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**STRATEGIC DIRECTION SESSION ST5**  
***Access to mobility: a basic social service***

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## **SUMMARY**

The problems of population's free mobility represent one of the rights entailed in the Bill of Basic Rights and Liberties. Its importance for the everyday life is ever growing. These days people demand wider and wider access to mobility: the modern age has brought about a whole range of demands upon transport that some time ago were almost inconceivable. And yet, the growth of the demands is in an abrupt contrast with lessening tolerance to congestion, delays, or low quality of some transportation services. These aspects, which are also stated in the European Union documents, have been incorporated into the very basic aim of the Transport Policy of the Czech Republic and are intrinsic parts of its strategic objectives. There are instruments to decrease the transport volume (for instance, area planning, development of up-to-date information and communication technologies, internalisation of the transport externalities), however; it must be stressed that their function is only limited. The growth of requirements upon transport is in itself a token of modern society, reflects economic and social integration as well as leisure travelling, and produces a number of positive economic and social phenomena.

The fundamental condition for ensuring the population's mobility, which is the key concept of the conference and the key subject matter of ST 5, is the existence of high quality transport infrastructure. It is necessary to divide this field into solving the problems of infrastructure in agglomerations and in other areas. Special attention is paid to international (TEN/TINA) and national transport networks. It is necessary to respect both capacity and qualitative perspectives and finish building the basic network of highways and roads. It is necessary to prefer reconstruction that is spatially and environmentally less demanding to building brand new roads; this is consistent with the Transport Policy of the Czech Republic. The problems related to maintenance of roads of various categories represent a special issue. Traffic accident related problems are also an important aspect. The number of people killed on roads is really menacing: there are data saying , that the number of people killed on European roads every day is comparable to a crash of a medium-size aircraft. The issue of the human factor is dealt with in Section 2.

There must be a clear concept and time schedule accompanying the development of transport infrastructure. More than a year ago, in January 2001, a document entitled "Time Schedule and Financial Backup of the Realisation of the Proposal for Transport Infrastructure Development in the Czech Republic" was created. The purpose of this material is to set out this concept, funding method and time schedule. Besides the state budget financial help from the European Union is also used in order to ensure the funding, and there may be some other additional resources (such as the PPP concept). The preparation of building new roads and highways is a process, that is structured into definite stages and has clear rules beginning with determining the building corridor, undergoing the EIA process and area decision and ending up with the approval and the actual realisation. Area planning is a parallel process. During this process it is very important to maintain a dialogue with all participating parties (see the Section entitled New Methods of Consulting the Public). The system of investment assessment is also an important part of the development of the road and highway infrastructure. For the Czech Republic a new system HDM - 4 was adjusted . This system is dealt with at the end of this report.

Providing public passenger transport services in an area is related especially to the quality of the public passenger transport and to the up-to-date concept of the Individual Car Transport (ICT) involved in the so-called „citizen’s network“ by means of the „park & ride“ systems (P&R - as scattering transport linked to the public passenger transport main lines). The Ministry of Transport and Communications supports the automatic integration by means of financial support in the process of ordering studies concerning transport services accessibility and by other means. In order to justify the need of high quality public passenger transport it is necessary to respect both the social aspect and the capacity, and especially ecological aspect. At this point the principle of the so called „public service obligation“ acquires great importance. The purpose of this principle is to define the rules for operation and funding for the public passenger transport lines. And yet we must be aware of the fact that the public services provided in an area cannot concentrate only on a particular transport type, but all transport types must work as a system, i. e. inter-modally. This principle must be followed both in the field of the public passenger transport (as an alternative to ICT) and in the field of goods transport where it is necessary to attempt at finding such ways that will be in accordance with principles of high quality logistics. In other words, it is necessary to attempt at introducing combined transport lines. This should help to optimise the transport system function and reduce the ecological loading of an area.

Innovation in the process of replacing technologies is another problem area, that is dealt with. The measures stated above are usually implemented with regard to the situation abroad, especially in the neighbouring countries. Taking into account the Czech Republic’s membership in the European Union , that is coming up , we must ensure that the legislation of the Czech Republic is consistent with that of the European Union. At the same time different measures are tested in Czech Republic and if proven are introduced here. From this perspective we must say that the Czech experts’ participation in the work of technical committees of PIARC has so far been successful. As far as the realisation of the measures proposed in the everyday practice is concerned , the key issue is still the way of sharing relevant information by all transport experts and providing users with the information.

## **1. Mobility in the Czech Republic - the Basic Problem Framework**

### **1.1 Mobility in the Czech Republic - Transport Policy of the Czech Republic as the Basic Mobility Framework, The White Book of the EU**

The basic framework covering the mentioned problems in the Czech Republic is entailed in the document entitled **The Transport Policy of the Czech Republic**. This document defines the most important objectives:

- ***The basic objective*** of the transport policy of the Czech Republic is to realise the freedom of permanently sustainable mobility of persons and things as an attribute essential for meeting the requirements entailed in the Bill of Basic Rights and Liberties and the requirements resulting from the free trade, and to provide an optimal support for sustainable development /of what? / by means of appropriate shaping of the transport system.

- **The following** are a few of the other **objectives** that are in some ways related to the issue of mobility accessibility:
- harmonisation of the conditions for transportation services providers entering the transport market
  - a step-by-step implementation of the EU's particular transport related political measures in the conditions of the Czech Republic
  - maintaining the state's influence on the transport infrastructure development and continuing in efficient programmes of transport infrastructure development
  - amending the set of laws related to taxes and the field of transport in such a way that transport related taxes and charges are brought into harmony including the continuing internalisation of external transport costs
  - harmonising the offer of capacities with the demand while respecting the changes in the division of transportation labour
  - creating equal access to rules for the transport infrastructure and transport facilities
  - preferring public passenger transport to individual transport and improving the quality of the public passenger transport
  - active co-operation on creating regional development programmes
  - reducing and eliminating the negative impacts of transport upon the environment
  - a step-by-step improvement of disabled persons' mobility

The particular transport fields are within the transport policy conceived of as parts of the transport system of the Czech Republic, therefore, the mobility problems are of multi-modal character.

The Czech Republic's transport policy and the **Medium-Term Strategy of the Sector of Transport, Telecommunications and Post** that originates from the transport policy have set out the objectives for the period before the Czech Republic becomes an EU member state. At present work on updating the transport policy to cover the period following immediately the association with the EU are being carried out. In this perspective the document **The EU White Book - European Transport Policy for 2010: Decision Time** is of great importance for the Czech Republic. This document was issued in 2001. Its key programme is to emphasise the solution of the worst transport problems of the EU with a pronounced necessity of multi-modal approach. This can be well illustrated by a quotation from the White Book:

*“Inter-modality is essential for development of alternatives able to compete with the road transport. There have been only a few achievements in this field so far. ... This makes it necessary to undertake appropriate steps to ensure more complex integration of the particular transport types and to offer a considerable transportation capacity in the form of links in effectively controlled transport chain linking all the particular transport services. ...”*

## **1.2 The Basic Condition for Mobility - Transport Infrastructure**

Transport infrastructure is a basic condition for providing mobility, however it is not the only one. Its development falls within the competence of the public sector. The development of both national and international networks, and responsibility for the proportional development of the particular transport types networks is controlled by the state. The responsibility for regional developments is being transferred to the competence of local authorities (this being the case with e.g. Roads of 2<sup>nd</sup> and 3<sup>rd</sup> class). The local authorities in question are regions, as was decided in 2000. Only local networks fall within the competence of municipalities or private subjects (local and utility roads).

The following represent important aspects of transport infrastructure:

- the network density
- parameters of the particular roads (capacity, design speeds, local limits, equipment, etc.)
- technical conditions of the roads based on the quality of maintenance

Generally, we can say that the road network density in the Czech Republic (0.7 km/km<sup>2</sup>) is sufficient. However, the road parameters and technical conditions are not.

According to the Road Act roads are divided into four categories:

- highways
- roads
- local roads
- utility roads.

Roads are divided into three further classes, and the primary roads may also be constructed as expressways (R category). As far as the maintenance and capacity perspective is concerned the difference between highways and expressways is almost none. Even many primary roads that do not belong to R category are built as four-lane roads with a central reserve, intersections, and sometimes the speed limit equal to the category of highways and expressways. This must be taken into account when assessing the highway network density (2001).

The highway network density in the Czech Republic and selected EU countries Chart No. 1

State Road Category Network Density (km/km<sup>2</sup>)

Czech Rep. Highway (H) 0.006

Czech Rep. H + Expressways (R) 0.010

Czech Rep. H+R+ Roads S/4 0.011

Germany Highway 0.031

Austria Highway 0.019

Belgium Highway 0.054

France Highway 0.015

EU average Highway 0.014

The sufficiency of transport networks must be assessed in three segments:

- the infrastructure servicing less urbanised areas
- the infrastructure servicing city and town agglomerations
- selected network for long-distance and capacity transport

### ***1.2.1 Transport Infrastructure in Less Urbanised Areas***

The services provided in the less urbanised areas are completely dependent on road transport. It can be said that the road network density in the Czech Republic is sufficient and that all municipalities and their important areas are linked to at least third-class roads with paved surface.

From the capacity perspective the third-class roads network that is used for providing transport services for municipalities or their parts is sufficient. However, their technical conditions caused by insufficient maintenance due to limited financial means are very poor.

### ***1.2.2 Transport Infrastructure in Agglomerations***

Transport networks in agglomerations belong to the most loaded networks. The problems are caused by the fact that these are localities with limited space and high prices of land. This is a great problem especially in the European conditions because in the historical towns there are usually narrow streets and due to protection of urban objects of historical value it is impossible to carry out demolitions. Transport in agglomerations represents a great problem and is impossible to solve without various restrictive measures (entrance fees, limitation of the number of parking places, collecting fees and charges for parking places, pedestrian zones, preferring public passenger transport, intensification of the capacity using intelligent systems ITS, etc.). Given all this it becomes apparent that a great emphasis is laid on public mass transport as far as passenger transport is concerned, and on development of citylogistics in the case of goods transport.

The level of motorization in the largest city of the Czech Republic, in **Prague**, has reached European level (1 passenger car per less than two inhabitants), but the portion of the mass transport is still fairly high (60%). Prague must face the problem of lack of wide roads; a great part of the inner city circle is built in tunnels. It is necessary to finish building of the expensive outer city circle. The problem of intensive transport multiplies in autumn and winter due to bad climatic conditions (frequent periods of stable or even inverse weather patterns of the air masses of the Prague Basin causing difficult vertical mixing of air ). During these periods the permissible limits of pollutant concentration in the air are dramatically exceeded. **Other** lower situated **major cities** have to face similar problems.

### ***1.2.3 Transport Networks of International and National Importance***

The modernisation of the long-distance network represented mainly by highways and expressways began gradually in the late 60's of the 20<sup>th</sup> century by building the Czech highway D1 (Prague – Brno) and D2 (Brno - Bratislava). As is apparent if we take a look at the Chart No. 1 the density of higher-category roads is falling behind the European standard, however it is drawing near some of the EU member states. The basic network has not been finished. It should roughly be finished between 2010 and 2015. After it has been finished, it will be necessary to concentrate on increasing the capacity of the sections around large city agglomerations and not on building whole long-distance sections.

However, in this context we must still be aware of the fact that no matter how dense the highway network is, the problem of congestion will not be solved. This is proved by the situation in Germany or the Benelux countries where the highway density has reached its feasible limits, but the congestion is still growing. That is why the White Book of the EU on transport policy stresses integration of other transport types.

### ***1.2.4 Transport Infrastructure Development***

Development and building of the transport infrastructure is very expensive especially the more so in the case of a transforming economy, that has to eliminate the delay caused by previous historical development. That is why various methods of funding the building are sought and the help coming from the European Union is very useful.

The transport infrastructure development must result from a concept, that will produce a coordinated development of all types of transport infrastructure. The basic material to be used in this field is the document created by the Ministry of Transport and Communications entitled **The Schedule and Financial Backup of the Realisation of the Proposal for Transport Networks Development in the Czech Republic till 2010**. This document is a part of the Czech Republic Government Resolution No. 145/2001. In order to improve the concept and define it more precisely, the Ministry of Transport and Communications has ordered the project entitled the **Development of the Transport Networks in the Czech Republic till 2010 with an Outlook to 2015**.

#### *1.2.5 Regional aspects of developments of transport infrastructure*

The Regional Offices created in 2000 are in charge of the development of the roads of regional importance. The Government must carry out the task of supporting those regions that are falling behind the other regions while respecting the economic power and structural affectedness of the regions. The Ministry for Regional Development is responsible to carry out this task. The document of 2001 entitled **The Regional Development Strategy of the Czech Republic** was supposed among other things to assess the particular regions in this perspective, and also to assess the quality of public passenger transportation services.

The basic documents that solve the transport infrastructure development of the particular regions are **region development programmes**.

#### *1.2.6 The Process of Road and Highway Building in the Czech Republic*

The state is the main subject financing the transport infrastructure development in the Czech Republic. The state does so using the State Transport Infrastructure Fund (STIF). The investor of the building of new roads and highways is the Road and Highway Management of the Czech Republic that is a state subsidy organisation falling within the competence of the Ministry of Transport and Communications. The Road and Highway Management provides for the building plan approved of by the Government of the Czech Republic.

A new law was passed - No.100/2001 Coll. on environmental impacts assessment, which came into force on 1 January 2001. This law emphasises synergic and long-term effects and divides the environmental impacts assessment into two areas:

- b) Assessment of road building work, activities, and technologies (regulated by the new law No. 100/2001 Coll.)
- c) Assessment of the impacts of development concept and programmes (regulated by the original law No. 244/1992 Coll.)

During the last three years there has been a positive shift in enforcing the above stated procedures, which is apparent also in the SEA and EIA processes. The following are the basic strategic documents in the transport resort assessed from the perspective of possible environmental hazards:

- **Medium-Term Strategy of the Sectors of Transport, Telecommunications and Post till 2010**
- the concept **Transport Network Development in the Czech Republic till 2010**

The preparation of a highway or road is a long-term staged process involving step-by-step specification of the route and technical parameters and participation of the public officers and also a number of experts working in the fields of civil engineering, designing, ecology. The basic stages of a preparation are these:

1. the State's transport concept
2. specification of the road building corridor by means of a look-up study (VST)
3. overall assessment of the road building by means of a practicability and usefulness study (STPU)
4. specification of the route by means of a technical study (TST) and EIA negotiations
5. documentation for land development
6. documentation for the work permit

There is a process parallel to what has just been said, a process that is in mutual relation to the preparation and that also influences the actual siting of the road construction site. This process is area planning. Area planning is realised on two basic levels:

- plans of large regions that deal especially with basic concept relations and ways of utilising the particular parts of the territory
- area plans of residential sites that deal in great detail with municipality development conception.

The area plan preparation involves negotiations concerning the road among all participating parties and the public. It is not until the new road has been approved as a construction for public benefit that the state investor is allowed to expropriate private land if their owners are not willing to sell it.

We can sum it up by saying that the current legislation regulating the investment process ensures both a detailed, multilevel assessment of the environmental impacts of the proposed construction and selection of an optimal variant with minimal negative impacts. Besides a number of experts working in many different fields, it is also the public represented by elected municipality authorities, civil organisations, and individuals that participates in the process of the selection.

## **1.3 Transportation Services**

### ***1.3.1 Passenger Transport***

#### **1.3.1.1 Justification of the Need for Public Mass Transport**

We must note that the problem of access to mobility is irreducible to the problem of sufficient road network. The whole transport infrastructure including the road network serves as a basic and essential condition for the access to mobility. However, the ways of using this network for the purpose of providing transportation services are of equal importance.

Passenger transport can in no country do without the support of public authorities that are interested in decreasing the growth of the individual transport. The support of public passenger transport should be pursued as a public interest due to the following reasons:



### Social reason

The number of those who are due to many different reasons unable to drive motor vehicles or cannot afford to buy their own car is growing all the time. An important role is played by the fact that the law directs obligatory school attendance; therefore it is necessary to enable children to attend their lessons – and children are not allowed to drive cars. The law No. 111/1994 Coll. on road transport defines transport on social grounds as basic transportation service. Transport of this user group is not very demanding as far as the quality of the service is concerned; the extent of such transport is determined by local conditions (the beginning and end of lessons, working hours, etc.). Mass transport providing for the basic functions of municipalities is the inevitable means for maintaining the country inhabited. Transport funding thus has a function similar to that of agriculture funding.

### Reason for insufficient capacity of the road infrastructure.

In order to demonstrate this spatial reason, we can use the following scenario: a desire for a free lifestyle expressed among other things by a desire for free unhindered movement; all this combined with the influence of the market → excessive use of cars + lack of willingness to pay taxes to fund the public transport → hindrance and consequential collapse of the public transport system + insufficient road capacity and large congestion → the necessity to use a car, for there is no other possibility → the impossibility to avoid congestion, loss of personal freedom in the area of mobility + the necessity to get more room for ICT + the necessity to pay higher taxes in order to eliminate external costs. In short:

- The Earth is too small to allow all its 6 billion inhabitants to drive their cars only.
- The existence of public transport is good even for those who do not use it, for those who use it do not lessen the capacity of ICT communications.
- The existence of public passenger transport means an opportunity of option for everyone and is, therefore, a precondition for real freedom of mobility. Everyone may now and then get to a situation when using mass transport is due to many reasons an advantage.

This reason makes it clear that we need a transport able to compete with ICT as concerns both the quality and extent of the services provided.

### Ecological reason

This is the most serious one. Transport is an intrinsic part of civilisation. And civilisation must, as is believed, develop along the lines of *sustainable development*. The environment on Earth is indivisible, so is sustainable development. This article, unfortunately, does not allow of enough room to justify in detail why the most important reason for operating the public transport should be the ecological one. We have to be content with the conclusion that transport together with agriculture are the biggest pollutants and that transport is responsible even for some damage that has so far been attributed to other human activities.

The ecological reason makes it apparent that we need a transport able to compete with ICT both on the side of service extent and quality and on the side of the price we pay for the services. On the other hand, the car must be linked to the passenger transport chain and must become a pronounced part of the so-called citizen's network.

### 1.3.1.2 Ensuring Availability of Transportation Services in the Czech Republic

The current transport policy fostered by the Ministry of Transport and Communications, which follows the concept and regulations of the EU, supports such a public transport system that features the coach line transport, railway passenger transport and city mass transport with links to integrated transport. The policy is concerned with both operational and economic backup. The Ministry emphasises the environment protection.

The Ministry has reacted to the unfavourable trend in the development of bus and coach passenger transport and decided to contribute as much as 35% to cover the costs of the **Transportation Services Availability Studies** ordered by district authorities. The Ministry started this activity in 1997 and went on in 1998, 1999, and 2000. The original intention to optimise the bus and coach transport was gradually extended to cover the entire public transport including the railways. The studies were held to be the prerequisites for optimal solution of the transportation services availability. The results serve for the purposes of planning and, if it is the case, providing arguments in favour of the optimisation.

The state furthermore supports the public line transport by means of participation in funding the **car fleet renovation**. The amount reaches approximately 150 million CZK.

In 2001 the system of **compensation for the loss of public passenger transport** was changed. The basic funding changes are as follows:

- separate funding of the costs of the transport route via the State Transport Infrastructure Fund
- the duty to ensure the basic transportation services in an area (i.e. such an extent of transportation services that will provide for fulfilment of the basic functions of small municipalities and will prevent the country from being left empty) using bus, coach and railway transport was transferred to regional authorities. The contract form of the public service obligations include also compensation for provable loss.
- the duty to provide for the state's transportation needs is ensured on the level of the Ministry of Transport and Communications. This includes operation of higher-class trains, i.e. fast trains, express trains, IC, and EC.
- the public service's obligation to provide the basic transportation services includes also the operation of suburban and interurban transport.

On 1 January 2003 on the basis of the stage II of the public administration reform the regional authorities will acquire the following competence:

- selecting the optimal variant of the transportation services in the region, including the relevant transport network and respect to the environment protection.
- funding the services and activities of public interest and the operation of the infrastructure that results from the optimal extent of the services in the region.

At present two projects are being dealt with. Their task is to help to support the public transport and to stop the decrease in using the public transport. This should be done on the basis of requirements expressed by the Ministry of Transport and Communications. The projects are also supposed to suggest changes in the organisation and funding of the transportation services in relation to the public administration reform.

The project entitled **Funding of Transportation Services** will have been completed by the end of 2002. The project is targeted at **determining the methodology of calculating the provable loss in bus, coach, and railway transport and proposing a system of its compensation**. The project will do so on the basis of existing data on transportation service finances.

In 2002 the Ministry of Transport and Communication's another reaction to the new organisation of the state was the order for a rationalising project **Methodological Materials for Solution of Regional Transportation Services**. The project will be finished in December 2002.

The aim of this project is to provide for information and methodological support for the new public administration bodies – regions. This concerns both the spheres of autonomy and enforcing the state administration's competence transferred to regions. This is especially the case with a uniform procedure of licence granting, approving of JR and creating materials for the national information system of JR, concluding contracts concerning public service's obligations, optimising the regional transportation services and performing the state's expert supervision.

Within the framework of public transport support in agglomerations and neighbouring regions the introduction of integrated transport systems has brought forth good results during the last several years. These new approaches to and new possibilities in solving the public transport and regional transportation services problems are promising to keep the access to mobility unlimited while following the lines of sustainable transport. We may hope that it is possible to find a compromise between the ever growing demand for mobility and the environment's ability to absorb the impacts of the growing transport volume.

### ***1.3.2 Goods Transport***

#### **1.3.2.1 Goods Transport Services**

In the field of goods transport the Czech Republic is these days facing the trend that the West European countries had to face in the 70's. The goods transport is ceasing to use railway and is instead beginning to use roads in growing extent. Large road vehicles have lower and lower operational costs, which are not in any way affected by the fact that these vehicles considerably damage the road infrastructure. On the other hand the drop of the railway performance is leading to shortening the train lengths, which is accompanied by both economic recession and deterioration of the ecological parameters. Both the Czech and European transport policy consider this trend to be negative.

Trucks with higher capacity damage the road infrastructure more (the extent of the pavement wear is the function of the fourth power of the vehicle weight). However, this does not in fact influence the freighters' expenses. Heavy transport influences the railway infrastructure *wear* far less than it is the case with the road infrastructure. If the goods transport was transferred back to railway, the railway infrastructure maintenance costs would increase relatively little. However, it is estimated that if there were no goods transport on roads, the road maintenance costs would be six times lower.

There are more things causing the goods transport to use roads rather than railways. One of the most controversial and important is the ***Conditions Harmonisation***. This is an old problem that has been discussed many times, but no remarkable progress has been made. The group of the most serious problems includes **damage to the environment, congestion problems, compensation for maintenance, repairs and modernisation, and also damages of accidents not covered by insurance or the social security system**. In other words, the issue of **internalisation of external costs** is not tackled in a sufficient way.

Unfortunately, there is not enough room to deal with these complicated and urgent problems. In the Czech Republic the Ministry of Transport and Communications ordered research projects **External Effects and External Transport Costs, Approaches towards their Internalisation** and they have been carried out.

### 1.3.2.2 Logistics

Providing logistic services has a considerable influence upon the quality of transportation services, for it is logistics that links transport with the production process. Logistics enables minimising production and transportation costs. It enables utilising high-capacity means of transportation on one hand, and supplying the historical town centres using smaller vehicles on the other hand.

Large companies set up their own logistics centres that are used for the purposes of managing the delivery flow in large areas. However, medium and small companies do not have this possibility. For their purposes there should be public logistics centres based on regional principle and created either by a subject offering its services to the particular companies or on the principle of association of participating companies. The smaller companies will find the public logistics centres useful regarding their ability to compete on more distant markets. These centres will at the same time make the goods flow more efficient, which is true of the large companies as well.

The public logistics centres will concentrate the transportation flows, which will enable use of high capacity means of transportation. Therefore, we have to strive to link the centres with terminals featuring more transport types, especially the combined transport.

There is no network of public logistics centres in the Czech Republic, which is a handicap we must eliminate otherwise the medium and small firms will have to face the threat of low ability to compete on the European market. The Ministry of Transport and Communications therefore placed an order for a project entitled **Selection and Elaboration of Logistic Technologies Based on the Intensification Function of Transport Suitable for Implementing in the Conditions of the Czech Republic.** This project involves also a proposal for a report to discuss at the Transport Minister's session and then to use in the inter-resort negotiations concerning the conception and building of the logistic centres. The project was completed in 1999. The Ministry of Transport and Communications is using the results of the project in preparation of further activities in this field.

According to the Bill of Basic Rights and Liberties every citizen has a right to satisfy the basic life requirements near the place where he or she lives. In sparsely inhabited areas this is very demanding as far as logistics is concerned, it is also very expensive. In this case the claim for a subsidy from the public budget provided in the mode of service on the grounds of public interest (i.e. such a service that no firm would accept otherwise) is justified.

## **2. Human and Social Psychology Approach to the Engineering Concept**

The key issue the transport psychology deals with is the system consisting of the person (crew) – means of transportation – transport environment (especially roads). The particular parts of this system mutually interact, but the person performs the controlling function. The activity of this system is usually realised in these subsequent stages:

1. reception of information
2. processing of the information (its assessment and seeking a decision) and realisation of a decision
3. control and check

The aim of psychology dealing with transport is to determine the regularities of human mental activity in relation to transport and to use such knowledge for the purpose of increasing the traffic safety and smoothness.

In 1999 the Ministry of Transport and Communications placed an order for a project entitled **Elimination of the Road Conditions Related Causes of Traffic Accidents**. The project produced the following results:

Roads must be designed, built, and used with respect to humans, their sensor and psychic capacity. Both building of new roads and highways and updating of older road sections must not respect only the economic side but also the side of safety, aesthetic qualities and drivers' time saving measures.

The way a driver perceives a road and reacts to it (to the received and processed information) is very important.

Psychology helps road engineering by providing information on road perception errors that may result in traffic accidents. This knowledge then may be used both in the process of adjusting older roads and building new ones. It is necessary not to use only the knowledge concerning the technical parameters, but also the perception parameters as perceived by the driver.

The researches into localities with high accident rates that have so far been carried out found repeated risk elements on roads. These elements either directly cause dangerous situations or deteriorate the traffic safety on certain conditions. There may be errors in the architectonic or organisational sides of a road. The roads may even meet all the requirements set out by technical standards and still be unsuitable for the parameters of human activities, potentials and ways of drivers' behaviour.

#### **Frequent risk elements on roads:**

- information overload caused by traffic signs or irrelevant information
- driver's mental capacity overload caused by the necessity to make a decision in a short time
- unclear direction of the route caused by an error in its situating in the terrain or by inexpressive surroundings, possible misinformation
- traffic organisation contradicts the natural direction of the route and perception of its quality (the so-called "psychological priority")
- bad view ratio at crossings = obstacles in the view triangles (most often bad view from a side road on a main road, but a side road "hidden" from a main road is equally dangerous)
- short view on the next course of the road – most often hidden direction curves, bad view ratio in direction curves, unclear slope course, etc.
- architectonic and organisational error in crossing design (for instance joining the side road in an acute angle limiting the drivers' view and timely registration of cars approaching on the main road, situating the crossing on top of a height curve, etc.)
- technical parameters of the road making drivers take the risk and rely on co-operation of the others (limited view on the junction, the drive up to the main road following a steep ascent, short slip lanes on highways and expressways)

- technical conditions of a road make it difficult to solve a situation, especially for large and long vehicles, buses (crossings situated in broken terrain, slow start up the hill, not enough room to turn round, distance too short to reach the speed necessary to join in the traffic )
- inexpressive and inefficient warning signs including unsuitably situated traffic signs (too near the critical place, in the curve) failing to perform the intended function of a psychological barrier against risk behaviour
- pedestrian crossings installed in places with insufficient view in both directions and in places where drivers cannot see the pedestrians until very close, etc.

Some other road elements that cause drivers react in inappropriate ways and may lead to traffic accidents are for instance small radius curves, small width of road preceding the top of an ascent, short view, and disused verge. These elements are not dangerous if signalled in time or if there is a good optical control. However, they can lead to feelings of discomfort and lessen the drivers' tolerance when under pressure.

Even such a road design that evidently helps to improve the road traffic safety may produce negative effects. This is the case with for instance too long, direct and uniform sections of roads, and especially highways. Passing through such sections, drivers may succumb to the monotonous influence of the road and its surroundings and as a result of their lessened awareness (that may be accelerated by weariness potentially leading as far as micro-sleep) a traffic accident may occur. That is why the designed length of such a straight section should not exceed the length of two-minute driving at the proposed speed. As another example we can mention too wide roads passing through an urban area. These roads, and mainly their straight sections, make drivers exceed the speed limit.

A transport engineer must in the project respect also the so-called "weaker participants" in the road traffic, i.e. especially cyclists and pedestrians. These have different degree of adaptation and reactions in changing conditions, different degrees of mobility, and traffic experience.

The road projects and designs psychological side, i.e. their expected influence upon those who take part in the traffic, should be consulted at all stages from the preparation till final assessment.

In order to prevent the human factor failure from occurring it is necessary to include in the project of the road and its surroundings conditions suitable for drivers' ability to perceive information, make a decision and react. On the basis of experience we can say that 30 – 40 per cent of all traffic accidents happens on as little as 3% of the total length of the road network. That is why the building and traffic safety improving activities have to concentrate especially on these sections.

Within the project entitled **Analysis of Transport Engineering Characteristics of Roads and the Traffic on these Roads** a transport related psychological research was realised in 2000. The research dealt with the problems and effects of making the traffic sign background more expressive.

The knowledge psychology acquires represents an important contribution for road engineering and road traffic safety.

The Ministry of Transport and Communications has set out the task to work out several projects. The Czech Republic is participating in several international projects as well.

- ordering **road safety audits** – road safety assessment during the preparation process and the realisation,
- determining **the principles of road marking** – obligatory guidelines for using and placing traffic signs,
- **SAFESTAR** – a research project targeted at traffic safety on the TERN network connecting some major European cities,
- **ARROWS** – a project whose aim is to develop a uniform system of measures for ensuring the works in road closures by means of traffic signs, road marking and traffic facilities,
- **Problems of the Safety of the International Transport between the Czech Republic and Austria** – the project seeks to find the differences between the Austrian and Czech transport environments,
- **Principles for Designing Clearways** – are technical conditions bringing on a new view of the problems concerning the design of roads passing through towns, a number of design elements is defined here, the projects presents experience from abroad,
- **Elimination of the Road Conditions Related Causes of Traffic Accidents** – is an analysis based project processing the methodology of identification and solution of localities with high accident rates,
- **Transport Engineering Prediction of Accidents at Crossings** – is a project that, on the basis of statistical analyses and direct observation, determined the dependence of the number of traffic accidents on selected constructional and transport characteristics of crossings. These results are used to work out materials for revision of design elements of level crossings and determination of the principles for the necessary view fields of level crossings of roads and railways.

### 3. New Methods of Consulting the Public

After the World War II the transport planning and town planning became a technical and administrative discipline in which the citizens' participation was next to none. The public began to take part in the processes of development programme preparation and new roads, sites, and reconstruction realisation in the 60's. In this period the post-war lack of apartments was eliminated in the well developed countries and groups of citizens stood out, criticised the new sites, and demanded a comeback towards traditional living in towns and cities. These democratisation trends became part of political programmes, and ever since the 80's guaranteed citizens' participation has been a part of the legal norms regulating the creative and decision making process concerning important changes in towns and cities. The citizen did not become only the opponent, but co-operated on making the decisions concerning important changes in the given region.

It is clear that experts at transport or technical networks, town-planners – i.e. professionals – cannot bear the major responsibility for the reality of the urban life. There must be wide discussions concerning the developments potentials of the contemporary city that is very often the home of many different cultures, religions, interests and economic systems able to co-exist. The differences must become the source of mutual inspiration and must not lead to isolation growth or, even worse, confrontation.

The management of towns and agglomerations development itself had to face new problems in the 90's. Political changes and new values cast doubt upon the planning practice that had been fostered before. That is why new ways have been sought and the planning methods and instruments that had been used till those days cast doubt upon. The programme Agenda 21 from Rio de Janeiro talks about a common course of all parties within a municipality – citizens, enterprises, and interest groups

In many directions new forms of transport and town planning interventions are being made. Planning must result from people's needs, that is why the role of local representatives is strengthening in this respect. The number of those who influence the town or city development has considerably increased. We have seen occurrence of many different interest groups demanding their right to claim their interests and ideas concerning the town or city development. User participation is one of the up-to-date trends in town planning development.

It is the duality of claims featuring on one hand the integration into the global society (for example a city as the transport junction and functional centre) and on the other hand people's need of identity or traffic smoothening that makes it necessary to formulate new city development objectives. The participating public usually makes use of the following instruments: **Urban Design Alliance** (= an association of the citizens who are interested in a solution of a certain part of their urban environment) and **Collaborative Ventures** (a group most often consisting of citizens, local politicians, businesspersons, and experts – developers, architects and town planners).

Due to social and political changes after 1989 more and more self-confident groups of citizens interfere with the goings-on in a town, city or region. However, no group is willing to respect the majority's decision without any reserve, and that sometimes makes the trouble. Appointing common aims and deriving measures in the process of dialogue of all participating parties increases the probability of their realisation. Therefore, it is necessary to find an open and democratic procedure that will involve all the important parts of the urban community in the decision making process. Collection and utilisation of the data on the public's views and opinions is still but exceptional in the town planning procedures fostered in this country. The procedures that make use of the citizens' participation represent a good step towards a new dimension of planning. Experience concerning the citizens' participation in transport planning both in this country and abroad leads to the following conclusions:

- Participation, pro-active planning and citizens' co-operation during the process of creating area planning documentation is essential. Citizens' co-operation is a part of town or city administration and helps to improve the cultural quality of the engineering and town planning activities. The focus of the citizens' interest should leave the sphere of negativism, criticism and opposition, and concentrate on positive co-operation in such a way that the urban structure will result from common will of the citizens as was the practice in the oldest democracies.
- Citizens' participation is a benefit and can be recommended for use in the initial stage, during creating the preparatory materials, analyses, and assessments.
- It is believed that a blend of official procedure under the law on area planning and building order and voluntary informal negotiations can be very efficient.
- Operative co-operation and citizens' participation is very demanding as concerns time and personnel. Citizens' meetings save time, but involves the danger of contingent decisions. A real dialogue with the citizens including evaluation of partial and general interests can be realised better in smaller groups. There are other possibilities: public discussions, workshops, etc.



- The more complicated and complex a project is, the more limited the citizen group's influence might be and, therefore, the more clearly the political aims must be laid down and procedures agreed on.
- The technical perspectives should prevail in the decision making process.
- It would be a good idea to appoint a permanent management of the life of the town and its changes.
- In the process of enforcing ecologically balanced approach towards the site developments the citizens' better awareness and knowledge of the development intentions (and especially their sensibility to transport and the environment-related problems) would be a great help.
- Supervision over the implementation of the prepared urban development and its realisation is also important.

It is necessary to be careful and to approach these issues in a qualified way. The public's participation may produce negative effects if based on the belief that a group of laymen is wiser than a trained expert. The ideas suggested above should not lead to the conclusion that experienced town planners are needless and that the citizens themselves know best what they want and are able to decide what should be built and where. Various initiatives and associations may orient their activities towards the negative side of things and manipulate the objectivity of the decision making process by means of media campaigns and personal insults. The notion of the environment is very often abused in this context.

#### **4. Innovations in the Technology Transfer**

The "Technology Transfer" does not mean only "taking over (often simply buying) technological systems" from partners from often technologically far more developed countries, but it means also and mainly exchange of knowledge and experience concerning effective procedures and methods including sharing the results of research and development projects. In the conditions of "transforming economy" it has been proven very important to "test this knowledge carefully in the domestic conditions".

The Czech T2 centre for the transport resort established in 1998 helped to substitute the above-mentioned narrow interpretation of the T2 notion with the factual sense of the "Technology Transfer". The sense can be briefly characterised as "the transfer of relevant information from those who have it to those who need it".

The "information transfer" activities can be characterised from many different perspectives. With regard to the orientation of this report subject matter the authors decided to emphasise the division according to the assumed addressee of the information.

If we agree on the idea that it is the government's duty to guarantee all citizens fair access to mobility, we can identify two major groups of T2 output recipients:

**Group No. 1 users**, who use the information or technologies for fair, exact and effective decision making or prepare documents to use in the decision making process. The group involves the Ministries' decision makers, road network construction or maintenance workers, and researches or consultants participating in the technology development or testing.

**Group No. 2 users**, the citizens, who are the final recipients of the results of group No. 1 users' work.

Therefore, the role of T2, viewed as one of the supportive instruments of the state (which is aware of its "responsibility") is especially:

As concerns group No. 1/ experts: to ensure effective use of financial means within the resort in the process of development and implementation of new knowledge.

As concerns group No. 2/ users of infrastructure and services: to provide relevant information and fair access to this information.

In the conditions of the Czech Republic we can say that the Government and transport resort decision makers are aware of their basic duty (to guarantee the citizens fair access to mobility) and that they do create, both on the expert and decision making levels, systemic prerequisites for a technology transfer supporting this sphere.

- One of the objectives of the technical policy of the Ministry is to build a "resort expert information system". The documentation centres that used to be scattered are being, due to employment of up-to-date technologies, interconnected (Internet pages, distributed libraries) and the users get far more complex information concerning his field. The T2 centre created at CDV ensures the link to foreign information resources both within the framework of activities performed by CDV as the resort research institute representing the Czech Republic in many international expert organisations, and as the co-ordination centre of the Central European group of T2 centres linked to other centres all around the world.
- At present most of the research and development projects involve also presentation of their results to the professional public. Training, seminars, or participation in professional conferences has become an intrinsic part of designers' or construction workers' activities.
- International co-operation is most often realised among expert divisions of road management and their foreign partner organisations (focused on practical application) as well as on the level of research centres.

During the last four years there have been considerable changes in the sphere of providing information:

- The Internet (previously rejected by many relevant officials) was included into the conception of the state information system as a platform suitable for presenting the public with new information. Functional IS groups were defined and included in one of three levels with corresponding regulations (information guaranteed by the state, information provided by state organisations not guaranteed due to its character, private resources information). These pieces of information are connected via the Government and resort's www-portals. And within the course of creating the information society we create conditions for the public's fair access to this information. (Internet at every school, libraries, public www terminals).

On reconstructed Internet pages of the Ministry of Transport and Communication you can find for instance information on the Ministry's structure and competence, documents concerning new legislation, or applications searching for links in railway, bus and coach schedules. This information is available for free.

## **5. HDM – 4 and the Czech System of Road Evaluation**

The system HDM – 4 is a new instrument for road economy management following up with the previously used HDM – III. In the Czech Republic it is used for economic assessment of actions funded using the EU financial means or foreign banks' loans. It was necessary to adjust the system so that it would fit in the conditions of the Czech Republic. The task was ordered by the Road and Highway Management of the Czech Republic; it was carried out by Mott Mac Donald Prague Ltd. in co-operation with Birmingham University using financial support provided by the World Bank and a whole range of other important organisations. The activity resulted in the proposal for the Czech Road Evaluation System (CRES) laying down the conditions for CRES usage, defining a certain universe of input data and prescribing output forms that the evaluation processor must work out.

CRES uses the modulus Construction and enables to respect four kinds of interference:

- maintenance
- repair
- widening
- new road construction

While defining the basic alternatives the project alternatives are compared to the CRES is introducing limiting conditions for parameters of the pavement technical conditions deterioration:

- Highways max. IRI 5
- First-class Roads max. IRI 6
- Second- and third-class roads max. IRI 8

Other economic assessment parameters were defined in the following ways:

- The length of the analysed period: 20 years
- Discount rate: 8%

The CRES pays careful attention to the Czech Republic's vehicle fleet transfer to categories used by HDM – 4. The CRES also defines the passengers' travelling time expenses and expenses of traffic accidents. The CRES has chosen two representative courses for the yearly course of intensities per hour on roads within and outside urban agglomerations.

HDM – 4 enables employing a great number of climatic zones. The CRES uses three: mild, medium, and rough. These three zones have been defined all data necessary to describe these zones in detail.

The Road and Highway Management uses the CRES as an efficient instrument of economic assessment of proposed construction and adjustments, which will considerably improve the effectiveness of using the financial means at disposal and will result in better road network conditions.

### 5.1 The State Transport Infrastructure Fund (STIF)

The STIF was set up by the law No. 104/2000 Coll. of 4 April 2000 coming into effect on 1 July 2000. The purpose of the Fund is development, construction, maintenance, and updating of roads, highways, railways, and domestic waterways. Besides funding construction and maintenance it provides means to fund research and project activities, study and expert activities focused on transport infrastructure.

The Fund's gains involve road tax yield transfers, transfers of a portion of the yield of consumption tax on carbohydrate fuels and lubricants, and highway toll yield transfers. It is ensured in this way that a part of the yields transport produces returns into transport again. The STIF balance of funds is at the end of every year transferred to the next year.

The Fund is controlled by a nine-person Committee. The Director is the Minister of Transport. The other members are appointed by the Government. The Committee is elected every four years. The Committee's competence include among other things appointing and removing the Fund's Director, approving of the Fund's budget, gains and expenses time schedule, annual programme of announcing tenders for investing actions realisation according a special legal regulation, and providing financial means for investing actions in consistence with the Fund's statute. The five-member Supervisory Board elected every four years by the House of Representatives performs the function of the Fund's supervisory body that should check the activities and economy of the Fund. The Director and the statutory body of the Fund are appointed by the Committee. They control the Fund's apparatus activity and realise the Committee's decisions on providing the Fund's financial means.

## 6. Road Transport Contributions

The Czech Company SBP, LTD. (Company, BCEOM, Prague) performed the role of the researcher of the Ministry of Transport and Communications' project entitled "Assessment of Road Transport Contributions for the Society". The project took place in 2001 and 2002.

If the result of the work carried out for CEMT/ECMT\*<sup>1</sup> expresses *external costs of road transport* in measurable economic units (EURO/person-kilometre, EURO/ton-kilometre), then it is necessary to quantify also equivalent values for *external yields of road transport*.

It is obvious that these are rather complicated problems demanding a sensitive approach and long time work. The information published here must therefore be viewed as the first look at the problems.

We divide the contributions into the following groups:

- road transport as a whole (transportation processes, the existence of a high quality traffic route, services)
- road transportation (transportation processes only)
- services

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<sup>1</sup>Source: 1) European Conference of Ministers of Transport, Report on Strategic Environmental Assessment for Transport, CEMT/CS/ENV(99)13, Oct-99.

2) Efficient Transport for Europe, Policies for Internalisation of External Costs, OECD Publications, No 49711, 1998.

The contributions can be evaluated verbally. Quantification is possible on a limited scale using these units:

- physical (natural)
- economic (financial)

There are two methods for assessment of road transport yields:

A: Experts' relative point evaluation of journey purpose importance (a questionnaire method)

B: Pair comparison of transport types (road transport to railway transport) to determine their share in creating the gross domestic product.

These fairly sophisticated procedures and calculations, especially the transformation of the relative point evaluation of journey purpose importance into economic terms in the A method, are very demanding as far as research activities are concerned. Therefore, we are going to take a closer look at them.

The particular experts inserted their point evaluation (following prescribed procedure rules) into *cells representing journey purpose importance in a "tree"*. (The tree is displayed in pictures 1 and 2). The tree is vertically divided into three levels in a hierarchical order. Horizontally, it is divided into branches, in which a higher level cell is divided into the appropriate lower level cells.

The concluding statistical processing of the partial expert evaluations of the journey purpose importance after calculations along the levels and branches of the tree were carried out is in picture 1. It is often a problem to tell which journey purpose falls within external or internal yields. Most of the internal yields produce secondary effects (i.e. also external) and vice versa.

Determination of the borderline between them (or their mutual portions) is always consensus dependent. Therefore, **there is a computer model "Yields - roads"** that enables creating any (logical) number of variants of the journey purpose division.

Another partial problem that we are facing is the task to decide whether a journey purpose falls within passenger transport or goods transport. However, this problem, too, can be solved using the computer model variants.

For the present evaluation of *external yields* of road transport we have chosen the following purposes of journeys (see picture 1):

Passenger transport:

- Ambulances
- The police
- Accidents (gas, water, electricity, but not traffic accidents)

Goods transport:

Fire brigades

Natural disasters

2.1 Supplies within an agglomeration

2.2 Supplies among agglomerations

2.3 Supplies coming from abroad

4.1 Technological transportation of raw materials

4.2 Technological transportation of semi-finished products

If we adopt the premise that **the relative point evaluation of the journey purpose importance is to an acceptable extent fair**, then it is sufficient to **learn the real yields** at least in one of the cells in the tree and using simple calculations we can fill economic data in all the other cells (carry out economic evaluation of external yields of journey purposes).

If we learn the real yields of more cells, then the computer model makes it possible to carry out a series of calculations that can be ascribed different degrees of credibility of the particular direct external yield of the journey purpose.

***An example of the computer model output:***

For the purpose of the first calculation we used "**values saved due to fire brigades' timely arrivals**". This was taken over from the Czech Republic Fire Brigade Yearbook 2002. (This is just one of the calculation variants). The values are entered in cell 1.2 "Fire brigades". You can find the results in picture 2.

The approximate lower amount of *external yields* of road traffic in the Czech Republic in 2002 is:

|                          |                       |
|--------------------------|-----------------------|
| passenger transport..... | 550 mil. EURO         |
| goods transport.....     | 810 mil. EURO         |
| <u>total.....</u>        | <u>1360 mil. EURO</u> |

After the passenger road transport and goods road transport yields were divided by the relevant performances in the Czech Republic, we reached the *approximate specific yields*

|                          |                               |
|--------------------------|-------------------------------|
| passenger transport..... | 4 EURO/1000 person-kilometres |
| goods transport.....     | 11 EURO/1000 ton-kilometre    |

*The specific external costs* according to materials provided by the CEMT/ECMT are

|                          |  |
|--------------------------|--|
| passenger transport..... | 30 - 65 EURO (ECU)/1000 person-kilometre |
| goods transport.....     | 16 - 35 EURO (ECU)/1000 ton-kilometre    |

Multiplying the specific external costs (the lower values) by the relevant performances in the Czech Republic will produce these *external costs*:

|                          |                       |
|--------------------------|-----------------------|
| passenger transport..... | 2200 mil. EURO        |
| goods transport.....     | 625 mil. EURO         |
| <u>total.....</u>        | <u>2825 mil. EURO</u> |

It is apparent that the **total of the external yields is equal to approximately one half of the total external costs of transportation processes.**

**The balance is very bad in the case of the passenger transport, on one hand. On the other hand, the balance of the goods transport is favourable.**

As far as the road passenger transport is concerned, the "shadow value of a human life" and traffic accident injuries play an important role in the external costs. It might be a good idea to approach this debatable area from another perspective; we will do so from the perspective of theoretical **yields due to lives saved by timely transport of ill or injured (not just in traffic accidents) people to hospital.** As we have carried out a detailed research in the Czech Republic, we have managed to fill the value of saved human lives in 2001 in cell 1.1 Ambulances.

Timely transportation of ill or injured (not just in traffic accidents) people to hospital saved 2628 lives. Approximately 1500 people were killed in traffic accidents.

The key problems of economic consideration are determining the "shadow price of a life" and stating the portion of saved lives to cover in the external costs. However, these are not important for our purposes (the appropriate quantification is available at SBP Ltd. in Prague), for we use the opposition of a person killed in a traffic accident to a person saved by timely transport to hospital and hold them to have the same value.

The ratio of saved and killed people is  $2628/1500 = 1.75$  therefore, the existence of road traffic is a benefit from this perspective.

If we accept the "shadow price of a life" in the amount of 300000 EURO, then the yields of the ratio of people saved and killed due to ambulances' "work" is

$$1.75 \times 300000 = 525000 \text{ EURO.}$$

However, we must be aware of the fact that the lives saved represent **internal costs** to a great extent; or are at least held to be internal costs. Nevertheless, **it is the same thing in the case of the external costs.**

*During introducing internalisation, casualties should not be included in the external costs due to accidents. Therefore, it is necessary to reduce the specific external costs in order to provide for fairness and compatibility with the external yields.*

*Regardless the economic side of these problems it is necessary to be aware of the facts that:*

a number of road transportation cases (purposes of journeys) cannot be substituted for by another transport type, a number of road transportation cases (purposes of journeys) can be quantified using neither the physical nor economic units (for example the feeling of independence on railway timetables), positive external effects that are in a way expressible in economic units are not produced only by transportation (transportation processes, journey purposes), but also the traffic route (that can have positive effects on, for instance, regional development).

A note: Unfortunately, transport types are sometimes compared only as far as the time necessary for moving from one place to another is concerned. Such a criterion is certainly very important, but not sufficient.

The calculations of road transport external costs as presented in the CEMT/ECMT's documents can be objected to in many ways.

For instance: If a road traffic accident resulting in death is quantified in economic units in the external costs, then a life saved by timely transport from home to hospital must have the same value.

## **Conclusion on the Road Transport Contributions**

It is obvious that if the internalisation of external costs following the principle of "those who make the damage pay" is to be fair, it must be realised according to the balance of "**external costs minus external yields**" and not just the external costs. And it is necessary to **exclude costs resulting from casualties from the external costs of road transport because the existence of roads enabling timely transportation of ill and injured people to hospital exceeds this value.**

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Fig. 1 Relative expert assessment of the trips purposes in road transport

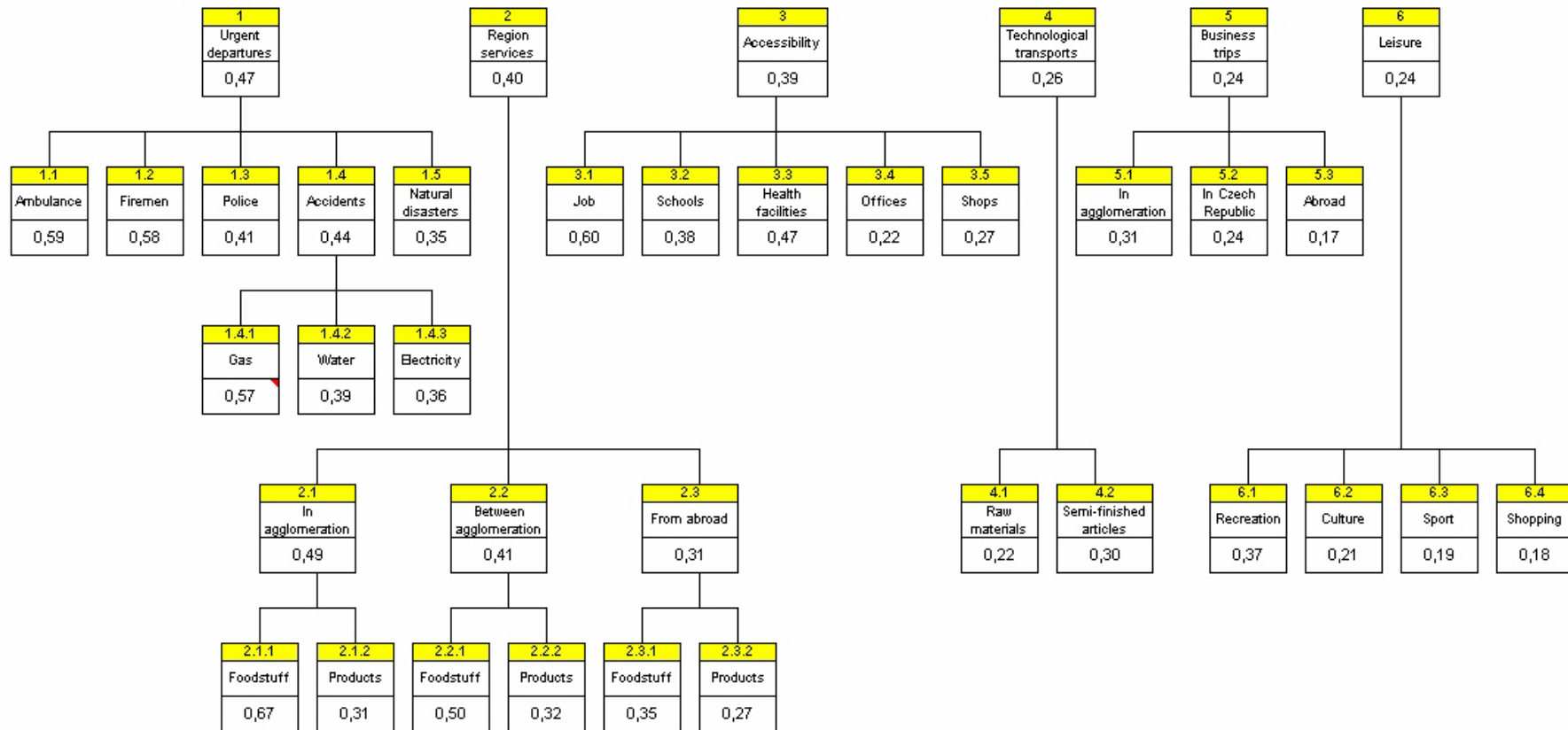


Fig. 2 Economic yields in accordance with trip purposes (mil. €)

