prescriptions that define the existence of a certain element of the environment but do not assign it a concrete spatial form; these can determine the position either in direct localisation/routing (e.g. stating the position of a height landmark or routing the axis of a transit route) or in relation to another element/surface (e.g.: prescribing the connection of a network of public spaces through urban blocks in specified points, but without setting a direct route, or prescribing the realisation of a park within a set part of the territory)
- delimitations that determine not only the positioning of elements in a specific place, but also their spatial extent; the delimitation could be determined as the precise boundary of a space by a solid element, or by setting a maximum boundary (e.g.: limiting the areas of the park or the built-up section of urban blocks)
- restrictions / regulations that organise space through the assignment of parameters, either through their qualities (e.g. determining the functional composition) or limits (e.g. regulating the share of paved areas)

The basic principles described above do, of course, overlap to a certain extent in various situations (e.g. selected parameters are often assigned to independently determined areas, while prescribing a concrete element it is also possible to limit the parameters of its size, etc.), yet nonetheless in their differentiation it is possible to note a basic division of the level of abstraction and the method of its determination.

3. Description of the Built Environment and Its Scale Levels

For expressing the relation between individual subjects of regulation and scale levels in the environment, as well as outlining the possible methods of their description, a verification study was performed within the research project in selected localities (fig. 01).

Fig. 01Selected localities for verification study: Prague, Dejvice / Prague, Novodvorská / Amsterdam, Ijburg / Štětí, Chcebuz; pictures showing three scale levels: district level / neighbourhood level and block level

Towards the aim of capturing a wider scale of elements of the environment and tools for their description, different areas were selected that represent varied types of urban patterns derived from the historic changes in the character as well as the size of the planned and administered units. The structure of a traditional city is represented by a section of the Prague neighbourhood of Dejvice; for confrontation of the examined tools with modernistic localities, the Prague housing estate of Novodvorská was selected and, bearing in mind the absence of a contemporary approach to planning to the necessary extent in Czech urban setting, the typology of a contemporary compact city is represented by the Amsterdam district of Ijburg. For verifying the selected principles on a different scale of settlements and in a landscape setting, these urban localities were matched

against one village – Chcebuz, located in the administrative authority of the town of Štětí in the Ústí nad Labem region in North Bohemia.

In the matrix grounded in this theoretical basis, the key connections between the components of the environment and the scale levels were identified. These connections were described in a system that assigned decisions concerning concrete elements of built environment to the scale range of district-neighbourhood-block (fig. 02). As has already been noted, the individual scale levels represent not only units of the environment with their definite attributes, but equally transitions between the qualitative transformation of components of the environment or their mutual relations. This change usually expresses not only the extent of greater precision of the given component through greater detail, but often represents an independently describable and unambiguously specifiable theme that directly corresponds to the given scale level.

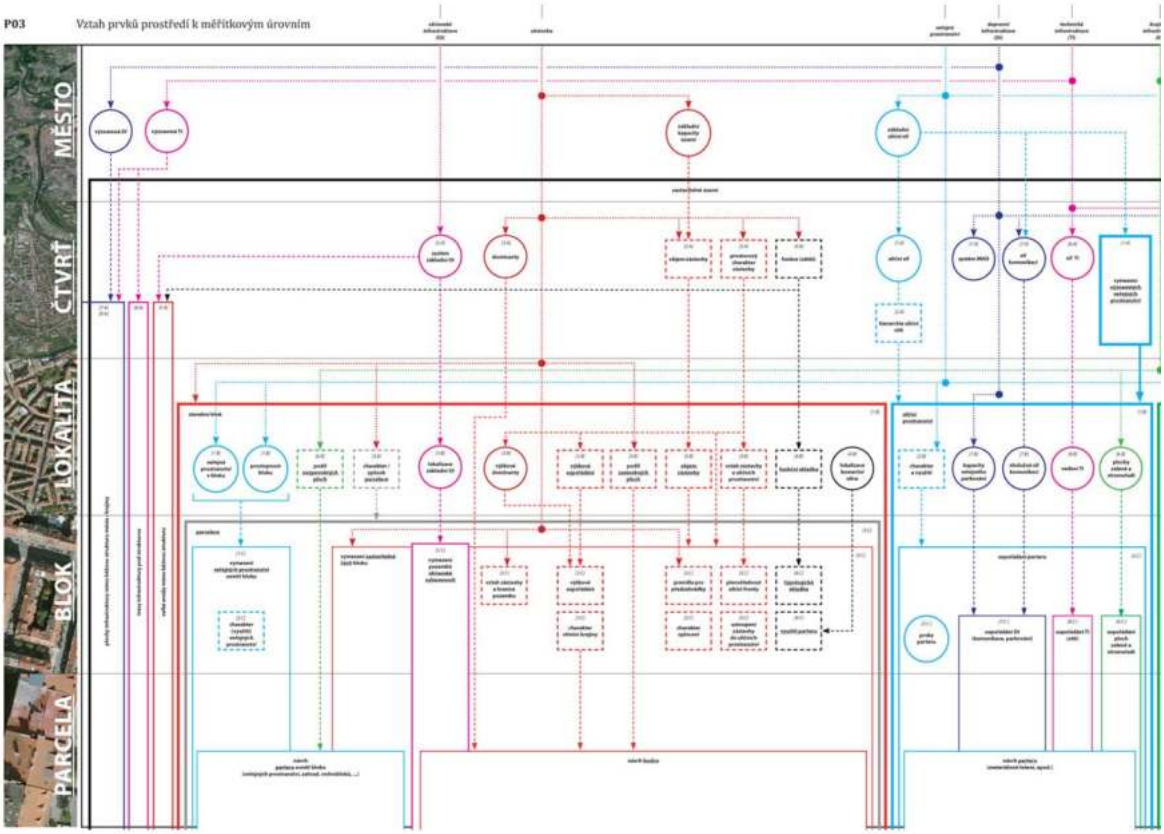

Fig. 02 Decision-making analysis through scale levels (system maquett)

The themes of the scale levels and changes in the description of each component of built environment can be described as follows:

Scale level: district

The scale level of the district is usually the last effective planning level for larger cities in planning these settlements as a whole. Typically, this is the level at which the more detailed relationships of city-wide systems are addressed (transportation, technical or landscape infrastructure) in relation to each other as well as to the basic organisation of the settlement on lower scale levels (i.e. the system of articulation into blocks, distribution of capacities and the ensuing possible basic typologies, organisation of transport on the lowest level etc.).

- Public spaces (fig. 03): The basic organisation of their network is formed (delimitation of places and axes of main public spaces, and directions or connections of secondary public spaces) and their connection to the superior systems of a city-wide character.

- Built mass (fig. 04): The basic capacities and land-use limits are distributed as well the basic spatial character including the composition of major landmarks is decided.

- Transport and technical infrastructure (fig. 05): On the scale level of the neighbourhood, what is usually addressed is the connection of local systems of transport and technical infrastructure to city-wide systems. At the same time, decisions are also made on the basic system of transport service in the area, the connection of separate transport systems (mass and individual transit) and cycle and pedestrian transport. On this level the detailed localisation of the main connection points of utility networks of city-wide systems of technical infrastructure is being distributed (transformation stations, sewage treatment plants, waterworks, etc.).

- Civic and commercial infrastructure (fig. 06): Elements of public facilities of medium size (primary and nursery schools, medical facilities or sports areas of local importance) are regularly assigned on this level – the capacities are known, but the concrete delimitations of the basic street network and built-up blocks are not. At the same time, also a basic organisation of the small scale services is decided, primarily by setting the place for their main concentration (main commercial boulevards).

Scale level: neighbourhood

In terms of planning, this level involves relatively concrete assignments and goals (usually the given capacity, the required spatial character of built mass etc.). Through the delimitation of the streets, the local character is to a significant extent stabilised, and a basic network of public spaces is formed. Thanks to the delineations of the streets, there occurs a basic distribution of capacities, outlining of urban blocks and localisation of main elements of civic facilities.

- Public spaces (fig. 03): Street space is delimitated by the street lines, i.e. the basic network of public spaces is stabilized (setting the street lines and basic characteristics of the street profiles, prescribing the permeability of individual blocks).

- Built mass (fig. 04): For built mass, this involves the final delimitation of urban blocks (setting the street lines). On this level, the character of built mass is generally regulated by specific parameters and to a large extent prescribed (simultaneously it is possible to guarantee it effectively from this scale level on). In addition from here onwards, it is possible to perform the effective setting of the basic elements of spatial regulation.

- Transport and technical infrastructure (fig. 05): Connected to the delimitation of the street pattern a more detailed specification of transport and technical infrastructure becomes possible.

- Civic and commercial infrastructure (fig. 06): Elements of civic facilities are delimited on this scale level in specific urban blocks. Likewise, there is also a more detailed organisation of the lowest level of commercial services (creation of a living ground level along public spaces etc.), which is related to the character of the street profile.

Scale level: block

On the scale level of the block projects of individual private and public builders are coordinated. In terms of the systematic organisation of the built environment, the block is also the basic compositional unit of the settlement. This statement holds true in spite of all heterogeneities of size and form of the block, as well as the fact that in certain types of construction (housing estates, large complexes etc.) its delimitation is somewhat difficult. At the same time, it is true that only very few other boundaries inside a settlement are usually so clear, and at the same time containing so many levels of meaning (private/public, accessible/inaccessible, formal/informal, mass/space etc.) as the boundaries of the blocks and streets. Nevertheless, it is important not to lose sight of how the block, as a scale level of settlement planning, contains in itself as well the adjoining street spaces, i.e. usually streets or squares.

- Public spaces (fig. 03): The network of street spaces is already delimited, and arrives at this scale level as the basic specification. On the level of the block (street), the organisation of the parterre of the public space is determined, largely through the setting of the street profile As a result, here it is possible to adjust in greater detail the basic relationship between public and private (primarily outdoor) space. A localisation of the permeability of urban blocks (walkways, arcades, covered passages etc.) takes place.

- Built mass (fig. 04): In terms of built mass, we encounter the delimitation of individual construction projects, usually through the form of parcelling of the land. There can also be a delimitation of the space inside the blocks, i.e. the organisation of the space as semi-private or as semi-public. Construction is formed by the already concretised volumes, thus usually occurring in the form of determining their positioning and height (delimitation of parcels, building alignments, heights of cornices and rooftops, number of floors, eventually with other concrete parameters ensuing from the nature of the location).

- Transport and technical infrastructure (fig. 05): On the scale level of the block, it is possible (keeping in mind the determination of the street profile) to set in more detail the organisation of transport service of the area (e.g. one-way or two-way traffic, ways of parking in public spaces etc.). Simultaneously, it is possible to effect a more detailed organisation of transport service for the block as a whole, primarily the system for parking.

- Civic and commercial infrastructure (fig. 06): Elements of civic facilities can be delimited here at the very lowest level of the public (nursery schools, children's playgrounds or sports fields occupying a semi-private inner-block area etc.).

Fig. 03 Description of Public spaces through different scale levels: Prague, Dejvice / Prague, Novodvorská / Amsterdam, Ijburg / Štětí, Chcebuz; pictures showing three scale levels: district level / neighbourhood level and block level

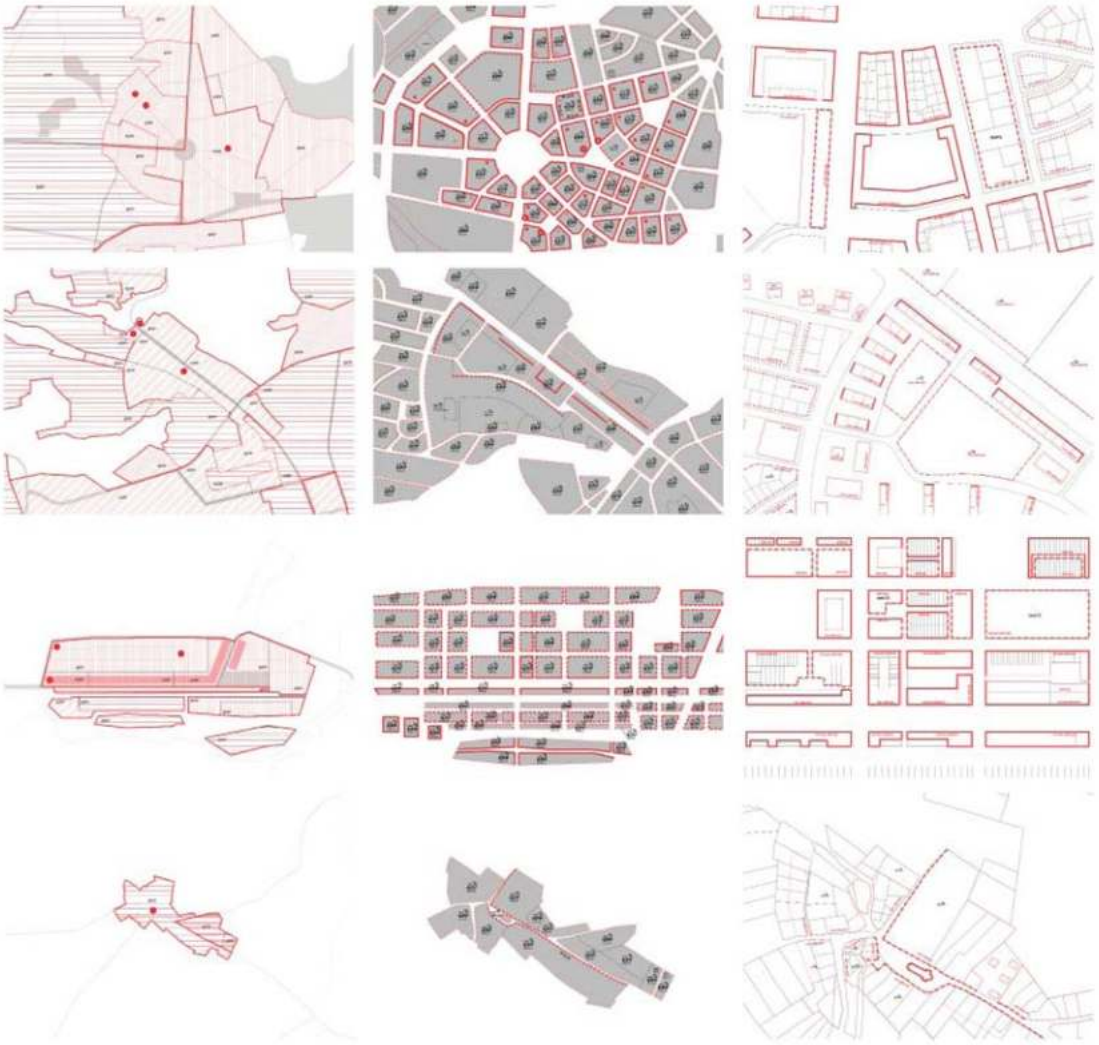

Fig. 04 Description of Built mass through different scale levels: Prague, Dejvice / Prague, Novodvorská / Amsterdam, Ijburg / Štětí, Chcebuz; pictures showing three scale levels: district level / neighbourhood level and block level

Fig. 05 Description of Transport infrastructure through different scale levels: Prague, Dejvice / Prague, Novodvorská / Amsterdam, Ijburg / Štětí, Chcebuz; pictures showing three scale levels: district level / neighbourhood level and block level

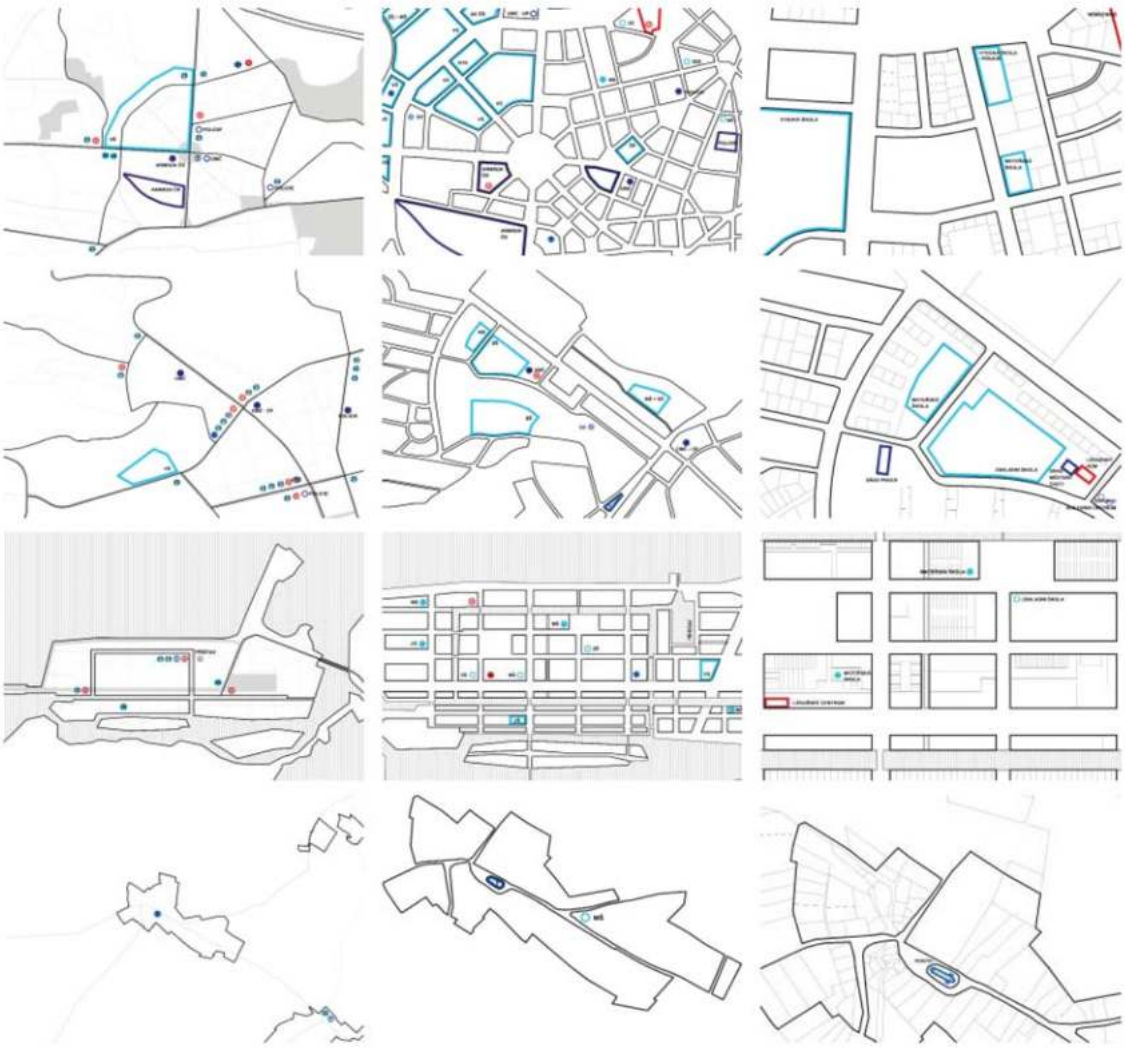

Fig. 06 Description of Civic infrastructure through different scale levels: Prague, Dejvice / Prague, Novodvorská / Amsterdam, Ijburg / Štětí, Chcebuz; pictures showing three scale levels: district level / neighbourhood level and block level

4. Scale Levels of the Built Environment and the System of Urban Planning

As described previously in the introduction, the purpose of this analysis is primarily the description of the built environment on the basis of its implicit parameters and qualities, without regard to the distribution of responsibilities in a specific urban planning system. Nevertheless, for understanding the use of the results of this research and the adequate formulation of conclusions, it is necessary to give a suitable outline of the principal relationship between the described scale levels and the system of plans. The planning system is generally compiled from the scale of plans in varying degrees of detail, which form a more or less hierarchical system of planning levels. Here as well, scale is unquestionably a basic systematic parameter for articulation on the level of the plan. If we extend the systematics of planning levels to the basic framework of this text, in terms of scale the key question is in what detail (scale of detail) the plan operates, and at the same time to what units it is applied.

It is necessary to stress that the levels of the plan may well not cover the complete described scale range. The gamute will, out of principle, always be richer than the utilitarian quantity of planning levels. What is key here is the extent of detail in the description (organisation) of the space within which the relevant planning level operates. The consensus on organisation of built environment on a lower scale implicitly contains within itself the decisions that are necessary to implement on a higher scale. The hierarchy of these interrelations manifests itself in the process of preparation (creating, processing) of the plan, without it being necessary to formalise decisions in the higher scale level through an independent planning level. On the other hand, it is also true that various scales can function for a number of spatial areas on a single planning level – even with the use of descriptions and regulations with a varying amount of abstraction and detail corresponding to the differing scale levels.

Within the framework of the research, the relation of planning levels in individually investigated international planning systems towards the scale levels of the actual built environment was observed (fig. 07). The primary object for observation was the level of the local plan, and its relation to the higher level of urban-planning documentation. The majority of investigated systems have at their disposal planning levels corresponding in detail to the scale of the block, which aggregates within itself decisions on the scale level of the neighbourhood, possibly even the district. Supplementing this is the “city-wide” planning level, which ranges in its level of detail from the city to the district, in a few cases even to the neighbourhood. This planning level usually operates with greater flexibility in its level of detail.

5. Conclusions

On the basis of the performed analyses and verification studies, we can draw attention to selected essential findings concerning not only the importance of the components of the built environment in relation to scale levels, but also the changes in the method of their description.

The research verified that the components of the built environment and their individual elements permeate throughout all of the observed scale levels. The majority of elements find a relevant description on the scale of the district, neighbourhood and block. A change in the scale of the built environment causes not only a refinement of the description of the area, but also a change in the significance of the aspects of its individual elements. For instance, for determining public spaces the key on the scale of the district is the network relations of the system; on the scale of the neighbourhood the more important factors are its spatial dimensions and proportions. The use and character of the public space is, in turn, on the scale of the neigbourhood represented specifically by hierarchies of importance, yet on the level of the block through the organisation of the parterre.

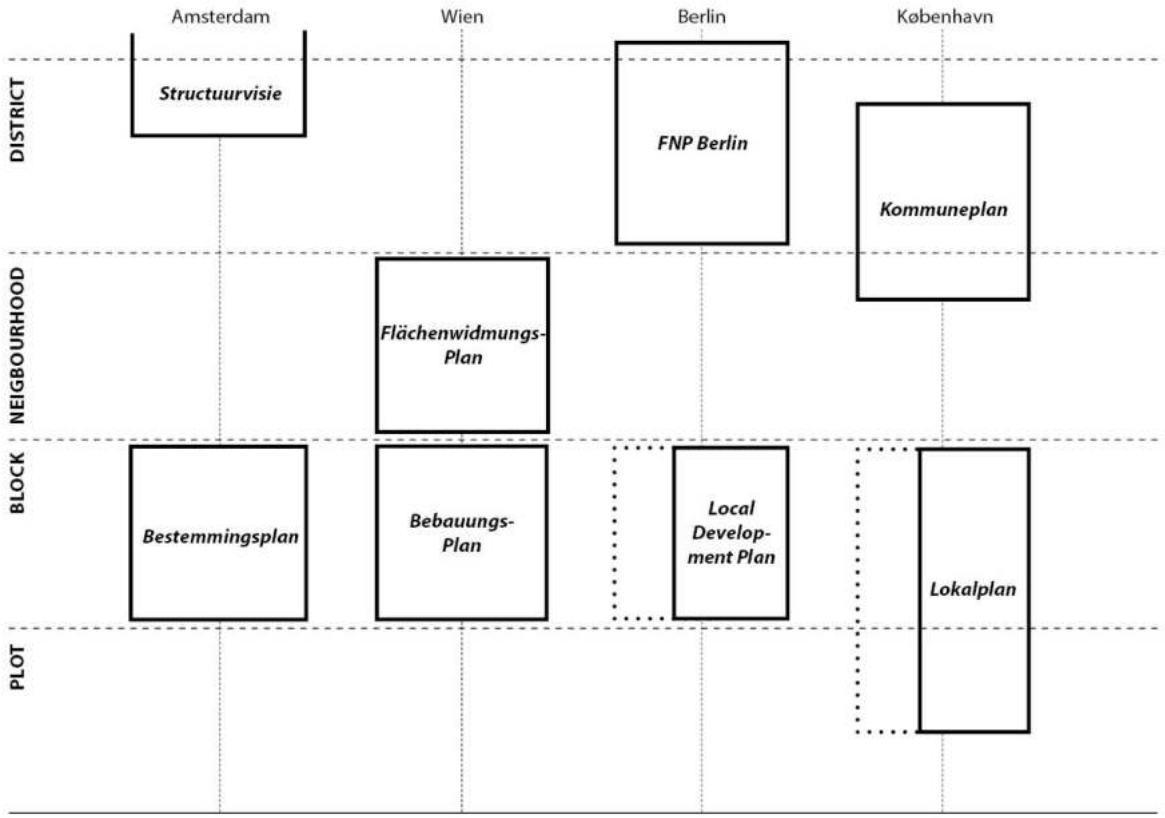

Fig. 07 The relation of planning levels to scale levels of built environment: Amsterdam, Vienna, Berlin, Copenhagen. The diagram likewise displays the amount of coverage of the area of the given urban-planning level (dotted lines represent partial coverage)

Nonetheless, it is also possible on the individual scale levels to identify key aspects of planning and its goals, or in other words to follow the gradual change in the sense of planning across the scale levels. Though each level understandably fulfils to a certain extent all of the aims of urban planning, it is possible to assign to each scale level a certain characteristic meaning:

- Scale level of the district – organisation (of public systems): The scale level of the district is usually utilised for operations on the boundary between city-wide and local systems. Here, the basic system of organisation is created, the city-wide public space is stabilised, as well as the infrastructural systems. The scale level of the neighbourhood thus represents primarily the record of public aims in space.

- Scale level of the neighbourhood – guarantee (of the character of the environment): On the scale level of the neighbourhood, we find the stabilisation of the basic physical attributes of the built environment. Here lies the determination of the street spaces and blocks as the key systematic delimitation within the framework of urban planning. The basic character of built mass is translated into parameters on this level. Hence, it is only at this scale level that there appears the possibility of its more precise definition in relation to the specific limitable space (block) and thus its effective assurance. The scale level of the neighbourhood, therefore, represents the basic framework for reaching agreement on the character of the built environment and the extend of its change.

- Scale level of the block – coordination (of individual intentions): The block is the scale level at which we find the main mutual coordination of the projects of individual builders

(private and public). The parameters of individual components of the built environment are translated into specific spatial arrangements, on the basis of which it becomes possible to speak of the determination of the planning typology of individual structures. The scale level of the block, therefore, primarily influences the quality and effectiveness of individual intentions in relation to their surroundings.

Legibility of the Built Environment

For all scale levels, it holds true that the system of public spaces can be regarded as the basic reference level for all other physical elements of the built environment. Without knowledge of their routing or (at lower scales) their delimitations, it becomes considerably difficult to prescribe the parameters for other elements of this environment. In essence, this principle holds true across all scales, though the surface delineation of street areas and blocks on the scale of the neighbourhood can, in this respect, be viewed as most essential.

As a result, it can be possible to refer back to the introductory analysis of the compositional and unitary sides of the built environment, in which an adequate hierarchy of units and 'connecting elements" leads to the legibility of the built environment. Legibility here does not refer solely to the comprehensibility of the urban structure for the ordinary user, but more significantly to the determination of the framework for its administration, management and the conditioning of the possibilities of its change across time, which frames both, top-down as well as bottom-up processes.

An open system of hierarchically ranked elements means that it is possible to a large extent to exchange individual elements of the whole – primarily those at lower levels – according to need, without in any way significantly harming the character or identity of elements at a higher stage in the hierarchy. Respect for basic relationships and ties, their gradual adaptation to the given circumstances of the place and the era, allows an urban structure its natural development while retaining its characteristic traits and basic identity.

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