THE IMPACT OF URBAN TRAFFIC ON THE URBAN living conditions OF the CZECH TOWNS AND CITIES

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HARMONY OF URBAN STRUCTURE AND URBAN TRANSPORT NETWORK: ITS IMPACTS ON THE PROTECTION AND CREATION OF URBAN ENVIRONMENT

The current unsatisfactory state of traffic in historical European cities has a number of causes. One of them is the discrepancy between the layout of the urban structure and the present-day requirements made by the volume of traffic. The physical environment of Czech towns and cities was formed for less demanding modes of traffic. Other traffic problems are caused by the distribution of urban activities, which is unsuitable at the present time, this distribution having been strongly affected by the strict segregation of functions. As a result, the origins and terminations of traffic have been spread throughout a large area, this results in an enormous growth of internal urban traffic. The current state is also due to a predominantly technically oriented solution to this problem that showed no respect for urban and environmental requirements.

The natural development of Czech towns and cities between 1918 and 1939 manifested itself in their compact growth, mostly following the historically established structure of streets and roads. The renewal of towns and cities that followed this period, and the advent of concerted urbanisation encouraged their rash growth, which was accompanied by the construction of large industrial plants and ever-growing housing estates located on the outskirts of towns and cities. Towns and cities spread out on all sides, this leading to a "division of labour within the settlement". As a result, the volume of transport grew enormously. High-aiming conceptions, strongly impairing the urban structure of cities and their environment, should have been the solution to problems resulting from this development. The homogeneity of natural quarters, the image of the city and the urban landscape were impaired. At the same time, spatial relations, the possibility of orientation, the identity of urbane environment and its cultural continuity got lost.

The impossibility to implement high-aiming conceptions by stages which would have been acceptable in terms of time, and which would follow each other, proved a serious problem. The slow implementation of these conceptions resulted in the fact that doubts were expressed about the capability of the system to cope with the complicated traffic situation. Gradually, the conviction was ripening that the efforts aimed at adapting urban structure to the requirements made by traffic were of no avail. New views of the solution to this problem
are characterised by direct support for public, pedestrian and cycle transport. Due to the change of economic conditions, the current favourable modal split between public and individual transport (75:25) will be getting balanced. Together with the growing mobility, this will force us to look for possibilities of adapting traffic routes to the urban structure. When reducing traffic in historical cores of towns and cities, it is necessary to provide for suitable motor-traffic routes outside these centres, preserving, at the same time, the urban character of streets.

For this purpose, it is necessary to establish new categories of streets, focusing maximum attention on all aspects (urban, architectural, traffic, environmental, hygienic etc.) of the layout of these streets. The possibilities to create new transport networks within the existing urban structure will be addressed later in this report.

**2. THE RELATIONSHIP BETWEEN URBAN STRUCTURE AND URBAN TRANSPORT NETWORK**

The relationship between the urban structure and the urban transport network results from the organisation of urban structure, the mode of transport, the transportation relations, the traffic load and the "division of labour within the settlement."

The economic and cultural values of the physical environment, together with the shaping of functions, operations and space, obstruct the adaptability of the urban structure. Geographical conditions of each settlement and, often, a different historical development may also contribute to this.

When choosing the means and systems of transport, particularly the percentage of individual and public transport, and the segregation of the passenger and goods service play an important role. Particularly the distribution and mutual relations of urban activities (such as domicile - work place, domicile - public utilities, manufacture - market are affecting the transportation relations and the traffic load. "The division of labour within the settlement" considerably affects the transportation relations and the traffic load. Modal split in towns and cities as well as in their regional surroundings is dependent on the location of facilities and the lay-out of the urban structure. Therefore, regulating the amount and the distribution of new activities can substantially affect traffic operations, and it can become an efficient measure to protect whole parts of cities against its adverse impacts.

It appears that the urban structure, with its immense material, environmental and cultural values are largely stabilised, and its rearrangement, redevelopment or restructuring are enormously resource-intensive. From the cultural and societal point of view, these interventions appear to be very questionable, often even as much as unacceptable. As regards the great "urban stability" of cities, it is necessary for the organisation of traffic to be based on the urban structure, in other words, the volume of transport needed should be in harmony with the spatial capacity of the existing street network. It is wise to respect the principles resulting from the established transport network.

An optimum relationship between the urban structure and the transport network of a big city should be based upon the requirements resulting from the "division of labour within the settlement", upon the established transport network and upon the possibilities of making use of the transportation technologies available. All natural and cultural values as well as the values of civilisation proper to each residential space, and the possibilities of adapting these values to new requirements should be also respected. The matter is that the spatial needs of the society must be satisfied so that the dynamic balance of the whole settlement can be preserved. This means that social, environmental, economic and cultural values must be preserved and developed.
The relationship between the urban structure and the transport network of a big city should be understood in a comprehensive and systematic way. This means that their relationship is not only a structural (functional, operational and spatial) problem of the city as a settlement unit, but also a problem of its external regional surroundings. The solution to this problem should be also subject to environmental criteria. That means that the requirements made by environmental protection and management should be respected within the framework of sustainable development of the whole system.

The problem resulting from the relationship between the urban structure and the transport network of a big city is getting shifted from the technical, urbanistic/traffic solution to the comprehensive solution based on a concept covering the development of the whole settlement and region, reaching as far as the "philosophy of the operation and development of the city." When the city organism is permanently overloaded, operational breakdowns, resulting from unproportional traffic requirements placed on the urban structure of the city, often occur. If these problems cannot be resolved within the framework of the "division of labour within the settlement", that is by some organisational changes such as distribution of traffic into the street network, rearrangement of the structure of origins and terminations or deconcentration of urban development into the surroundings of the city, transport has to be handled at a level representing a different quality.

When establishing the relationship between the urban structure and the transport network, the percentage of individual and public transport plays an important role. The percentage of public transport depends on many factors, such as the economic situation, the structure of transport network, the location of activities, the comfort, the safety, the accessibility etc. The present-day favourable ratio of public and individual transport in big Czech cities and agglomerations (in Brno for instance, the ratio is 80:20) is likely to change. The current values will probably remain the same in the centres of cities, and they will change as the distance from the centre will grow. In terms of further development of Czech cities, it will be important for them to be prepared for and manage the growth of the expected individual transport. The high percentage of urban public transport in the cities of Central and East Europe was caused, in particular, by a different social and economic situation. The change of the political system in these countries and the anticipated rise in the standard of living will result not only in a higher number of vehicles, but, in particular, in a higher number of journeys made by these vehicles. The urban transport networks, which are underdimensioned in most cities, have to be adapted to this fact.

It is therefore necessary to look for the possibility of complementing the street network in harmony with the new urban development. The new ways must not interfere with the existing urban structure on the one hand and, on the other hand, they must ensure the functionality of the city, that is, they must not restrict the possibilities of mobility. When reducing traffic in historical centres, it is necessary to provide for new trafficways outside these centres, these new trafficways being endowed with urban character. It is just the shaping and the layout of streets that substantially affect urban development. It is therefore necessary to find harmony between urban structure and traffic that is between the type of development in terms of functionality, layout and structure, and the kind and intensity of traffic.

To achieve this, the normative categories of urban trafficways, currently adopted in the Czech Republic, are not sufficient. For this purpose, a new categorisation of streets should be created. The street should be the basic space, in which the city is functioning and the urban structure is being created. It is therefore vital to focus all attention on the layout of streets, taking into account all aspects involved (urban, architectural, traffic, environmental, hygienic aspects etc.). The possibilities of creating a new transport network within the
existing urban structure, as well as the opinion on the layout of streets are presented later in this report.

3. THE RELATIONSHIP BETWEEN URBAN STRUCTURE AND URBAN TRANSPORT NETWORK: AN EVALUATION

We are aware of the fact that the relationship between the urban structure and the transport network directly affects the overall urbane value of space. Therefore, we suggest that their mutual harmony should be measured by the criteria used to measure the urbane value of space. The set of these criteria used for the area under investigation would then become an objectifiable starting point for the preparation of a proposal for its restructuring and reconstruction or a proposal for the change in the organisation of traffic.

We understand the urbane value of an area, in a broader sense, to be a value, which is dependent on the solution to social, economic and cultural problems connected with the process of urbanisation, on the possibilities to control this process, and, thus, to also affect the growth of towns and cities. It is a value-based system that helps the society to focus on itself in the attitudes toward economic development, toward the protection and management of environment and toward the development of transport. In a narrower sense, the urbane value expresses the functional, operational and spatial quality of environment. To determine the urbane value, a set of criteria has been defined, these criteria being based on:

- The land use in terms of functions
- The traffic operations
- The shaping of space (cultural values),
- The environment (hygiene, amenity, safety).

The relationship between the urban structure and the urban transport network can be evaluated on three levels.

The first level of evaluation concerns the street as the basic urban element characterised by a specific arrangement of buildings, open spaces and trafficways, and their utilisation by activities occurring in the particular settlement, and by traffic operations. The evaluation is oriented toward the capacity of the particular street profile to receive the volume of traffic required. This capacity is determined by the type of urban structure and by the state of the network of trafficways.

The second level of evaluation concerns the urban structure as a typological segment of urbanised area characterised by a consistent development representing various periods of time, and by the street network, also including the utilisation of the buildings and streets by "settlement activities" and traffic. The evaluation is oriented toward the capacity of the urban structure in terms of traffic, and toward an optimum composition of functions and their flexibility in terms of the use of land. By means of such evaluation, areas can be designated, which are, from the point of view of functions and the transport network, self-sufficient in terms of transport service, or are just satiated by their own terminating traffic respectively. They usually have a limited permeability and, without radical interventions in their structure, are not able to handle more traffic, particularly the through-traffic. Homogeneous areas, characterised by these elements, are called "environmental neighbourhoods", and we presume that they will become the basis for a new spatial organisation.

The third level of evaluation concerns the city as a unit of settlement, and, usually, also its region. The city is characterised by its system of development and open spaces, by its "settlement functions" and by its system of transport including the main urban trafficways.
The evaluation of the relationship between the urban structure and the transport network focuses on checking the capacity of the city as a unit of settlement as related to the traffic load required. Based on an analysis of the urban structure and the traffic network, the evaluation can define urbane values of the whole city and designate the most valuable parts as environmentally stabilised areas. Then, it is possible to define traffic corridors in other areas and on the fringes of environmental neighbourhoods, these corridors forming the basis for a superior traffic system.

3.1. THE IMPACTS OF URBAN STRUCTURE ON THE FORMATION OF TRANSPORT NETWORK

Built-up and stabilised urban areas can make transportation possible only to an extent that corresponds with those values of adverse environmental impacts that can be generally accepted. The following situations may occur:

- the urban structure makes it possible to completely and harmonically encourage all traffic interests,
- Traffic operations reduce the social and residential function of the street,
- Traffic operations require changes in the utilisation of the adjacent development,
- Transport is conditioned by the demolition of the adjacent development,
- Transport is possible only outside the urban structure.

Furthermore, the characteristics of street profiles within the environment of a particular urban structure are given in greater detail.

The Historical Urban Core

The historical urban structure, accommodating a high number of functions, is not able to meet almost any external requirements of traffic; however, the internal requirements resulting from the necessity to serve public facilities (service of the area, increasing standards of stationary traffic) are strongly restricted and regulated, too.

The Historical Cores of Integrated Settlements (Quarters)

The local, historically determined centres, which have not experienced a significant increase in the intensity of land use, are able to relatively harmonically absorb their internal traffic but not the external.

The Urban Block-Type Development

The block-type development can provide for its internal traffic only if the particular area has a certain size. In the event of the main axes being organised regularly and designed to have larger dimensions, the block-type development can cover some portion of urban traffic, but, being compact and homogenous, it does not provide for opportunities to meet the requirements made by expressways and urban distributor trafficways.

Low-rise Suburban Development

Small-sized and often irregular development with narrow streets makes it impossible for higher-grade trafficways to transverse these areas. On the contrary, the strong residential function requires minimising the thoroughfare through these areas. Sanitation is possibly
dependent on the physical as well as the cultural value of the built-up area, and requires that the particular locality be apt for an overall redevelopment and revaluation.

The New-Age Housing Estates

The questionable location of large housing estates and their considerable monofunctionality resulted, in a series of cities hit by "socialism", in unbalanced traffic requirements. Distributor trafficways have no social function, the strengthening of which would be desirable, especially in the anonymous housing estates. Other problems include the humanisation of the residential environment itself, a purposeful differentiation and social identity of space around residential blocks.

3.2 THE IMPACTS OF ROAD TRAFFIC ON THE FORMATION OF URBAN STRUCTURE

In the past twenty years, there were significant developments in traffic, especially in big cities and city regions. Traffic gradually filled the street network formed by historically grown urban structure, and gradually required considerable constructional interventions.

The impacts of road traffic on the formation of urban structure in the Czech cities are best apparent in those cities in which motor traffic was, during their growth, concentrated in selected traffic corridors, which are generally identical with trafficways of city-wide importance.

The analysis of the development of the road network and the growth of motor traffic in selected corridors, and the analysis of their insufficiency in terms of traffic indicate that the naturally-grown urban structure is being impaired by excessive traffic flows, particularly when they are concentrated in selected corridors. The selection of the corridor is not accidental, and is subject to various conditions. Among them, the distribution of origins and terminations of traffic, the continuity of routes and their integration in the system of traffic which is being gradually formed, the requirements of routes in terms of energy, their length etc. can be considered the most serious ones.

The theoretical as well as the actual traffic capacity of the corridor - if having certain parameters and working under certain conditions - is the same in all localities with developed land. The intensity of traffic in the corridor comes into conflict with the existing development only if - in addition to the capacity limits - the use of land surrounding the corridor, too, is being evaluated. It is then necessary to search for limits of the allowable intensity of traffic in this corridor.

The allowable intensity of traffic is a value agreed upon by the society. However, this value has appeared only recently when the intensity of traffic began to exceed acceptable limits. In terms of current regulations and standards, the allowable equivalent level of noise, and the allowable level of the concentration of air pollutants and traffic as related to being detrimental to human health are defined. Noise and air pollution are being checked, with consistency, in locations with concentrated housing situated near the basic system of trafficways, these localities having the most serious conflicts. Even if the specific values of the equivalent levels of noise and of the concentration of air pollutants are not known, the basic evaluation of the locality of a distributor traffic corridor can be made, making use of the knowledge of the land use in the surrounding area and its evaluation.

The location of traffic routes in Brno, for example, was questionable in some areas. Significant traffic routes of the basic system of routes, some of them having even the parameters of an expressway, have been integrated in suburban residential areas (Zidenice,
The most significant conflict between historical routes in Brno occurs in the locality of the internal semicircle road.

The examples of Brno suggest that the naturally-grown urban structure is being impaired by traffic whenever a part of the city with a homogenous urban structure - to some extent a "self-sufficient area" - is suffering from whatever kind of through-traffic with a higher intensity. To avoid this impairment, traffic routes of the town-wide distributor network (that is, the set of local and service highways), must be located only in localites, in which the individual city parts with homogenous urban structure and definable concentric relations to the local centre touch one another.

An exact designation and definition of the self-sufficient area, also containing the definition of its basic urban functions, is considered a basis for a successful location of a trafficways of city-wide importance. The transitional areas between the individual city parts require a thorough urbanistic analysis because they can be touched by the proposal for the location of routes of the city-wide system, and it is necessary to ensure that they are hit by the traffic as least as possible. It is important to define the size of the transitional area connecting the individual parts, which will be suitable for the technical organisation of trafficways belonging to the urban distributor network, as well as those supradistrict trafficways, whereon traffic can be expected to exceed the permissible intensity. In the case that a supradistrict traffic route cannot be located in the transitional area, and a larger intervention in the urban structure of the district is needed, it is necessary to locate the route in a place for which it can be proved that the damaged urban structure can be restored to return to its previous form. However, the complementation of urban structure is not sufficient; it is primarily necessary to restore all relations in the particular area that may be touched by the new traffic route.

4. THE PRINCIPLES OF THE LAY-OUT OF STREETS

The aim of this chapter is to propose an optimum normative arrangement of the characteristic profiles of streets in the basic types of urban structure, which would be in harmony with its spatial value and function. The requirements of good environment, the efforts to overcome barriers easily - and roads in residential and central areas are sure to be barriers for pedestrians -, the related aesthetic and cultural aspects, and the acceptable scope of interventions in the existing urban structure, too, limit the maximum values of traffic load and other traffic parameters.

4.1. General Principles

The street profile is the point of encounter between the urban structure and the transport network. A harmonious organisation and a balanced amount of all desirable functions of the street significantly help enhance the image of the city, and are an inseparable part of its urbane value. The inherent laws of the relations between urban structure and traffic network, and also the absence of social functions of streets, which is strongly felt at present, have led us to the definition of four urban categories of streets: business street, residential street, city street and boulevard. We made an attempt to organically integrate these terms into the categories of trafficways, being aware of the fact that the traffic and urbane criteria of evaluation are interlaced.

The Business Street is a public street corridor in the centres of cities or in the centres of the city parts. It has an important social function. In terms of traffic, its importance is small, being reduced to the necessary stationary and local traffic. The facilities and the equipment of the see-level is in correspondence with its function, and with the importance and function of the surrounding development. The width of the street is limited only by technical, or
hygienic and social requirements respectively, to preserve minimum distances between buildings.

The Residential Street is a semi-private space between buildings and has the form of a street. Its function is strongly residential. It is equipped with conveniences corresponding with the communicative character of the space (benches, preschool-childrens' playgrounds, decorative front gardens etc.); the main entrances of buildings are oriented toward this street, these entrances being accessible by private vehicles. Its width is limited by hygienic and social requirements in terms of minimum distances between residential buildings.

The City Street is a public or semi-public street corridor located in an area dedicated to housing and public facilities. It provides for the service of the area, thus creating the necessary social or residential "forefield" for the surrounding housing. It is not part of the superior local trafficways network, nor is it part of the urban trafficways network. Here, the frontgardens, open spaces in front of public facilities, pavements and carriageways with the possibility to stop or park cars, or avenues respectively, are located. The width of the City Street is limited by social and hygienic requirements in terms of minimum distances between residential buildings and, in the case of public facilities, also by the minimum width of the individual functional belts. These streets form the basic street network of the city parts.

The Boulevards are clearly-shaped public corridors creating the main axes of the city parts. They have a traffic function and a social function. As a rule, they are equipped with the necessary "forefield" to serve the surrounding development, with avenues, pavements with marked-off cycle tracks, with a carriageway with parameters allowing public transport to move and vehicles to stop thereon. Their width is limited by the minimum widths of the individual functional belts. These streets create the main skeleton of streets.

4.2 The Lay-Out of Streets: Their Spatial Requirements

Spatial needs of streets are given by hygienic, social, aesthetic and technical/operational requirements. Hygienic requirements are understood to represent subjective demands of population on the one hand, and exact norms on the other hand. However, they always depend on the specific conditions of the particular area and on technical possibilities. The aesthetic and social requirements are significantly subjective. They reflect both the attempts to achieve a certain communicativity of housing and the justified need to preserve the necessary privacy. The traditional content of the term street, as it has been developing over centuries, is also important. It is here that we are trying to specify, in greater detail, the requirements of the individual types of trafficways, which often enter the image of the city as destructive elements. In doing so, we are trying, to some extent, to determine the real parameters of the street, thus harmonising urbane and operational aspects.

I. Highways

- The divided four-lane highway:
  - Traffic lane: width - 3,5 m (maximum), 3 m (optimum), 3,0 m (minimum)
  - Centre strip as wide as needed for the public supply system and for the widening of the carriageway at the entrance to the level crossing (to turn left); in the case of grade crossing, the optimum width of the guard fence is 0,75 m.
  - Emergency lane: width - 2,50 m in the external zone, in the internal zone with no continuity (bays: width - 2,50 m).
  - The marginal strip 0,50 m between the traffic lane and the guard fence, 0,25 m between the traffic lane and emergency lane.
II. Local Highways
The four-lane highway:
- Traffic lane: width - 3,25 m (maximum), 3,00 m (optimum), 2,75 m (minimum)
- Parking lane and turn-of lane, the width is dependent on the number of parked heavy vehicles - 2,00 m /optimum/, 1,80 m (minimum),
- Cycle lane in the adjacent traffic area - 1,50 m wide,
- The pavement - its width depending on the function of the area - 2,25 m /minimum/ or 2 m on undeveloped sites,
- Pedestrian and cycle paths - 6,00 m wide /optimum/, 4,00 m /minimum/,
- in the case of bus or trolleys traffic, it is necessary to consider the suitability of applying the minimum width of traffic lanes - 3 m will suffice.

Two-lane highway:
- Traffic lane - width: 3,25 m /maximum/, 3,00 m /optimum/, 2,75 m /minimum/,
- Parking lane - width: 2,00 m /optimum/, 1,80 m /minimum/,
- The other parameters are identical with those of a four-lane highway.

III. Arterial Highways (boulevards)
Two-lane highway:
- Traffic lane: width - 3,00 m /optimum/, in the event of the parking lane being part of the highway, 3 m is a minimum. Otherwise, the minimum is 2,75 m.
- In the event of applying the parking lane, drainage is part of it,
- Parking lane: width - 2,00 m /optimum/, 1,80 m /minimum/,
- Car-track lane, not elevated: width - 6,25 m
- Green belt: width - 1,50 m /minimum/ - it can be combined with parking,
- Cycle track: width - 1,00 m /minimum/,
- Pavement: width - 5,00 m /optimum/, 3,00 m /minimum/ (with other service highways: the minimum can be as much as 1,50 m, dependent on the intensity of pedestrian traffic).

IV. Service Highways
- Traffic lane: width - 2,75 m /optimum/, 2,50 m /minimum/,
- Drainage lane: width - 0,50 m /optimum/; in the optimum case, the drainage lane is not part of the traffic lane, in the minimum case, it is part of it (minimum = 5,50 m, maximum = 6 m in width),
- Pavement: width - 1,50 m /minimum/, 2,25 m /optimum/; the optimum value varies according to the intensity of traffic.

V. Tranquillised Highways and Non-Motor Traffic Ways
- Traffic lane: width - 2,50 m /optimum/, 2,25 m /minimum/,
- The width of the two-directional traffic lane if providing, at the same time, for stationary traffic, bays and passing places, equals the minimum width of the traffic lane,
- The width of the pedestrian or cycle paths is guided by the above principles.

4.3 The Enforcement of the Principles of the Lay-Out of Streets
The minimum spatial requirements of various categories of streets make it possible to measure the capacity of the urban structure to handle the traffic load. In particular areas, in spaces marked off by street lines, only a certain type of trafficways with a limited number of traffic lanes and a limited width can be led if a change of the use of land or a degradation of the street profile are ruled out.
The number of traffic lanes and their width predetermine, at the same time, the maximum number of vehicles. It appears that there is simply no possibility to pass through some localities in Brno. On the other hand, there are streets, the width of which is greater than necessary from the point of view of traffic. About 1000 to 2000 vehicles/24 hours move on the two-lane highways, with the width of lanes exceeding 3 m. (From the technical point of view, their capacity is ten times higher). It is natural that this full load is frequently intolerable, at least in terms of hygiene. In many cases, this highway, that is the width of the carriageway, is overdimensioned, and, if utilised intensively, the highway ceases to fulfil its social function. Selecting the proper width of the traffic lanes, by applying various retarders and other technical restraints, thus influencing also the capacity and safety of these highways can adequately reduce the speed of vehicles moving on these highways. These measures are suitable for residential areas, for example, because they reduce the number of vehicles traversing them, and the adverse impacts of traffic on the area to a desirable limit.

The widths of the individual functional lanes can be adequately enlarged in areas that permit it, and in the event that there is a justified need for locating a new function in the particular area. However, this enlargement is limited by the fact that a larger amount of traffic could endanger other functions in the area (this is true, particularly, of the carriageways and the adverse impacts of traffic noise). If justified, the functional belts can be narrowed, but only exceptionally and in such a manner that this does not prevent the area from functioning.

4.4 The principles of the lay-out of streets: their impacts on urban development

The principles of the lay-out of streets are based on the precondition that, when handling traffic in cities, particularly when forming the relationship between the urban structure and the transport network, it is necessary to show respect not only for traffic, transport and mobility, but also for the enormous physical value of the urban structure. These values find their overall expression in the normative standard of the urbane milieu of the street, this standard expressing the socially accepted environmental, hygienic and cultural limits, as well as the limits of civilisation of this milieu. The proposed types of streets express the possibilities of their lay-out in terms of functions, operations and spaces.

The principles of the lay-out of streets make it possible to meet the requirements of the particular area in terms of its functions, operations and spaces from the point of view of the quality of the urbane milieu desired.

The principles of the lay-out of streets, as related to a broader area and its urban structure, enable to test them in terms of traffic and its load capacity. They make it possible to designate areas in which the normative values of the urbane milieu can be achieved. The area that has been designated that way is characterised as the environmental neighbourhood.

It is only on periphery of these neighbourhoods that highway, connecting the individual parts of the city, should be located. The areas that can be transversed by these highways include the following:

- A free corridor transversing an undeveloped or sparsely developed area, this area being mostly valuable in terms of nature. Such highways can be located on sites whereon the existing use of land can be reduced, the development released or where the open space is of low ecological value (such as areas with full-grown greenery, or protected areas belonging to the system of ecological stability).

- A continuously developed or urban structure with a clearly shaped street profile in the particular area, wherein a highway can be led.
A continuously developed urban structure wherein a highway cannot be led. In this case, a technologically intensive constructional rehabilitation and redevelopment is needed, and/or the construction of an underground trafficways is necessary which requires special technology and high investments.

In areas whose urban structure is being established as a new one all requirements made by highways can be met as needed according to the appropriate schedule.

The designation of a stabilised area of environmental rings, and the designation of possible corridors for highways is an important basis for a serious solution to the problems emerging from the relationship between the urban structure and the transport network of the entire city.

This approach makes it possible to set the scope of conditions under which traffic and the city itself can be handled in an integrated, comprehensive way, and on the grounds of target requirements. Employing this approach, not only the multiple partial needs, but also all the requirements made by a high-quality urbane milieu can be met.

Among the crucial conditions, the following ones may be of importance:

- The reduction or extension of the utilisation of the area in terms of its functions and the volume of traffic,
- The necessity to revitalise, reconstruct or redevelop the area,
- The necessity to design highways that place great requirements on technology (underground trafficways).

In addition to this, it is obvious that the above mentioned approach to coping with the relationship between the urban structure and the urban transport network can encourage considerations about the necessities and possibilities to correct the division of labour within the settlement, thus also improving traffic flows, namely in favour of a better utilisation of the urban structure and a better distribution of traffic operations within this structure. In addition, this approach may also result in a question, namely, whether the city authorities and the citizens can change their attitude to the modes of traffic and to the total mobility.

**RESUMÉ**

**THE RELATION OF THE URBAN SPATIAL STRUCTURE AND THE TRAFFIC NETWORK OF BIG CITIES**

**Key words:** urban spatial structure, traffic network, big cities, urban environment, urban value of the territory, environmental district, optimum arrangement of streets, harmony of the town and the traffic.

The enormous increase of traffic in towns means more mobility and higher intensity of residential distribution of work, at the same time however it also created a series of conflicting situations in people's every day life, it disturbed their living environment, it disturbed the towns as entities and their working ability.

The enormous increase of traffic in towns means more mobility and higher intensity of residential distribution of work, at the same time however it also created a series of conflicting situations in people's every day life, it disturbed their living environment, it disturbed the towns as entities and their working ability.

The experience from the control of traffic and from planning the development of towns demonstrate that ensuring the harmony between the traffic and the town represents one of the most serious problems of contemporary communal policy. This problem involves two levels of treatment. On the social level it is a question the social, economic and cultural problems of the process of town planning, of the possibility to control this process and in this way also of its influencing the growth of towns. Further more it is a question of value orientation in the approach of society to economic development, to protection and creation...
of the living environment and to the development of traffic. On the level of control of the operation and development of the town it is then a question of selecting the optimum traffic system, of ensuring the safe traffic and of removing the negative influences of traffic on the urban environment. It is especially possible in case of ensuring the harmony between the town structure and the traffic network, between a good organisation of the operational exploitation and the preservation of an acceptable level of urban environment on the given territory.

We propose to consider the degree to which we can ensure the harmony between the town structure and the traffic network as a sort of "Urban Value of the Territory" which may be determined by means of the following criteria:

- Functional use
- Traffic
- Spatial shaping (cultural values)
- Environment (hygiene, environment and safety).

The determination of the urban value of the territory will serve as objective starting point for establishing the proposal of its restructuring, reconstruction or for a proposal to change its traffic organisation. By means of a collection of pattern criteria it will be also possible to evaluate the possible variants of a proposal of adaptations of the town structure by the method of multi-criterial evaluation.

The evaluation of the relation of the town structure and the traffic network of a town may be realised on three levels:

1st level - the City Street as characterised by the arrangement of buildings, open spaces and communications and their use through residential activities and traffic.

The evaluation is oriented to the bearing maximum capacity of the street profile for traffic. The evaluation may express the limitation or the possibilities of enlarging the functional use and of the traffic of the municipal (urban) street or also the need for its reconstruction.

2nd level - town-planning structure as a typological section or urban territory characterised by the land coverage as used at its historic period and street network and their exploitation by residential activities and traffic.

The evaluation is oriented to the bearing power of the town planning structure for traffic. The evaluation may determine the territory that from the point of view of functional facilities and traffic is self-contained. These territories are called the "environmental districts". They may become the basis for the design of a new town planning organisation of the territory. On the perimeter of these districts only there should be the municipal communications that ensure the traffic between city districts.

3rd level - the town as a residential entity as characterised by the system of development and open spaces, by location and allocation of residential functions and the systems of traffic with the main municipal communications.

The evaluation is oriented to the maximum capacity of the town as a residential entity for its traffic. The evaluation may - on the basis of the analysis of urban structure and traffic network - determine the urban values of the whole territory of the town and may define a territory stabilised as to its environment. On the other territories and on the perimeter of environmental entities it is then possible to define the traffic corridors that are the base for creating the system of the main city communications. The value of the town may also
express the needs for its functional restructuring whose application is desirable for achieving a more rational residential distribution of work, limitation of mobility and in that way a higher effectiveness of traffic. The evaluation may also in case of the town express the needs for reconstruction of its urban structure. This is important where it is not possible to adapt the town to new needs just by means of organisational measures.

The research was oriented to the evaluation of the 1st and 2nd levels. For them the research proposed the system of evaluation, the typology of urban structure and traffic network. Further on were designed the principles for optimum arrangement of city streets and the principles for optimum arrangement of the town spatial structure.