



COST 341
Habitat Fragmentation Due to Transport Infrastructure
State-of-the-art Report
Czech Republic

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1. Introduction

Habitat fragmentation caused by transport infrastructure is a problem of all Europe. Europe continent has dense transport network but also is inhabited by many species of animals. These animals need sufficient amount of natural habitats connected by suitable landscape structures. Due to barrier effect of transport infrastructure it is necessary to connect fragmented areas by effective measures and to renew natural fauna migration routes. That is why, the Czech Republic entered to IENE (Infra Eco Network Europe) that has initiated the action COST 341 - "Habitat Fragmentation Due to Transport Infrastructure". National report is elaborated for the needs of this action, according to the content recommended by Management Committee.

2. Elements of basic ecology - biogeographical description of the Czech Republic

Area of the Czech Republic belongs to four subregions being divided into 90 bioregions.

The widest one is **Hercynian Subregion**, which includes whole Bohemia and the western half of Moravia. Its biota belongs to biota of western and central part of central Europe. Vegetation is influenced by geologically old fundamental complex of the Bohemian Massif being mainly built by acid crystalline schist and hypogene eruptive rocks. Acid soils with small amount of nutrients have developed on these types of rocks. The relief is mainly created by uplands and upper rolling countries, rarely by mountains. The climate is transient, mainly oceanic, modified by continental influences from the east. Vegetation gradation is created in this subregion from 1st oak degree to 8th subalpine degree. Widely is present 4th beech (submontane) degree. Animal part is created by poor western paleo-arctic arboreal fauna.. Animal structure is highly influenced by climate changes during Pleistocene. Lower species diversification, mainly in mountain areas, and high abundance of western and northern migrants. Small amount of endemites is present in Hercynian Subregion, only some species of insects and molluscs belongs to endemites. After-glacial relicts are numerous in warm areas. Big mammals, e. g. Lynx (*Lynx lynx*), Wolf (*Canis lupus*) and Brown Bear (*Ursus arctos*) belonged to typical species of original forests (the last two species do not live in Hercynic part of the Czech Republic area recently). Capercaillie (*Tetrao urogallus*) and Black Grouse (*Tetrao tetrix*) belong to the typical birds of mid-mountain forest - both species are endangered by extinction. Moose (*Alces alces*) migrate to Southern Bohemia from Northwest (from Poland) and created the permanent population. European Deer (*Cervus elaphus*), Wild Boar (*Sus scrofa*) and Roe deer (*Capreolus capreolus*) belong to another wild ungulates.

Polonian Subregion is spreading to CR area from the north and is present in northern parts of Moravia. Relief is characterised by lowlands and by uplands being not so much high and created by Mesozoic and Cenozoic sediments. The climate is slightly warm, little bit colder than in the same heights of Hercynic Subregion, slightly wet, with marked penetration of oceanic and continental influences. Main part of the area is specific by forest vegetation - the 3rd oak-beech and the 4th beech degrees are dominated. Fauna is not so numerous from the diversity point of view. Lower areas species and cultural steppe species are presented, mountain species are missing. Very numerous is fauna connected with stagnant water and wet areas and also with wide lowland rivers. Characteristic migration of some important species from Hercynic and Carpathian Subregions into Polonian one is seen in CR area.

Western Carpathian Subregion is spreading into CR area in eastern Moravia only. This area is geologically very varied - sandstone, claystone and non-continuous chine of limestone create flysch sediments. Climate is more continental compared with Hercynic Subregion, but local differences are presented due to geomorphologic conditions. High vertical differences create presumption of high biodiversity of fauna and flora. Comparing the fauna with previous subregions, it is richer both in species number and density of individuals. Especially the mountain fauna is very rich with numerous endemites. Typical species of Moravian part of Carpathian Subregion are:

amphibians: Fire Salamander (*Salamandra salamandra*), Yellow-bellied Toad (*Bombina variegata*) and Montandon's Newt (*Triturus montandoni*),

birds: Hazel Grouse (*Bonasa bonasia*), Capercaillie (*Tetrao urogalus*) and Lesser Spotted Eagle (*Aquila pomarina*)

mammals - big predators: Wolf (*Canis lupus*), Lynx (*Lynx lynx*), Brown Bear (*Ursus arctos*) and Wild Cat (*Felis sylvestris*).

Northern Panonian Subregion – is spreading into CR area in south-eastern Moravia. The whole Panonian subregion is characterised by very warm weather influenced by continental conditions from the east and partly also by Mediterranean climate from the south. Rolling countries mainly creates the relief, only the area of limestone called "Pálava" has upland character. Only the first two vegetation degrees are presented - oak and beech-oak degrees. Flora is typical by presence of numerous species with submediterranean or continental pontic-panonian area. Numerous species reach northern border of their spreading in Southern Moravia. Panonian fauna is typical thermophile; no mountain species are presented. Approx. 20% of species living in this subregion is not present in the other parts of CR. Steppe species are mainly present - for instance European souslik (*Citellus citellus*), (*Putorius evermanni*), Lizard (*Lacerta viridis*) and Aesculapian Snake (*Elaphe longissima*) are characteristic from reptile group.. Also avifauna is very rich, for instance Roller (*Coracias garrulus*), Hoopoe (*Upupa epops*), Great Bustard (*Otis tarda*) or Saker (*Falco cherrug*) belong to typical species..

3. Habitat / landscape fragmentation

3.1. Recognition of landscape and habitat fragmentation (agriculture, urbanisation, transport infrastructure)

Generally it is possible to say that there is still no relevant attendance of environment fragmentation problematic in the Czech Republic. The necessity of the solution appears mainly at present, in connection with the transport growth and accelerated development of transport infrastructure.

Environment fragmentation problem affected firstly these species which live separately with small density of individuals (big predators, big hooves). Micropopulations with small amount of individuals live among barriers and they are not able to eliminate adverse influences of surrounding. These barriers divide the species population into isolated islands. Isolated islands populations are also very vulnerable and their long-term existence become uncertain. In case

of any local adverse influences is small isolated population not able to eliminate these local damages. Isolated islands could start to suffer from small genetic diversity in case of small animals amount and this fact could cause gradual extinction of this isolated population.

Big mammals are especially the most affected group. Differently is the fragmentation shown in case of amphibians. Beside the line barriers, the separation of sites in intensively used landscape is occurred. Extraordinary the worst living conditions in one location could cause extinction of local population and re-settlement from surrounding sites is out of migrate ability of individuals.

Specific problems are barriers in watercourses, which prevent animals from migration. This problem is not evaluated in detail in this report because of numerous specific problems.

Generally is possible to state suitable consideration is still not given to fragmentation problem in the Czech Republic. Necessity of this problem solving occurs recently in connection with transport growing and quick development of transport infrastructure.

3.1. Natural Barriers (Agriculture, Urban Development, Transport Infrastructure)

As written above, numerous kinds of barriers are presented in landscape and have various influences to various animals. These barriers could be natural (big rivers, mountain belts) or man-made. Natural barriers are existing permanently and animal populations have developed during their existence. Barriers created by man are short-term elements, main part of them has arisen during late several tens of years and their density is still growing. Transport Infrastructure - is the most important type of barriers. Especially the roads of highway type are obstacles impossible to overcome for majority of animals. Running over the highway is almost impossible; the number of secure suitable culverts is totally not enough. The influence of highways and another roads is very significant because they intersected all territory of CR regardless of biogeographical regions and migration needs of animals. There are also some situations where road (lower class) divides the amphibians territory and high population damages occur, especially during spring road overcoming.

Other less significant barriers are created landscape intensively utilised by agriculture. (cultivating of areas by heavy mechanisation, using of chemical compounds, changes of tropic conditions and high predation pressure on bare areas after harvest create big barriers for these groups of animals) and urbanisation (urban areas creates only local migration barriers).

3.2. Present Fragmentation State Data (Infrastructure Density, Natural Corridors, Area of Non- fragmented Regions)

In conditions of Czech Republic, especially highways and another roads of highway type create hardly overcome barriers. There is approx. 725 km of these roads in Czech Republic recently. Average density of these type of roads is 0,9 km /100 km² in CR (area 78 866 km²). The character of highway net is recently omnirange star with centre in Prague. The highway limit the natural migration of animals, but it is necessary to say their recent density is not still high to create sectors surrounded by highways. Planned development of the highway network will be able to change significantly this situation.

No significant migration corridors exist in the territory of CR. Only areas are existing (mainly lowlands without forests and industrial areas), where big mammals do not live or migrate. Animals uniformly in whole areas use the other types of landscape (uplands, rolling areas, mountains and sub-mountains). Wide regions is possible to specify as very significant based on spreading of big mammals populations and their migrate directions. Following areas belong to them:

- Area between Moravskoslezské Beskydy Mountains and Hostýnsko-Vsetínská Hornatina Uplands on first side and area of Nízký and Hrubý Jeseník Mountains on the second side beside the animals mentioned above (it is necessary to calculate with big predators migration (bear, lynx and wolf) and animals mentioned above
- Corridor among floodplain forests along the Morava River, Vizovická vrchovina Uplands, Hostýnsko-vsetínská hornatina Uplands , Bílé Karpaty Mountains and Moravskoslezské Beskydy Mountains.
- Corridor of border mountains and forests - from Jeseníky Mountains through Orlické hory Mountains, Krkonoše Mountains, Jizerské hory Mountains, Krušné hory Mountains, Český les Mountains, Šumava Mountains, Novohradské hory Mountains to south - Protected Landscape Areas Novobystřicko, Třeboňsko, Slavonicko and Podyjí National Park
- Hrubý Jeseník Mountains - Drahanská vrchovina Uplands
- Wide corridor from Jeseníky, Kralický Sněžník and Krušné hory Mountains towards central part of Českomoravská vrchovina Uplands and Třeboňsko area to Novohradské hory and Šumava Mountains
- Šumava Mountains – Brdy Uplands - Křivoklátsko Area

Very specific are migration ways of moose. Mooses come to CR from Poland through the Frýdlant Ledge and Náchod area, the second corridor is wide area from Vidnava town to Jablunkov town.. It is possible to see the moose individuals in all more preserved areas of Bohemia and Moravia, but the most significant is the migration from the north through western border of Českomoravská vysočina Uplands and middle Posázaví Region to Southern and Western Bohemia.

3.3. Evaluation of existing fragmentation (fragmentation effects, influence to population, species and behaviour)

The main factor that causes environment fragmentation in CR is transport infrastructure, especially highway net and roads of similar parameters. Dividing of areas by these roads influences especially to populations of big mammals. Agriculturally cultivated areas are another significant barriers. These areas caused the isolation of sites and populations especially in case of amphibians, reptiles and numerous groups of non-flying invertebrates.

4. Legislative framework

The protection of the environment is legally set in Law 17/1992 Coll., on the Environment. In this law the Environmental Impact Assessment of constructions (EIA) was introduced for the

first time. The EIA problematic was adapted in detail in special Law 244/ 1992 Coll., on the environmental impact assessment. This law reflects the EC Directive No. 85/337 EEC, from 27.6.1985.

From 1992 year all planned constructions of transport infrastructure must come through EIA process, before the construction. This process is described in detail in mentioned law 244/92 Coll. Detailed information are in Chapter 7.3. "Environmental Impact Assessment, Strategic Environmental Assessment - new trends in legislation and practice".

The law No. 114/1992 Coll., on the protection of nature and landscape regulates and in some regions bans some activities and investment actions among others from the field of transport. It deals about national parks, protected landscape areas etc. where the following activities are prohibited: highway, rail and road construction (national parks) highway construction (protected landscape regions), construction of industry centres, etc. In the case some other public interest prevails significantly interest of nature protection, a relevant environmental institution can permit an exception from prohibition in especially protected areas.

Road infrastructure is defined by Law No. 117/97 Coll., on the ground communications. Rail infrastructure is defined by Law No. 266/94 Coll., on Railways. National definitions are described in Chapter 6.1. But these law do not solve the habitat fragmentation problematic.

Institutional framework, responsibility of institutes

Ministry of Transport

Ministry of Transport is responsible for management of transport sector and transport infrastructure planning; create and edit laws and policies concerning the transport sector, harmonise the EU legal in the field of transport, transform the Czech Railways, finance the construction and maintenance of transport networks and transport research.

Ministry of Environment

Ministry of Environment is responsible for environmental sector, create and edit laws and policies concerning the environment, harmonise the EU legal in the field of environment and also finance the environmental programs, projects and research.

Transport Research Centre

Transport Research Centre is the tool of the Ministry of Transport and Communications in the field of transport research. In the problematic of environment fragmentation the TRC is entrusted by the co-ordination of national activities in this field where co-operates with many project and research organisations.

Masaryk University, Department of Environmental Chemistry and Ecotoxicology,

Besides of fragmentation problematic the department activities lead up to the solution of persistent organic pollutants (POPs) fate in terrestrial ecosystems.

Directory of Highways and Roads

Directory of Highways and Road is responsible for construction of the approved transport road network (quality and finance), maintenance of present road network and construction or reconstruction of fauna passages across road infrastructure.

Czech Railways

Czech Railways are responsible for the construction, maintenance and operation of railways including the rail corridors modernisation, which should make the rail transport more attractive to the road transport (travelling more comfortable, speed increase to 160 km/hour...). Czech Railways should also be an investor of passage constructions for fauna migration.

Agency of Nature Protection

In the field of fragmentation research the Agency monitors the passages use by fauna, evaluates present culverts from the view of its use as fauna passages.

5. Land use planning in relation to nature and landscape conservation and transport

Environmental protection is ensured by Act No. 114 from February 19th, 1992 (Environment and Landscape Protection). The purpose of this Act is to contribute for keeping and reclamation of natural balance, for preservation of life diversity, natural virtues and beauties, and for considerate managing of natural sources. Environment and landscape protection according to this act further means specific care of wildlife,, plants and their unions, minerals, rocks, paleontological discoveries and geological units, care of ecological systems and landscape units and also care of landscape appearance and its possibility of admission, realised by government, subjects and individuals.

Areas with environmental or esthetical importance are possible to proclaim as specially protected according to this Act and conditions of their protection are given. Categories of specially protected areas are given as follows:

- national parks
- protected landscape areas
- national nature reserves
- nature reserves
- national natural monuments

- natural monuments

National parks

Wide areas, unique from national or international point of view, with presence of mainly natural low human influenced ecosystems, where plants, animals and abiotic nature have significant or educational importance. The whole using of national parks must be subordinated for keeping and improvement of natural conditions and must be in accordance with scientific and educational aims given by parks reclamation. Methods and ways of protection are graduated, based on dividing of national parks areas into three zones of protection, demarcated in accordance with natural virtues. The strictest regulations of preservation are given for the first zone. Detailed character and rules for zones are summarised in general regulation, by which the park is reclaimed. Environment Protection Authority suggests and approves the National Park Care Plan and its protected zone for period of 10 years. The entrance, free movement of persons outside the urban zones and also recreation and hiking activities are limited. Conditions of this limits and list of prohibited activities are given in this Act and also in Visit Rule. Fishing and hunting activities according to specific rules could be limited or prohibited by Environmental Protection Authority in whole area of park or in specific places only. It is prohibited to build new highways, to go by car or caravans and stay outside the roads and places specified by Authority, except of ambulance, fire brigade and Authority cars.

Protected Landscape Areas

Wide areas with harmonically built landscape, characteristic developed relief, significant presence of natural forest and permanent grass stand, with abundant tree species, or with preserved monuments of historical settlement. Exploitation of these areas is realised in accordance with protection zones demarcation to keep and improve their situation and to keep and create optimum environmental functions of these areas. Recreation is possible in case of no damages of the natural environment of protected landscape areas. In whole area, it is prohibited to build new highways, to realise car or motorbike races, to go by car or caravan into and stay outside the roads and places specified by authorities, except of ambulance, fire brigade, army and authorities cars. To specify the way of area protection, four (three in minimum) graduated protective areas are delimited, the first one with the strictest rules.

National Nature Reserves

National Nature Reserves are smaller areas with exceptional natural virtues, where ecosystems significant from national or international point of view are attached to natural relief with typical geological constitution. Exploitation of national nature reserve is possible only in case of keeping and preservation of present natural environment. It is prohibited (in whole area) to permit building activities, to entrance or to go outside the roads delimited by Authority, except of owners or hirers of parcels. Fishing and hunting activities are possible only in accordance with the permission of Authority.

Nature Reserves

Nature reserves are smaller area with concentrated natural virtues and with significant presence of ecosystems, typical for specific geographical areas.

National Nature Monument

Natural monument of smaller area, especially geological or geomorphologic units, rare minerals or endangered species (in fragments of ecosystems) discoveries, with regional ecological, scientific or esthetical signification (could be also created by human activities).

<i>Development of Protected Areas in Czech Republic</i>								
Year	National Parks		Protected Landscape Areas		Other Protected Areas and Monuments		Total Area (ha)	Part of Protected Areas from CR Total Area (%)
	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)		
1918	-	-	-	-	14	not found	-	-
1945	-	-	-	-	100	7 538	7 538	0,1
1960	-	-	2	21 700	356	22 373	44 073	0,6
1970	1	38 500	7	385 200	524	28 784	452 484	5,7
1980	1	38 500	19	999 200	700	41 039	1 078 739	13,6
1991	3	111 120	24	1 042 365	1291	67 427	1 220 912	15,49

The object „Development of Transport Network to 2010“ is recently assessed in Czech Republic. Three possible variants are considered:

- X variant (created by Ministry of Transport and Communications - MDS)
- Y variant (European)
- Z variant (created by non-government environmental initiatives)

X variant assumes highway D8, which will connect Czech Republic and Germany, will get in protected landscape area „Ceske Stredohori“. No collision of infrastructure and protected areas is assumed in case of Y and Z variants realisation. Sustainable Ecological Network (USES) consisting of complex of over-regional, regional and local biocentres connected by habitat corridors is created for the area of Czech Republic. It is evident multiple collision between USES elements and infrastructure in case of each variant will occur because of USES elements density. It will be necessary to solve the situation individually in case of each permitted variant, together with realisation of suitable compensation or relieving provisions.

Maps of intersections between designed infrastructure and protected areas with USES elements are attached to this Report.

6. Habitat fragmentation and existing transport infrastructure

6.1. National definition /terminology of considered infrastructure and their permeability

6.1.1. Highways, Roads

Highway is defined by Act No.13/1997 Coll., on the ground communications, as ground communication for fast long-distance and international transport by road motor vehicles, built without any level intersections, with separated entry and run-out and with separated tracks. Highway is established only for vehicles with the maximum permitted speed not lower than specific speed limit according to special regulation. The transmittance of highways depends on size, construction and design of culverts. Generally, older highways constructed before Act No. 244/92 became operating have low transmittance (especially D1 highway), even no transmittance in some parts. New highways being designed in accordance with EIA process have partial or good transmittance.

The road is defined by Act No. 13/1997 as public ground communication for road and other vehicles and for pedestrians. The roads are divided according to their specification and signification into following classes:

- a) 1st class roads are determined especially for long-distance and international transport
- b) 2nd class roads are determined for transport among the districts
- c) 3rd class roads are determined for connecting among municipalities and among municipalities and other communications

The transmittance of road network mainly depends on traffic intensity, because no culverts for animals were constructed.

6.1.2. Railways

Railway road is defined by Act No. 266/94 Coll., on Railways, as a road for rail vehicles including permanent accessories necessary for safe and fluency of the rail transport.

Railways are divided as follows:

- nation-wide railways for national and international public transport
- regional railways of local significance, connected with nation-wide railways
- railway sidings for owners need, connected with national-wide or regional railways
- special railway for municipalities traffic services

The railway territory is defined by land planning beside the railway tracks for location of railway structure. The railway structure is road determined for moving of railway vehicles including accessories for extension, complement, changing or securing of the railway.

Railway structure includes all buildings or accessories in railway territory regardless of their purpose.

The transmittance of railways in the Czech Republic is generally very low, better situation is on railway corridor Brno - Česká Třebová - Kolín - Praha - Děčín after its modernising.

6.1.3. Waterways

Two watercourses are navigable in the Czech Republic - Labe in part from Chvaletice to Děčín (Germany border) and Vltava from České Budějovice through Kamýk to its confluence with Labe. In total, 625 km of navigable river parts are used in Czech Republic (data from 1998). Watercourses are totally non-transmitted for fauna in navigable parts.

6.1.4. Secondary Infrastructure (Field and Forest Roads)

Secondary infrastructure is not defined by any Act in the Czech Republic and it creates no barriers for fauna migration.

6.2. Defragmentation Policy, Government Priorities

Unfortunately, new created State Environmental Policy does not solve the problem of fragmentation by traffic infrastructure. Solution of transport and environmental problems is summarised in separate Chapter of the Policy, included following activities :

- supporting of suitable technical and infrastructure arrangements (town bypass roads, noise walls) created for reducing of health risks caused by excessive charging of municipalities by noise and emissions
- supporting implementation of economic instruments including internalisation of external expenses to intensify the application of transport systems and transport media being economically acceptable and decreasing environmental freight
- supporting of arrangements for traffic safety and protection of pedestrians, bikers and wildlife
- influencing of public (together with non government and non-profit organisations) to prefer public and personal bike transport

Mention of arrangements for wildlife safety increasing is the only one thing to concern fauna security because of traffic. The problem is reduced only to collisions of vehicles and game and, in addition, very generally. Description of arrangements to increase the wildlife safety is missing. The lack of understanding of the problem is evident. Incorporation to fragmentation context, barrier effect, isolation of individuals and followed genetic changes (degeneration caused by reproduction among the same individuals of island populations) - all these problems are missing

6.3. Identification of hot spots at crossings of ecological corridors with transport infrastructure

For identification of hot spots, permeability of highways was evaluated at places of crossings with official elements of ecological stability regional system and at places, which are actually used by large animals for migration.

A. Evaluation of highways crossings with elements of ecological stability regional systém

The network of Czech highways intersects the supra-regional biocorridors at 34 places. It was evaluated that only at 2 places there are crossings permeable for large animals like deer, moose, and lynx. Five crossings are partially permeable and all other crossings are impermeable. So far, there was not enough attention paid to evaluation of highway permeability for large animals.

B. Permeability at places actually utilised for migration by large animals

It is difficult to describe and evaluate the real migration needs of large animals. Most species (like fox, roe deer and wild boar) do not have clean-cut needs for a certain type of a habitat, which is showed by places of animals that were struck dead by cars. It is evident though, that large woods and areas between them are of higher migration importance. Large part of the most important Czech highway D1 (Praha – Brno) passes through the Českomoravská vrchovina highlands and Středočeská vrchovina highlands. In these areas there is a steady alternation of small woods and agricultural landscape. There are not pronounced migration ways in such a kind of landscape. Migration of animals there has a whole-surface character and it is only influenced by local conditions like the existence of large communities and road network. Water reservoir Zelivka, which passes concurrently with the highway at the stretch of 20 kilometres, forms a migration barrier for large part of a year.

East of Brno, the situation is rather different. The landscape here is more differentiated. Large areas of agricultural landscape alternate with forested areas. The migration here has a different pattern and is focused to the forested areas.

The D1 highway stretch from Prague (exit Jesenice) to Humpolec has a uniform demands for migration permeability. The passages for all the categories should be uniformly spaced out along this stretch. The actual displacement of passages there more or less matches the demands. Between Humpolec and Brno, there are several stretches of higher migration importance. Mainly, these are the places of highway crossings with large forests of North-South orientation: - the stretch east of Humpolec, between Větrný Jeníkov and Jihlava, around the exit V. Beranov, west of Měřín and the stretch Velká Bíteš – Ostrovačice. All these places are completely impermeable for large animals.

The stretch between the exits Brno-West and Brno-East has no importance for migration of animals. The stretch between Brno and Vyškov is completely impermeable for large animals, the barrier effect of the highway is underlined by other parallel communications including the railway. It is desirable to re-connect the Dražanská vrchovina highland and the Žďánický les area from the viewpoint of large animals migration. This should be accomplished most likely at highway crossings with supraregional corridors. Making the highway permeable would bring an effect only if also other communications are made permeable.

The highway D2 passes through a relatively less important area for migration between Brno and Velké Němčice.

On the other hand, the area around Hustopeče is very important, as migration possibility here must be assured for communication between Žďánický les and the Pálava Protected Landscape Area. At present the highway here is completely impermeable for large animals.

The stretch between Lanžhot and the state border with Slovakia is of extreme importance as it passes through a complex of floodplain forest. Permeability for large animals at this stretch has already been assured.

The highway D5 has several stretches of different importance. The stretch between Praha and Plzeň is important mainly in its southern part. A single bridge assures the permeability for large animals. Its permeability is partly limited by proximity of the town of Rokycany. It can be said, that the migration possibility of animals between Brdy and the Křivoklát region is very limited. The stretch between Plzeň and Rozvadov is important and it is permeable for large animals. The highway D8, stretch Praha – Straškov is not much important, more important is the stretch Roudnice – Lovosice, at which migration has been assured.

The already completed stretch of the highway D11 crosses the former migration ways of mooses, its permeability is assured only in the Elbe River alluvial plain. In other parts the highway forms a migration barrier. At both the D8 and D11 highways the design of newly constructed/designed stretches will have a major importance from the view of their barrier effect to migration ways.

From the other communications that were evaluated the stretches Praha - Liberec and Olomouc - Mohelnice present the most serious migration barriers. The enclosed map shows the stretches at which the assurance of permeability would be desirable.

6.4. Overview of mitigation measures: fauna passages, type, and technical aspects

In the Czech Republic, measures mitigating the barrier effect of busy communications have not been implemented in a large scale. This is mainly because the needs had not been defined clearly. Relatively easily can be implemented the measures for improvement of permeability of bridges for otter. If water under the tunnel-shaped bridge spans from one bank seating to the other one, an otter usually does not go through the bridge but crosses the communication on the surface. It was prove that otters residential close to such bridges learn to use them as passages. On the other hand, migrating males do not confide in them and in most cases they try to overrun the barrier on the surface, over the communication. The underbridge can be made permeable by building a stone bench along one of the bridge abutments or by a construction of a wooden bridge 40-50 cm wide mounted 20-40 cm above the normal water level so that the otters can pass the underbridge by land. The underbridge must be further equipped with a guide fence. So far, several tens of such adjustments were implemented, mostly at places where collisions of vehicles with otters had been registered.

First green bridge was put in operation at the fast highway between Olomouc and Lipník nad Bečvou. The bridge width is 50 meters and its functioning will be surveyed in winter 1999-2000.

Another types of measures implemented in 1999 are passages for amphibians. At places of large migration of frogs barriers were installed along a road several hundreds of meters long that guide frogs to safe passages. Grids were installed at crossings of such guide ways with subsidiary roads and cart-roads.

6.5. Compensation measures (compensating for destroyed habitats by new biotopes)

So far, compensating measures have been implemented only at habitats of amphibians reproduction places. Either the measures are obligatory for investors of constructions or they are funded to owners in a form of subsidies from the resources of the Czech Ministry of Environment. In this way, mostly pools, ponds and small wetlands were built. Several hundreds of pools are built every year for reproduction of amphibians that are sponsored from the resources of the Czech Ministry of Environment.

6.6. Existing standards, reasons, minimal needs (design, role of biological needs for (re)construction of bridges

So far, no Czech standard deals with the needs for the provision of safe transits through line barriers. At present, only the environment protection bodies can demand implementation of such measures, which express their opinion of all newly designed constructions. The Ministry of Environment prepares a guideline that would standardise practices of environment protection bodies when according permissions for line constructions.

Assurance of permeability is closely connected with problems of fencing the highways and accompanying greenery along highways, this problematic will also be soluted in prepared methodology.

6.7. Maintenance aspects (responsibility, finance)

Road Transport

Centres of Maintenance and Management of Highways (SSUD) are responsible for highways maintenance (the number of centres is approx. 30). Centres are directed by Directory of Roads and Highways, responsible for financing of road and highway network building and reconstruction.

Road Management and Maintenance (SUS) are organisations responsible for roads maintenance, managed directly by the Ministry of Transport and Communications (MDS), only methodically is managed by Roads and Highways Headquarters.

SSUD and SUS are responsible for maintenance of the following:

- roads
- ditches, tree avenues
- mid dividing tracks
- back slopes, mounds
- road bridges.

Owners are responsible for the other types of roads - Czech Republic Forests are responsible for forest roads, agriculture farms and farmers for field roads and municipalities for roads inside towns and villages. The Czech Army is responsible for the roads inside the military areas.

Railway Transport

State organisation (Czech Railways - CD) is responsible for financing and maintenance of railways including back slopes, bridges etc. Czech Railways have their own budget, contingent deficit is paid by Ministry, in case of rightfulness.

6.8. Review of relevant studies and on-going research

Transport Research Centre (CDV) is intended on monitoring of recent highway network, especially on watching of fauna in surroundings of highways. This activity is performed in accordance with the results of the Agency of Nature and Landscape Protection (AOPK) - is intended to parts, which have been marked as problematic. Hunting statistics are used for studies together with periodical field investigation of selected species presence near highways (according to traces) and directly on the highways (run-over animals). Digital maps of transport infrastructure and protected areas or USES (sustainable ecological network) intersections are used for identification of hot spots. The maps are constructed in GeoMedia software also by CDV as a part of Unified Transport Vector Maps. Database of recent fauna transit places is creating in Microsoft Access software.

Problem of the environment fragmentation by transport infrastructure and its influence to big mammals population is also studied by Environment and Landscape Protection Agency of CR, branch Havlíčkův Brod. The research is focused to exploitation of separate types of highway bridges to various animal species during Phase 1. This investigation was realised during winter according to traces in snow. Also the investigation of all bridges and culverts in all highways and speed roads was performed. All objects were described, documented and their transmission was specified. Also the methodology specified the necessary distance for bridges of various transmission was created for various animals. According to this methodology, the transmission of separate highway parts was given - separately for animals like fox, badger and otter, separately for roebucks and another big animals. Results of this research are summarised in final reports - still in Czech language only.

7. Habitat fragmentation and future infrastructure development

7.1. Policies, strategies, trends

In the Czech Republic Transport Policy many measures to the elimination of environmental impacts of transport are formulated, but the fragmentation is not directly mentioned in this policy. The environmental measures of this policy, that correspond with fragmentation are following:

- gradual transfer of passenger and freight transport volumes parts in a road transport to transport modes more acceptable for the environment, as the railway, combined and water inland transports are,
- a creation of noise protection zones round airports according to EC recommendations, with the aim to eliminate the air traffic impacts on the surroundings, and introduce possibly any fees or compensations,
- development of non-motorised transport modes (mainly pedestrian and cycling ones) especially by construction of a relevant infrastructure,

- intermodal and integrated approach to the transport infrastructure planning which takes into account economic, environmental and social aspects,
- reduction of transport impacts on the environment in sensitive areas (national parks, protected landscape areas, etc.),
- scientific-research base especially in connection to deepening and expansion of projects aimed to the reduction of negative transport traffic impacts on individual components of environment, including a quantification of externalities
- further development of international co-operation on a level of governmental and non-governmental organisations at a solution of problematic aimed on the protection of the environment against transport impact mainly with the aim to remove obstacles which still inhibit to full development of this activity in the European region.

That is why, Ministry of Transport promotes the research action that, as mentioned, consist of the present infrastructure monitoring and the proposal of fauna passages construction methodology.

7.2. Data on transport infrastructure development

As is mentioned in Chapter 5, there are 3 varieties of transport infrastructure development in the Czech Republic to 2010 year and it is definitely not decided which of them will be realised:

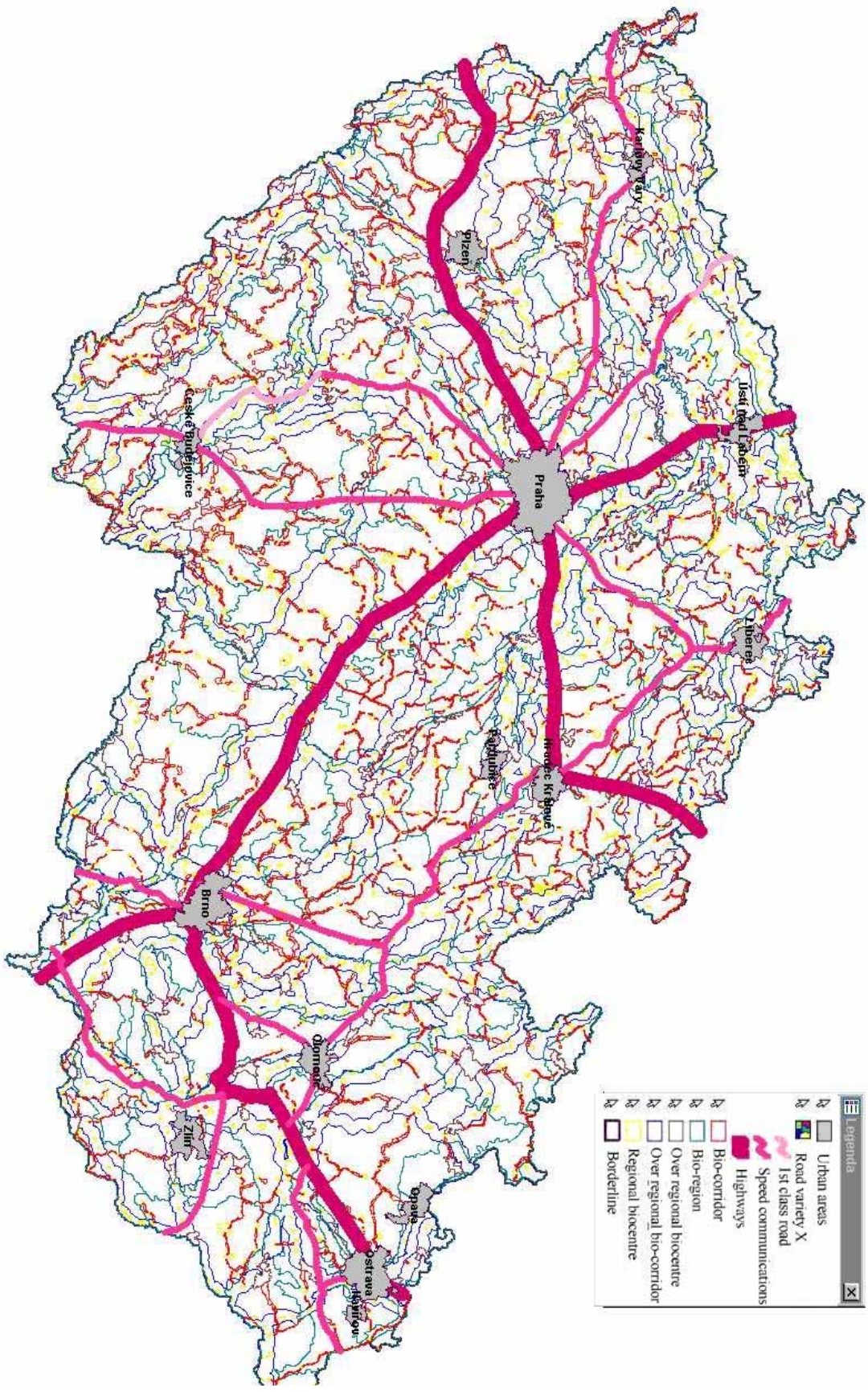
	Present network	X	Y	Z
D 1 (D 1 + D 47) (D 1 + R 46 + R 35 + R 47 + I/47)	D 1 Praha - Brno - Vyškov	D 1 Praha - Brno - Vyškov - Hulín + D 47 (D 1) Hulín - Ostrava - Bohumín <i>(border PL)</i>	D 1 Praha - Brno - Vyškov – Hulín + D 47 (D 1) Hulín - Ostrava – Bohumín <i>(border PL)</i>	D 1 Praha - Brno - Vyškov R 46 Vyškov - Olomouc R 35 Olomouc - Lipník nad Bečvou R 47 Lipník n.B. - Běloutín I/47 Běloutín - Ostrava - Bohumín <i>(border PL)</i>
D 2	D 2 Brno - Břeclav <i>(border SK)</i>	D 2 Brno - Břeclav <i>(border SK)</i>	D 2 Brno – Břeclav <i>(border SK)</i>	D 2 Brno - Břeclav <i>(border SK)</i>
D 3 / R 3 (D1 + R 3) (D1 + I/3)	D 1 Praha -Mirošovice I/3 Mirošovice - Dolní Dvořiště <i>(border A)</i>	D 3 / R 3 Praha - Jílové - Mezno - České Budějovice - Dolní Dvořiště <i>(border SK)</i>	D 1 Praha –Mirošovice R 3 Mirošovice - Benešov - Tábor - České Budějovice - Dolní Dvořiště <i>(border A)</i>	D 1 Praha –Mirošovice I/3 Mirošovice – Benešov - Tábor - České Budějovice – Dolní Dvořiště <i>(border A)</i>
R 4 / I/4 (+ I/20) R 4 (+ I/20) R 4 + I/20	R 4 Praha - Skalka (Milín) I/4 Skalka (Milín) - Nová Hospoda	R 4 Praha - Nová Hospoda I/20 (Nová Hospoda - České Budějovice)	R 4 Praha - Nová Hospoda I/20 (Nová Hospoda - České Budějovice)	R 4 Praha - Nová Hospoda I/20 Nová Hospoda - České Budějovice

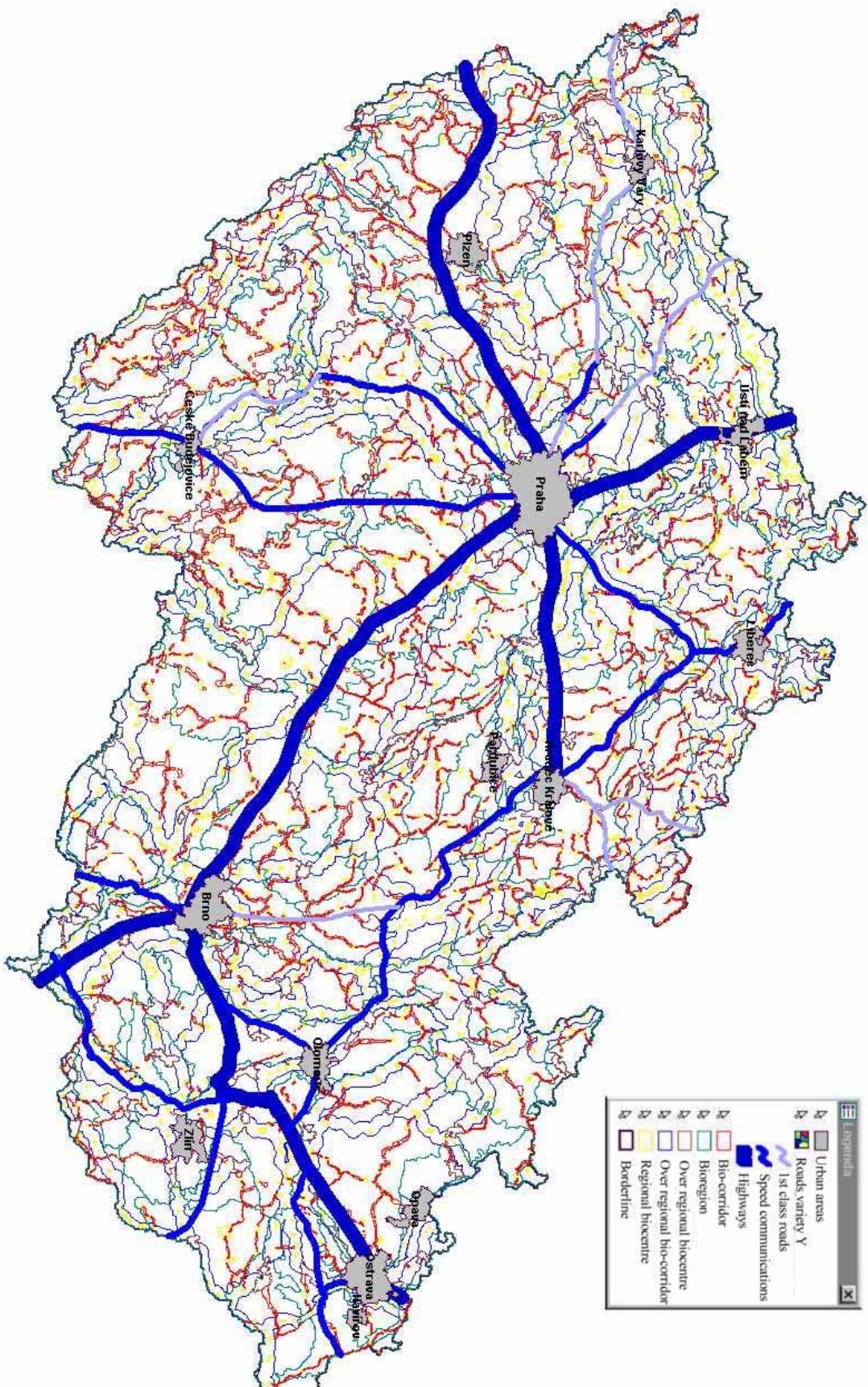
	I/20 (Nová Hospoda - České Budějovice)			
D 5 / I/5	D 5 Praha - Rozvadov (border D) (except I/5 Ejovice - Sulkov)	D 5 Praha - Rozvadov (border D)	D 5 Praha - Rozvadov (border D)	D 5 Praha - Rozvadov (border D)
R 6 / I/6	I/6 Praha - Karlovy Vary - Pomezí (border D) (except R 6 Velká Dobrá - Nové Strašecí)	R 6 Praha - Karlovy Vary - Pomezí (border D)	I/6 Praha - Karlovy Vary - Pomezí (border D) (except R 6 Velká Dobrá - Nové Strašecí)	I/6 Praha - Karlovy Vary - Pomezí (border D) (except R 6 Velká Dobrá - Nové Strašecí)
R 7 / I/7 R 7 + I/28	R 7 Praha - Slaný I/7 Slaný - Chomutov - Hora Sv. Šebestiána (border D)	R 7 Praha - Slaný - Chomutov I/7 Chomutov - Hora Sv. Šebestiána (border D)	R 7 Praha - Slaný I/7 Slaný - Chomutov - Hora Sv. Šebestiána (border D)	R 7 Praha - Slaný - Postoloprty I/7 Postoloprty - Hora Sv. Šebestiána (border D) R 28 Postoloprty - Most - Mníšek (border D)
D 8 / I/8 R 7 + I/28	D 8 Praha - Lovosice (except I/8 Nová Ves - Doksany) D 8 Trmice - Řehlovice	D 8 Praha - Lovosice - Ústí nad Labem - Petrovice (border D) (surface solution of passage of Protected Landscape Area)	D 8 Praha - Lovosice - Ústí nad Labem - Petrovice (border D) (tunnel solution of passage of Protected landscape Area)	D 8 + I/8 Praha - Lovosice (ROLA) - Teplice - Cínovec (border D) Alternative to D 8: R 7 + R 28 Praha - Postoloprty - Most -

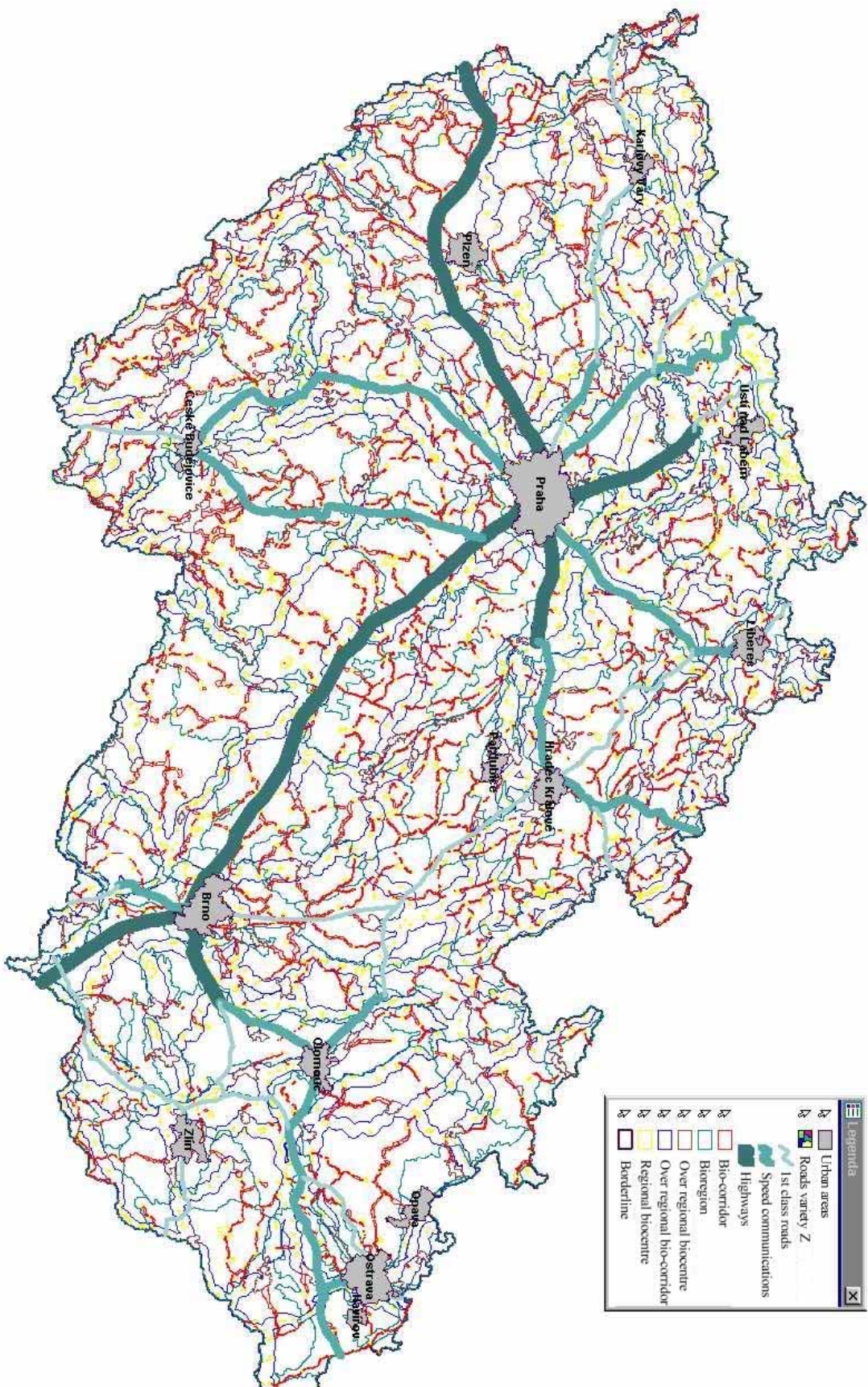
	I/8 Lovosice - Teplice - Cínovec (<i>border D</i>)			Mníšek (<i>border D</i>)
R 10 / I/10 (R35 / I/35)	R 10 Praha - Ohrazenice (Turnov) I/10 Ohrazenice (Turnov) - Harrachov (<i>border PL</i>) R 35 / I/35 Ohrazenice (Turnov) - Liberec - - Hrádek nad Nisou (<i>border D</i>)	R 10 Praha - Ohrazenice (Turnov) - Hrádek nad Nisou (<i>border D</i>) R 35 Ohrazenice (Turnov) - Liberec - Hrádek nad Nisou (<i>border D</i>)	R 10 Praha - Ohrazenice (Turnov) R 35 Ohrazenice (Turnov) - Liberec - Hrádek nad Nisou (<i>border D</i>)	R 10 Praha - Ohrazenice (Turnov) R 35 / I/35 Ohrazenice (Turnov) - Liberec - Hrádek nad Nisou (<i>border D</i>)
D 11 / R 11 I/11 I/33 I/37, I/16	D 11 Praha - Libice (Poděbrady) I/11 Libice (Poděbrady) - Hradec Králové I/33 Hradec Králové - Náchod (<i>border PL</i>) I/33+I/37+I/16 Hradec Králové -Královec (<i>border PL</i>)	D 11 Praha - Libice (Poděbrady) - Hradec Králové - Královec (<i>border PL</i>)	D 11 Praha - Libice (Poděbrady) - Hradec Králové I/33 Hradec Králové - Náchod (<i>border PL</i>)	D 11 Praha - Libice (Poděbrady) R 11 Libice (Poděbrady) - Hradec Králové I/ 33 Hradec Králové - Náchod (<i>border PL</i>) R33+R37+R16 Hradec Králové -Královec (<i>border PL</i>)
R 35 / I/35 (D 47 / D 1)	I/35 Hrádek nad Nisou (<i>border D</i>) - Liberec - Ohrazenice (Turnov) - Hradec Králové - Olomouc - Lipník nad Bečvou	R 35 Hrádek nad Nisou (<i>border D</i>) - Liberec - Ohrazenice (Turnov) - Hradec Králové - Olomouc - Lipník nad Bečvou (D 47 / D 1)	R 35 Hrádek nad Nisou (<i>border D</i>) - Liberec - Ohrazenice (Turnov) - Hradec Králové - Olomouc - Lipník nad Bečvou (D 47 / D 1)	I/35 Hrádek nad Nisou (<i>border D</i>) - Liberec - Ohrazenice (Turnov) - Hradec Králové - Olomouc - Lipník nad Bečvou

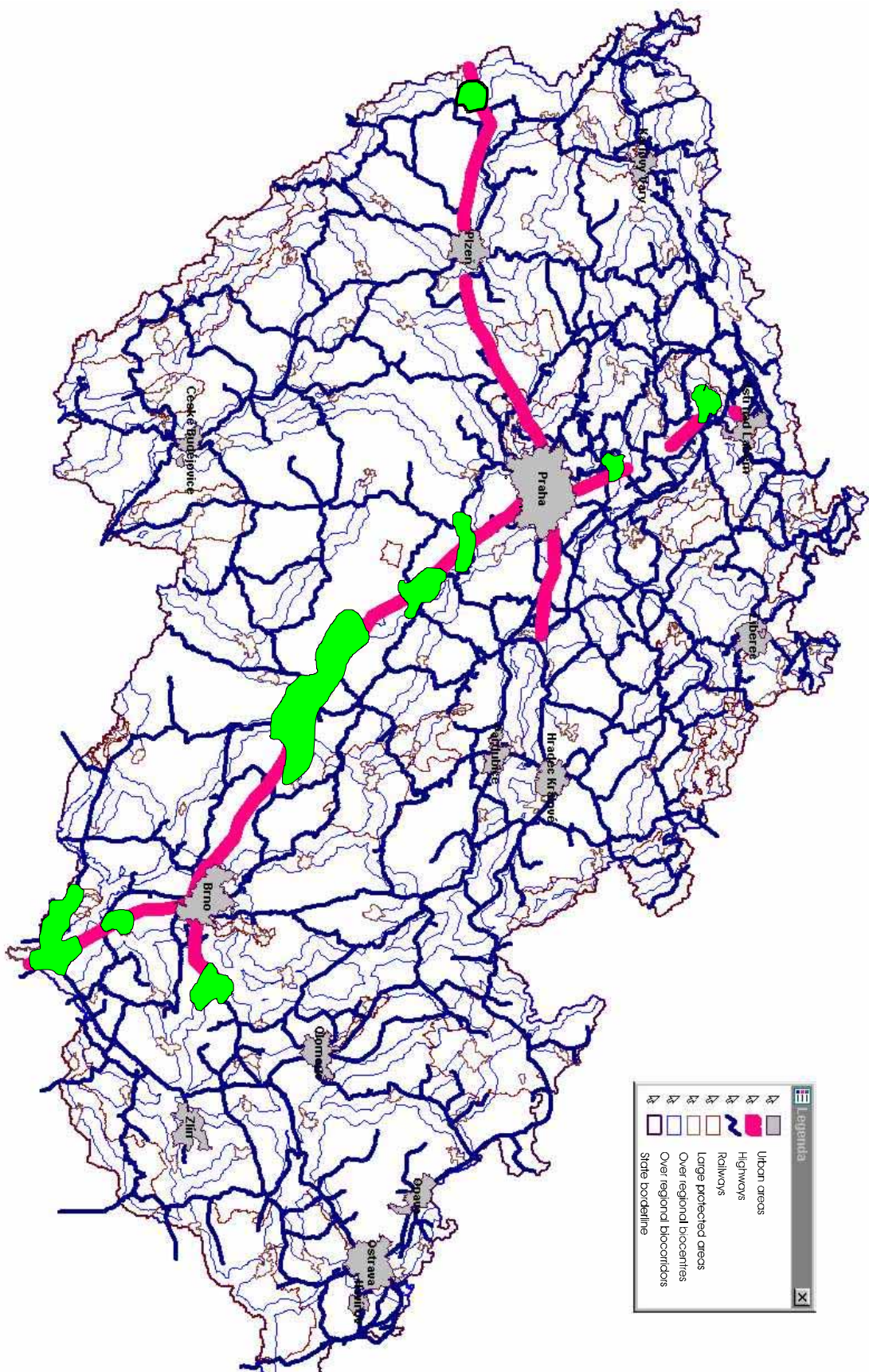
	(kromě R 35 Liberec - Ohrazenice, Mohelnice - Lipník n. B.)	Lipník nad Bečvou - Border na Moravě	Lipník nad Bečvou - Border na Moravě	(kromě R 35 Liberec - Ohrazenice, Mohelnice - Lipník n. B. a D 47 / D 1 Lipník nad Bečvou - Border na Moravě)
I/43 / R 43	I/43 Brno - Svitavy	R 43 Brno - Moravská Třebová	I/43 Brno - Svitavy	I/43 Brno - Svitavy
R 46	R 46 Vyškov - Olomouc	R 46 Vyškov - Olomouc	R 46 Vyškov - Olomouc	R 46 Vyškov - Olomouc
I/47 / D 47 (D 1)	I/47 Vyškov - Hulín - Přerov - Ostrava - Bohumín (border PL)	D 47 (D 1) Hulín - Ostrava - Bohumín (border PL)	D 47 (D 1) Hulín - Ostrava - Bohumín (border PL)	I/47 Vyškov - Hulín (nová trasa) - Lipník nad Bečvou - Běloutín - Ostrava - Bohumín (border PL) (kromě R 47 Lipník n. B. - Běloutín)
I/48 / R 48	R 48 / I/48 Hranice na Moravě - Běloutín - Příbor - Frýdek-Místek - Chotěbuz (border PL)	R 48 Hranice na Moravě - Běloutín - Příbor - Frýdek-Místek - Chotěbuz (border PL)	R 48 Hranice na Moravě - Běloutín - Příbor - Frýdek-Místek - Chotěbuz (border PL)	R 48 Hranice na Moravě - Běloutín - Příbor - Frýdek-Místek - Chotěbuz (border PL)
I/49 / R 49	I/49 Otrokovice - Střelná (border SK)	R 49 Hulín - Fryšták - border SK	R 49 Hulín - Fryšták - border SK	I/49 Otrokovice - Střelná (border SK)
R 52 / I 52	R 52 Brno - Pohořelice I/52 Pohořelice - Mikulov (border A)	R 52 Brno - Pohořelice - Nový Přerov (border A)	R 52 Brno - Pohořelice - Nový Přerov (border A)	R 52 Brno - Pohořelice I/52 Pohořelice - Mikulov (border A)
I/55 / R 55	I/55	R 55	R 55	I/55

	Poštorná (<i>border A</i>) - Břeclav - Olomouc	Poštorná (<i>border A</i>) -Břeclav - Hulín	Poštorná (<i>border A</i>) -Břeclav - Hulín	Poštorná (<i>border A</i>) -Břeclav - Olomouc
R 56	R 56 Frýdek-Místek - Ostrava	R 56 Frýdek-Místek - Ostrava	R 56 Frýdek-Místek - Ostrava	R 56 Frýdek-Místek - Ostrava
Watercourses	Labe Ústí nad Labem - state border SRN - without navigability increasing	Labe Ústí nad Labem - státní hranice SRN - with navigability increasing	Labe Ústí nad Labem - státní hranice SRN - with navigability increasing	Labe Ústí nad Labem - státní hranice SRN - without navigability increasing
Railways	I., II. corridor (parts) + TINA	I., II., III. a IV. corridor (gradual construction) + TINA (reconstruction and modernisation)	I., II., III. a IV. corridor (gradual construction) + TINA (reconstruction and modernisation)	I., II., IV. a III. corridor (gradual construction) + TINA (reconstruction and modernisation)
High speed railways	-	Area reserve	Area reserve	-
Combined		Development	Development	Development









7.3. Strategic Environmental Impact Assessment (SEA) and Environmental Impact Assessment (EIA) – new trends in legislation and practice

EIA

In the Czech Republic, Environmental Impact Assessment is a relatively young discipline. In former Czechoslovakia, public awareness about this process arose in connection with preparation of the Law No. 17/1992 Col. on Environment and with the signature of ESPOO Convention on Assessment of Transboundary Environmental Impacts in August, 1991.

In the Czech Republic, environmental impact assessment was first integrated to the legislation in the law above mentioned. Then it was treated in detail in the special Law No. 244/1992 Col. on environmental impact assessment. This law was based on the directive of the EU Board No. 85/337/EEC from June 27, 1985 and on legislation and practical experience of EU member states, which have already put this process in practice, as well as on the Czech legislative system. Due to that, the Czech law on environmental impact assessment has some specific distinctions from respective EU directives and from legislation of other member states.

The Law No. 17/1992 Col. respects the basic principles of EIA process. Principle of democracy implies the involvement of relevant authorities, respective communities and the public in the process of discussion on environmental impact assessment due to intended project implementation. Next is the principle of variants to the solving of a problem. Equally important is the principle of timely assessment - the impacts of a project are assessed as early as possible, so that the results of an assessment can be put in practice. The EIA process should serve as a tool for sustainable development policy implementation. It must ensure that in all stages of preparation of a project including its implementation the environmental aspects are taken into account.

The law also specifies the basic terms important for EIA procedure – environment, ecosystem, ecological stability, sustainable burden to an area and ecological derogation.

According to Paragraph 21 of the Law No. 17/1992 Col. on the environment, a Law of the Czech National Council No. 244/1992 Col. was adopted dealing with EIA on April 15, 1992 that came in force on July 1, 1992. By adoption of this law a platform was created for making decisions on development alternatives from the view of their possible impacts to the environment. It is a powerful tool for an enforcement of ecological ethics and ecological policy. The EIA process embodies environment protection policy into the decision making process. Public plays an important role in the EIA process. It is also different from the previous approaches utilised for the capital project assessment in its overall view to the environment as the complex of ecological, economical, social and health parameters and its aspiration to make a complex assessment of impacts of a designed activity to these parameters.

The above mentioned law deals with the prepared:

1. constructions, activities and technologies
2. development concepts and programmes
3. products

The EIA process may differ significantly for each of the above-mentioned categories. The

following bodies are competent for environment impact assessment: Ministry of Environment, Czech Inspection for Environment and district authorities. Their competencies within the process depend on the level of importance of a construction, activity or technology impacts, or on the above-mentioned category.

The Czech law on EIA is rather specific. It is not consistent with a generalised EIA process used in most other countries as it starts by the core point – by passing on the prepared documentation (called E.I.S. abroad – Environmental Impact Statement). It is based on the so called „access of imperativeness“, according which the law provides a list of specific project categories (investment actions), for which an EIA must be prepared. It also sets a detailed scheme of documentation preparation. Thus the phases of screening and scoping do not apply in the process, unlike they do abroad.

Table 1. Schema of the EIA process

<i>generally</i>	<i>Czech Republic</i>
Intention proposal (+)	
Screening	Decision on E.I.A. preparation
Scoping (+)	Specification of EIA content and scope
EIS – report on impact to the environment	Statement including: <ul style="list-style-type: none"> • Documentation – opinion (+) • Report – public discussion (standpoint proposal) (+) • Standpoint
Disputation (+)	
Perspective	
Monitoring	Monitoring
Post project analysis	Project analysis
Appeal system	Appeal system

+) public involvement

1. *EIA documentation includes:*

PART A: basic data on the project: title, place, character (new or modernised construction), investor, designer, terms of introduction and finalisation

PART B:

- data on inputs: land use - permanent and temporary, water consumption if any, raw material and energy sources, energy, data on sources of air pollution,
- data on outputs (point, square and line sources of air pollution, waste water if any - amount technological process, character of recipient watercourse, noise and vibration

P/ART C:

- description of varieties
- description of the environment possibly influenced (climatology, geology, geomorphology, hydrogeology, ground and surface water, flora and fauna)
- supposed impacts description
- proposal of measures and monitoring,
- non - technical summary, final point of view.

2. EIA review

EIA review evaluates completeness of data presented in documentation, correctness of all impacts assessment, review of maps etc.

3. Public discussion

The investor (Directory of Roads and Highways, Czech Railways), author of documentation and review, and civil initiatives (more than 500 persons), have one representative at discussions. Furthermore, also the interested communities as towns and villages are invited for a public discussion through its authorities after presenting a written expression.

4. Final point of competent authority

The final conclusion gives the competent authority, which is Ministry of Environment or/and District authorities. The point is not legally obligated but construction authority at the issue of construction permission respects it.

Biological valuation according to Law No. 114/92, out of EIA and SEA processes

The Authority of nature protection can order the biological valuation in case any construction does not have a size and parameters for EIA procedure. The content is similar to EIA documentation and includes variety description, environmental description, supposed impact description and proposal of measures, monitoring and a final point of view.

Short overview of Law No. 244/1992 Col., on Environmental Impact Assessment

Positives:

1. Complying with basic principles of EIA process that are applied abroad

- timely preparation principle, prevention (EIA procedure must be applied in the most effective phase of a project design, the law determines impact assessment of the prepared activities to the environment)
- ecological responsibility principle (responsibility for ecological consequences of attitudes, standpoints and decisions of all the interested parties)
- principle of democracy (broad participation of the affected public - its attitudes must be respected)
- principle of possibility of versions (several versions of each intention should be evaluated for eventual implementation)
- principle of ecological survey (assessment of the project under preparation in view of its direct and indirect impacts to the environment including the measures supposed to prevent, eliminate, minimise and compensate eventually the effects to the environment)
- principle of complexity (in principle, EIA is a complex procedure describing the whole „life cycle“ of a proposed activity)

2. Complying with ESPOO Convention

- prevention principle, the EIA process takes place at the earliest stage of a decision making process
- conceptions, plans, programs are viewed
- specification of obligatory assessed activities listed in appendix 1 to the convention is adopted
- the law complies with obligatory content of a documentation from appendix 2 to the convention
- detailed specification of involvement of the public to the process of EIA

3. Conveyance of the decision making process to the affected area

Negatives

1. The phase of „submitting of an intention” is missed, the EIA process starts by the phase of documentation preparation
2. Omission of the phase of screening (specification of established activities)
3. Omission of the phase of scooping (pre-determined obligatory content and scope of documentation)
4. Elimination of public involvement in the initial phases of EIA process
5. Development of variants of the solution is not obligatory

Competitive persons for the EIA process must pass a technical examination, which has its positive as well as negative aspects.

Main problems of road constructions assessment from viewpoint of investor

1. Highway or road construction preparation is longer by approximately 1.5 years (the whole process takes approximately 1.5 years, which prolongs documentation preparation needed for the preparation of documentation for a decision on strategic development of an area, that must include conclusions of an EIA process.
2. Different requirements for the level of detail of EIA and for documentation on a development of an area (DÚR). Law No. 244/1992 Col. does not specify precisely the level of technical documentation and EIA preparation.
3. Different requirements of competent bodies for the design of roads system (often the requirements are inadequate to the solved problem, but an investor must respect requirements of authorities. Bridge width for wildlife passages over a highway was 50 m in the requirement, whereas functional bridges in Europe are about 10 – 15 m wide; conduction of communications close to biocorridores etc.).
4. Conclusions on assessment of impacts to the environment (variants equivalence, neither transport no economic viewpoint included).
5. Criteria for selection of the best variant of a construction must be balanced (paradoxically a situation may arise, when a recommended variant complies with the demands for environment protection, but it does not perform the function for which it was designed. Thus for the selection of the best variant it is essential to imply a wide spectrum of criteria like the environment, transport relations and structures, construction costs, its operation and maintenance eventually).
6. Public involvement in the process of assessment (often the public involved in the EIA process has inadequate knowledge and information; its involvement is often casual or

purposeful; public standpoint should not be overvalued as it can often be misleading and subjective).

7. EIA survey costs (direct remuneration of the survey between investor and survey compiler, which, though selected by the Czech Ministry of Environment, may be influenced by an investor).

SEA

Among other things, the Law on EIA No. 244/1992 Col. requires development of an EIA conception, the so-called SEA-Strategic Environment Assessment. The conception is prepared and authorised on the level of central organs of public administration in the sectors of energetic, transport, agriculture, wastes treatment, minerals exploitation and processing, recreation and tourism. The SEA process leads finally to an adoption of the conception material by the Government. The process can be expressed by following succeeding steps:

1. Development of variants of a conception and their review,
2. Agreement on publishing of a conception and of results of a review with the Czech Ministry of Environment,
3. Public discussion of the conception and review according to SEA, preparation of suggestions of the the public,
4. Working off a conception and development of a verdict to the review (it may content a list of dissents).

As mentioned above, two levels of the environmental impact assessment can be distinguished: strategic and design level. In fact, the content of both is equal, nevertheless, there are the following differences:

- a) the scope of SEA is wider than that of EIA
 - geographic extent, the reviewed conception influences more elements than a local project,
 - variety of alternatives taken into account is much broader, varieties comparison is one of the most important processes within SEA,
 - generally, SEA is used for a review of influences from the point of view of sustainable development, global and regional effects, whereas EIA deals mainly with local effects of a project,
- b) SEA is a targeted process characterised by environmental objectiveness (qualitative and quantitative indicators). It provides for a system for testing of results and conclusions of environmental and development strategies.
- c) Its planning, approval and implementation takes longer time than in the case of EIA.
- d) The level of detail and accuracy of information and input data needed for SEA is considered on a general level, especially for the uppermost levels of planning.

Though the SEA process can depend on its strategic level, on a sector and national planning procedure, the necessary general procedural steps can be defined, in the following order:

1. Screening (definition of a need for SEA).
2. Definition of the tasks of a strategic conception and of priorities in the field of environment protection.
3. Scoping.

4. SEA implementation (prediction of possible influences to the environment and their importance, recommendations.
5. Preparation of a documentation and a review.
6. Public discussion.
7. Decision.
8. Development of monitoring measures.
9. Definition of further procedure of environmental assessment (definition of time period for revaluation of a conception, definition of the scope of EIA).

At whichever level the environmental assessment is prepared, it is necessary to make a correct choice and definition of impacts to the environment and their ordering according to their importance. Some impacts and criteria in the sector of transport can be given as an example: change of climate – emissions of greenhouse gases; air quality – emissions or concentrations of pollutants; change in biodiversity – decrease/extinction – of important plant and animal species etc.).

Acquiring the necessary data for sufficient evaluation of a conception and its alternatives is an important phase of a project, as the quality and credibility of obtained data may influence negatively the overall result of a review. Also the correct definition and understanding to the level of conception strategy is necessary for keeping the line of the assessment.

One of the first conception assessment materials prepared so far according to the paragraph 14 of the Law No. 244/1992 Col., was the „Proposal of the Czech Republic Transport System Development till 2010“. By its sight, this conception is a logical continuation of a government decree on the development of particular types of transport networks. The principle of this assessment consisted in a division of the Czech territory to the precisely defined multimodal corridors with individual criteria that enabled to make a comparative assessment of different varieties. It is worth saying, that the participants of public hearing ranged among the most important such aspects as emissions, noise, land annexation and danger to ecosystems. Generally, the necessity was stressed to make an exceptional attention to large-scale influences to landscape, influences to population health and influences to land structure and its functional utilisation.

7.4. Models to predict fragmentation by new infrastructures

CDV is creating so called Unified Transport Vector Map that makes possible stratification of separate transport infrastructure and environment elements vectors. This system is one of the systems recently used for conflict points identification.

7.5. Review of relevant studies and on-going research

CDV, together with AOP will start to create proposal of Methodological Guidelines for fauna culverts construction next year. Methodology will be based on biological approach - on real migration needs of individual species, behaviour and biotope demands point of view. Technical problems are also important - requested size, feasibility assessment, necessary financial expenses etc. Methodology will include also the time scale - three phases of process will be given - study, documentation for area decision, build planning documentation.

8. Evaluation and monitoring of efficiency of measures: overview of corresponding studies, ongoing research

So far, the measures for diminishing the barrier effect of communications have not been implemented in such an extent that would provide for evaluation of their efficiency. It is only possible at present to evaluate first experience with the implementation of otter passages. Otters started to use the wooden bridges in tunnel passages soon, if they were equipped with a steering fencing. It showed that also other species of animals use these passages (fox, marten).

New passages on the speed communication R35 (described in following chapter) including the eco-tunnel nearby Lipník n. B. could not be still evaluated, because the segment has started to work in July , 1999.

It is only possible to evaluate efficiency of individual types of bridges at the already constructed bridges at highways. Experience with utilisation of the bridges by animals compiled so far is described in the above chapters. In detail, it is described in final reports of the Czech Agency for Protection of Land and Nature on evaluation of permeability of the Czech highway network from 1998 and 1999.

9. Economic aspects

Due to so far insufficient defragmentation in the Czech Republic, no analysis of expenses and benefits for defragmentation has been realised. Exception is the speed communication R 35 between Olomouc and Lipník, where several excellent culverts have been built in places of communications and watercourses intersections. Following table summarises these arrangements together with expenses for their construction and will be used for future economic analyses.

Object No.	Lap (km)	Title	Price total (mil. Czech crowns)
203	160	Highway bridge over stream "Vrtuvka"	36,36
208	163	Highway bridge over river Olešnice	19,94
234	157,477	Highway bridge on R 35 across river "Beronka"	15,16
238	157,477	Highway bridge on by-road across "Beronka"	5,94
212	165,512	Highway bridge over stream ""Kyjanka"	10,83
215	166,205	Highway bridge over stream "Říka"	16,16
216	166,205	over stream "Říka" on B route	11,81
231	166,566	bridge "Antoníček"	12,58
221	170,354	bridge over drainage channel	4,78
223	171,965	bridge over stream "Trnavka"	30,33
224	173,771	bridge over stream "Loučka"	7,33
621	169,486	Highway tunnel	

10. Conclusion and recommendations

In the Czech Republic habitat fragmentation is not solved in corresponding level. That is why the working group was established. The WG is composed from representatives of institutes mentioned in Chapter 4 and from other experts connected to this problematic. The main task for 2000 – 2002 years is to develop the proposal of methodology for both Ministry of Transport and Ministry of Environment, which will be compatible with procedures in EC countries. The methodology will be done coincidentally with the preparation of Handbook. Present infrastructure will be permanently monitored in agreed range. After the methodology elaboration and approval the further activities of WG are supposed. The list of Czech experts is enclosed.

As the new research areas we recommend the cost / benefit analysis of defragmentation measures

Literature:

HLAVÁČ, V. et al. "Evaluation of Passage Possibilities for Big Mammals in the Czech Republic Motorway Net". Agency of Nature Protection Prague, 1998, 66 p.

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