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Perspectives and Debates

Historical public health in Central Europe with special reference to Hungary. Long-term environmental effects of a historical cataclysm

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Significance for public health

Are there any effects of historical events on the environmental hygienic circumstances and public health indices? This is a basic and crucial question of the recent studies on environmental injustices. In some multiethnic/multinational regions of the world minority groups or whole nationalities suffer disproportionately at the local, regional (sub-national), or national levels from environmental risks or hazards. Central Europe and especially the Carpathian basin yields a good example for the importance of historical aspects in the public health research. The disadvantageous situation of some European minorities can be demonstrated at all levels of environment-health interactions therefore studies should consider and emphasize the special historical background, as well.

Abstract

Hungary, in the centre of Carpathian basin grapples with numerous challenges in order to improve catastrophic indices of environmental conditions of the country, as well as the state of health of the population. Some of these problems are subjects of financial and health policy, and can be solved internally. The remaining environmental problems can only be remedied by cooperation with neighbouring younger countries. This vitally important cooperation is hampered by severe historical conflicts burdening even the present political affiliations. The authors give a short introduction and explanation of the recent sensitive situation in this central European region, as a late consequence of an historical cataclysm happened more than nine decades ago.

The Carpathian region in the 2nd millennium

The Hungarian Kingdom was established in 1000 in central Europe, in the Carpathian basin. Over 900 years Hungary was able to integrate the different nationalities living in this territory, and kept the territorial integrity more or less intact. Years after the unsuccessful War of Independence in 1848-49, a dualistic empire – the Austro-Hungarian Monarchy – was established in 1867, creating a modern European midpower. The crucial turning point in the Carpathian history came with the World War I.

During the post-war peace talks (1920, Paris-Versailles, Trianon Palace) the Great Powers determined new national borders that created large pockets of linguistic minorities; the purported aim of the victors was to acquire railways, roads, mines, industries, larger territory and greater economic capacity.[1] The Trianon Treaty resulted in Hungary's historical territory decreased to 33%, its population decreased to 36%, with only 7.6 million Hungarian inside the new borders while 3.24 million native Hungarians became minorities in the new states (see the contemporary maps of Hungary and the Carpathian basin, Figure 1 a,b). The territories inhabited by Hungarians returned to Hungary in consequence of Vienna Awards in 1938 and 1940. The price, however, was extremely high: the country became a satellite of Germany, and remained the last allied state until the end of World War II.

The peace treaty closing WWII (in Paris) reinstated the borders of Trianon, respecting the new strategic demand of Czechoslovakia for three more Hungarian villages on the right bank of the Danube, below Bratislava. This move would later have extraordinary environmental significance. Following the war, Hungary and her neighbours became part of the Soviet sphere of influence (Eastern Bloc), and it was forbidden to mention consequences of Trianon in the political sphere. By the end of the twentieth century, however, the democratic change brought the opportunity of joining Europe for the countries of the region.[2]

Effects of the *Trianon syndrome* on the demographic and public health indices

The Paris-Versailles Treaties were in fact a punishment for Germany and Austria-Hungary, rather than a suitable basis of a peaceful coexistence of the neighbouring peoples in central/eastern Europe (CEE). The health related indicators of the European countries during the second half of the twentieth century illustrate the political-social-economical diversification of Europe. The mortality in the countries of the Eastern Bloc has continuously increased, while the average life expectancy has decreased. Most western countries, in contrast, have achieved impressive results in this field. The starting point of the comparison goes back to the 1940's and 1950's, when European countries had similar mortality rates (from several points of view, the Hungarian health indicators were among the worse ones). Until now Hungary has achieved a 10-year negative difference in the average life expectancy, compared to the EU average (Figure 2). Not all the differences can be explained by the political system alone, as a number of causal mechanisms can be attributed directly to the Hungarian situation.

A thorough look into the charts of the most important health indicators (Figure 2) indicates the existence of Hungarian peculiarities. The most interesting question concerning Hungary is the discrepancy between having the worst public health indicators even among the socialist countries, and being the communist country that most closely matched Western socioeconomic approaches.

During the Kádár regime (1956-89) the role of centralized planning decreased, while a restricted and tightly controlled private sector was allowed to operate. Notwithstanding all the efforts, people had to face the increasing gap between East and West, which expressed a psychic

pressure for the whole society. This resulted in an overworked, exhausted, hopeless population, with many having to resort to second or even third jobs.

In contrast to the relative freedom in most areas of life, the national feelings were strictly depressed by the communist regime. In the spirit of proletarian internationalism the communist leaders of Hungary have left the Hungarian communities (3-3.5 million people) living outside the borders to their fate. In the meantime, these countries practiced a hostile policy against the Hungarian nationality: use of the Hungarian language was restricted, unification of the families was prohibited, and Hungarian ethnicity was a disadvantage in almost every field of life. In the mother country, prohibition of national interests (familial connections, social support and traditions, etc.) by the Hungarian communist party caused a psychic and moral pressure. It led to the depression and frustration of the nation, probably strongly contributing to the bad health status of the Hungarian population.

An additional effect of the Trianon Treaty has been highly influential in the further deterioration of the health status – and thus to the mortality relations – of the Hungarian population. The new Hungarian boundaries destroyed existing sociogeographic regions, and the historical situation did not make the organization of cross-border health care regions or units possible, which led to a decreased availability of the Hungarian health care system. Even taking the positive changes concerning the connection between Hungary and the neighbouring countries into consideration, it would still be very difficult to harmonize the health care systems in order to provide an effective regional level health care.[3,4]

The selected demographic and health indicators of Hungary (Figure 2) accurately reflect the historical facts mentioned above. They illustrate the consequences of high alcohol intake, unhealthy nutrition habits, high rate of smoking, enormously frequent occurrence of suicide, coinciding with the increasing mortality rates of the most important causes of deaths (diseases of circulatory system and cancer).

Industrialization, settlement of industry

Development of the heavy industry has been a central emphasis with the Communist world. In the neighbouring states of Hungary this activity was primarily focused to the areas inhabited by the Hungarian and other minorities. The main political aim was to change the ethnic composition on the acquired territories with the immigration of the national majority population. Another aspect was the elimination of pollution emitted, especially with the watercourses leaving the polluting countries toward Hungary. The former Czechoslovakia (together with the Hungarian chemical industry) was successful in the complete ecocide the River Sajó in the 1970's, and frequently polluted rivers Hernád and Bodrog with the most dangerous wastewaters of cellulose-production. Romania's similar activity has been reflected in the water quality of the Szamos, Kraszna and Maros Rivers (Figure 3). During the Ceausescu era the settlement of heavy industry near the Hungarian historical, cultural and religious buildings (forts, castles, monasteries, etc.) was also a frequent practice. Even after the democratic change of 1989-90, continued examples could also be found.

The frontier rivers and consequences of the downstream position

The borders of Trianon divided not only the Hungarian population, but the geographical and economic unity of the Carpathian Basin as well. The determining part of the water catchment area lays outside of the present borders, therefore quality and quantity of the river water, and the threat of flood depends on the water management activity of the upstream countries. Watercourses of Hungary carry 120 billion m^3/year, the 95% of which comes from abroad. Hungary, like each downstream country suffers due to the upstream countries' activities and operations.

The *Gabcikovo-Nagymaros* project - the Dunasaur

In general, hydropower belongs to the forms of green/renewable energy, however, in some cases - as the following example represents - when planning a hydropower plant other aspects have to be considered.

In 1975, the two communist leaders J. Kádár of Hungary and G. Husák of Czechoslovakia decided to prepare an international agreement on the implementation of the Danube River Dam project, which was signed in 1977. The project intended the energy utilization of the common river section and consisted of one reservoir at Dunakiliti (Hungary), an upper hydropower plant in Czechoslovak territory at Gabcikovo/Bös, and the lower hydropower plant (HPP) in Hungarian territory at Nagymaros (Figure 4). In 1983, the Hungarian Academy of Sciences advised to stop the works, but this opinion was qualified as

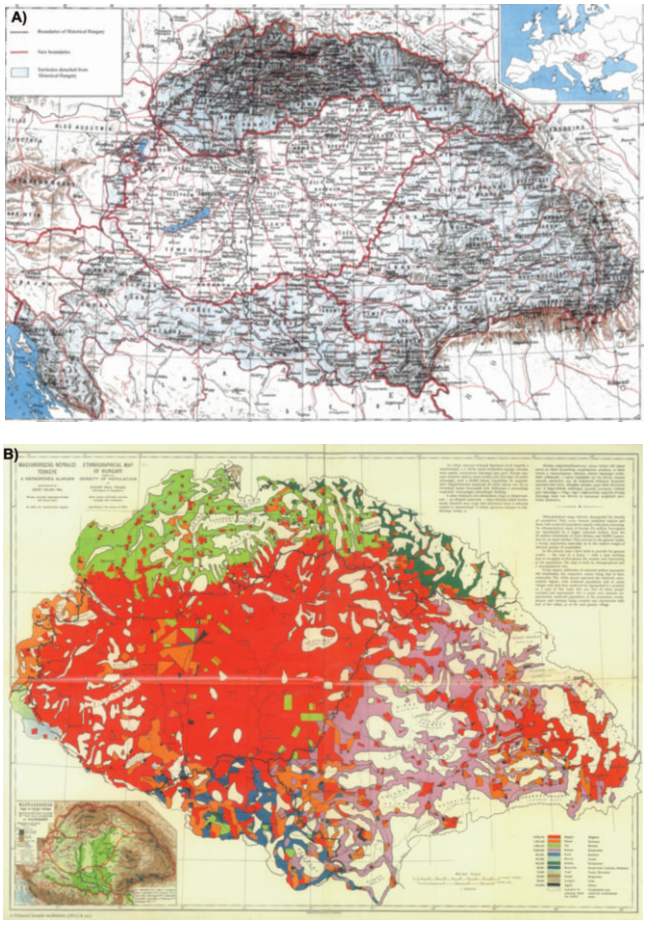

Figure 1. A) Hungary before and after Trianon (Hungarian Royal Office of Cartography, 1921). B) Ethnic distribution in the Carpathian Basin. Red color: Hungarian, white: uninhabited (P. Teleki's original map of 1910).

top secret by the government. The academists' memorandum declared that the conception was based on false economic, energetic and ecological assessments, and the environmental hazards were completely ignored. The Slovak Academy of Sciences also called the attention to hazards of the project to drinking water of Csallóköz (Slovakia's territory north of Danube, with compact Hungarian population, Figure 4).

The first Hungarian democratic government, following the unsuccessful negotiations, unilaterally abrogated the agreement in 1992. The Czechoslovak party started to complete the project by preparing the so-called *Version C.* This version is based on the fact that Czechoslovakia has the *tap* of Danube, controlling both banks under Bratislava since 1947 (Figure 5). The river has been dammed here at Cunovo/Dunacsún, and water has been redirected into the artificial canal built in Slovak territory to the completed Gabcikovo/Bös HPP, bypassing the Old Danube (the frontier determined by the peace-treaties). Czechoslovakia allowed only 300 m^3/s flow into the frontier riverbed while Mosoni Danube (a

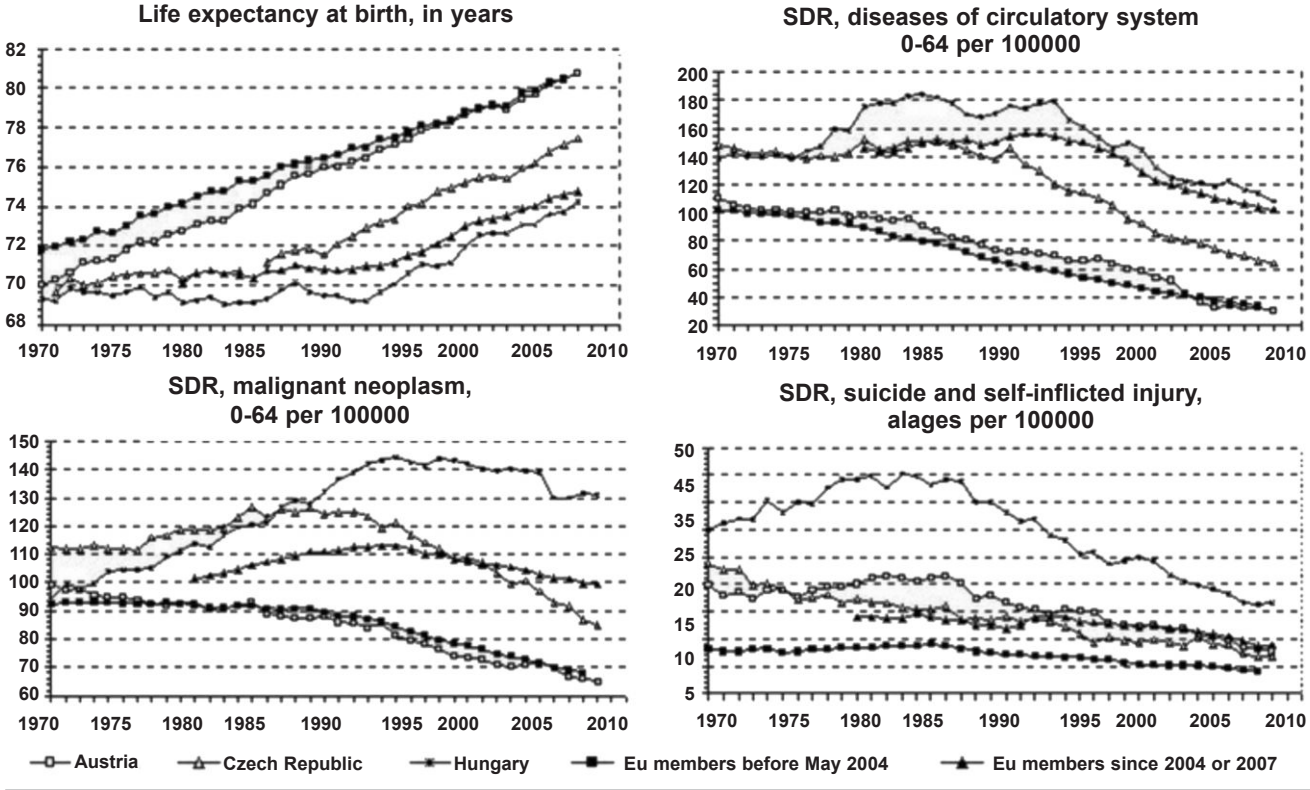

Figure 2. Health indices of Hungary compared to that of selected European countries and regions. EU: European Union (Source: Health for All database, WHO).

Figure 3. Quality of surface waters of Hungary at the end of the 80's (categories represent the contemporary COMECON standards). Based on the map of KGI/ELTE published in: The Quality of Waters, 1989 (Ministry for Environment and Development), Budapest, 1990.

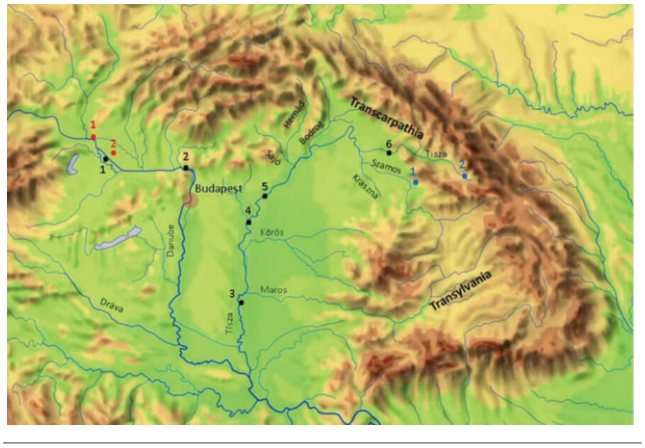

Figure 4. Map of the Carpathian basin with locations mentioned in the text. Based on: L. Zentai's map, 1996. Black color: Hungary. 1: Szigetköz region; 2: Nagymaros (bend of Danube); 3: Tiszasziget (southern border section of the Tisza); 4: Szolnok; 5: Kisköre reservoir (Tisza lake); 6: Tiszabecs (northern border section of the Tisza). Red color: Slovakia. 1: Bratislava, the Slovakian capital (formerly: Pozsony, Hungarian crowning town); 2: Csallóköz region. Blue color: Romania. 1: Baia Mare (formerly: Nagybánya); 2: Baia Borsa (formerly: Borsabánya).

right side branch) receives 20-30 m^3/s. The extraordinary low water surface has led to sinking of water table in the Szigetköz (H) (Figure 4), drying off the branches, channels and backwaters, threatening the unique biotopes. The groundwater under this area is one of the most important subsurface resources of Hungary, as well.[5,6] Closure of the frontier river Danube was considered by Hungary a violation of the international law, entering an action to The Hague International Court of Justice. Hungary argued that completion of the project could cause ecological catastrophe in the Szigetköz and in drinking water supply of Budapest, could spoil agriculture, the nearly natural flora, forests and biodiversity. Seismological, archaeological and landscape destruction issues were also addressed (e.g. the water level in the upstream canal of the HPP was dammed up above the towers of churches of the surrounding villages). Since Version C means that water of Danube has been driven to the navigable upstream canal of the HPP, ships has exclusively been directed to Slovak territory. According to the – *solomonic* – sentence of The Hague passed in 1997, Hungary had no right to abrogate the 1977 agreement, because her reference to the ecological emergency situation was not well proved (on the other hand, Hungary was not obliged to build the lower dam). Czechoslovakia (Slovakia from 1993) had no right to realize Version C, and to terminate the frontier-river. According to the verdict, the parties should maintain the status quo, and the issue of water distribution should be the subject of further bilateral negotiations.[7] Such resolution is unlikely, as in January of 2001 Slovakia finally declared that there was no way to let 50% of water flow into the Old Danube, because the hydrological model of Version C would collapse. By the time, the Slovak electric system included the HPP has been privatized by an Italian company and the profit produced by the *Dunasaur* was finally realized in Italy.

Cyanide and heavy metal pollutions in the Tisza river

An *Ecological Catastrophe Without Precedent*, said the headlines of European newspapers following the cyanide spill, which occurred in Romania on the 30th of January 2000, and was caused by the AURUL, an Australian-Romanian joint venture located in the area of Baia Mare/Nagybánya (Figure 4).

AURUL extracts gold and silver from the waste rock piles of the local mines, using metal enrichment technologies based on the extraction with cyanide after grinding the refuse ore. The process needs a large quantity of water, therefore after storage the cyanide-bearing water is recycled. The havaria was the result of bursting of the dam of the tailings containing cyanide. Almost 100 thousand m^3 concentrated cyanide solution discharged to the catchment area of the Szamos river.[8]

The pollution mainly consisted of metal complexes of cyanide that cause severe direct acute toxicity in all living organisms. Any water containing more than 0.1 mg/L cyanide is classified as *heavily polluted* (the directive 98/83/EEC proposes a limit of cyanide 0.05 mg/L for drinking water). The analyses indicated a maximum cyanide concentration of 32.6 mg/L in the Hungarian part of the Szamos river and of 12.4 mg/L in the Tisza river, downstream of the confluence with the Szamos. Further downstream of the Tisza, the concentration became gradually lower upon the diluting effect of the tributary rivers and also water from the reservoir at Kisköre (Tisza lake, Figure 4), which had been filled with clean water before the pollution wave arrived. The maximum cyanide concentration of the Tisza water, when leaving the country, was 1.49 mg/L.[9]

Cyanide behaved practically as a conservative material; it remained in the water and did not accumulate in the sediment. The likely explanation is that it formed associations with copper that was also present

Figure 5. General map of the frontier section of the Danube river. Insert: Version C and closure of the frontier-river.

as a pollutant. The complete flow through Hungary lasted 12 days and left the country towards Serbia, contaminating the Danube. In summary, it can be stated that in the Hungarian sections of measurements of the Tisza river the total quantity of cyanide (in the pollution wave) was equal to about 105-110 metric tons at all sites, while the quantity of copper was estimated at 70-100 tons.

The cyanide pollution resulted in the devastation of the larger part of planktonic organisms of the Tisza and Szamos rivers. During the passage of the pollution wave the lethality detected was 100% in the Szamos river, 70-80% along the central Tisza section and 90-100% at the southern border section. The most *spectacular* consequence, however, was the incredible fish kill. Considering the results of fish surveys using echo sonar during the previous years (1989-1995), as well as the growth of fish stock until 1999 and the residual fish stock, the total fish death was estimated as 1241 tons, 33.8 % predatory fish, 13.5 % carp, 8.1 % sturgeon and 44.6 % herbivorous and other fish (based on the mass of dead fish collected).[9] Beyond the aquatic organisms, the elements of terrestrial ecosystem (birds, mammals, macrovegetation, etc.) were also damaged, since the animals consumed contaminated fish and/or polluted water. Indeed, the effect of the pollution spread to ecosystems more distant from the river through the food chain and different transmitters. Several nature conservation areas were affected, like the protected area of lake Tisza (reservoir) that is an important part of Hortobágy National Park (and had recently become part of the World Heritage), is also Ramsar site and part of the UNESCO's MAB program.

Unbelievably, two months later, the dam of the settling pond of another Romanian mining company at Baia Borsa /Borsabánya (Figure 4) broke through upon the effect of heavy rainfall and simultaneous snowmelt. About 20 thousand tons of slurry, contaminated with heavy metals was discharged finally into the Tisza river again (Figure 4). The pollution wave, carrying lead, copper and zinc, crossed into Hungary on the 11th of March. The maximum concentration of total lead and zinc was 2.9 mg/L, while that of the copper was 0.86 mg/L. Before the arrival of the pollutant wave, the concentrations of the above-named heavy metals were characteristically below 0.1 mg/L. The first pollution wave passed the upstream border station until the 13th of March, lasting for

about one and half days. The quantity of lead transported through the border station Tiszabecs (Figure 4) during this period can be estimated as 50 tons, while that of the copper and the zinc as 20 tons and 70 tons, respectively. Two days later the second pollution wave crossed the border. This one carried smaller concentrations and load and lasted shorter than the previous one.

The pollution wave reached the downstream border station in eight days. At this station the concentration of lead (Pb) and copper was below 0.1 mg/L, while the total zinc concentration varied in the range of 0.2-0.3 mg/L, hardly higher than the background concentrations. The impact of the pollution wave on the composition of the sediment was detectable at some location in the upper Hungarian Tisza, in the zones of sedimentation.

Results of the analysis of sediment samples showed that heavy metals deposited from the pollution wave of high concentrations increased the lead concentration of the sediment to about 900 mg/kg between the river km 757 and 727.5. Copper and zinc concentrations of the sediment of the same stations were about 500 mg/kg and 1400-1500 mg/kg, respectively. These data represent about ten-fold concentration increase in comparison to background data (characteristic concentration ranges of the *non-polluted* bottom sediment of the upper Tisza are 20-70 mg/kg for lead and copper and 100-400 mg/kg for zinc).[10]

As the result of repeated release of pollutants, however, the involved companies not only killed the Tisza river as a living system, poisoned drinking waters, but also destroyed the whole region as a tourist destination. At present, a new similar gold mine with Canadian capital is also under preparation in Romania (Rosia Montana/Verespatak Project).

The Carpathian forests and floods

Due to its basin and mainly plain nature, Hungary is especially threatened by floods and inland waters. The proportion of areas protected against floods in Hungary is the highest in Europe. 15% of the territory of the country, where 2.5 million people live in 700 communities, is situated on flood plains. A third of arable land, 32% of railways, 15% of public roads are situated in threatened areas and 30% of the GDP is produced there. The safety of the population and material goods is protected by state-managed flood control works at a length of 4220 km (2640 miles). Nearly 60% of them are of appropriate construction. 97% of the threatened areas are protected against flood.[11] The costs of protection are very high; therefore the country is especially interested in the flood management of the neighbours.

In 1970, a whole county was flushed in one night, as dykes were cut in Romania, giving free way for the water through the Hungarian border. Some 30 years later, the country has suffered again larger and larger floods of Tisza river, since 1998. These floods serially originated in the Eastern Carpathians (Ukraine and Romania) keeping emergency situation costs as a daily average 0.3-0.5 USD millions and keeping in charge 10-15 thousand volunteers and the army (the total costs of protection and reconstruction e.g. in 2000 were 230 USD millions). Helping the Ukrainian territories of the upper Tisza is also an extra cost, but it is moral responsibility for the purely Hungarian settlements of this extremely poor region.

Experts attribute the re-current floods to various phenomena suggesting that each increase of the annual average temperature by one degree Celsius causes the Tisza's flood level to rise by one meter. Another explanation is that in Ukraine, sediment from the Tisza's catchment area, thick with a growing amount of vegetation, keeps raising the riverbed, resulting in higher water levels. Additionally, in the recent years snow melted at dramatic speed. Some 2 billion cubic meters of snow turned to water in just several days in early March of 2001. This, plus the fact that in there were days when 55 mm of rain fell throughout the catchment area were the main reasons for the latest flood. Besides the extreme meteorological-climatic conditions of the recent years there must be other reasons of the large floods. Hungary cannot collect data from the catchment area located abroad; it may be assumed that forests in the Carpathian mountains are not managed properly. The extreme woodcutting (deforestation) may explain the serial large flood events with peak water levels. The only solution for this problem is cooperation in studying and forecasting the hydrological and ecological impacts of woodcutting in the Carpathians. In order to avoid an ecological catastrophe the multilateral intervention is urgently needed. And it is a vital interest not only of Hungary.

Air pollution, noise and an overgrown capital

Hungary is located in a moderately polluted region of the continent. Approximately 40% of atmospheric pollution comes from foreign sources. Polluted areas were significantly reduced from 1985. The formation and presence of reductive air pollutants were characteristic until the 1980's, but in the last decade oxidative (photochemical) pollutants have become dominant.[12]

The historic borders of Hungary contained more than 20 million inhabitants, so Budapest, the prosperous capital,[13] was just the appropriate size. After Trianon, and especially nowadays, a capital with some 2 million citizens (1/5th of the total population) is not tolerable for long term. This small country cannot only keep such a big, overgrown hydrocephalus. But the tendency does not seem to turn at all. The vast majority of the foreign capital is located and invests in Budapest. More than 90% of the positions and jobs advertised are Budapest-based. The economical, cultural, educational, and financial possibilities irreversibly attract crowds of manpower. It is not unexpected, that this wonderful city is the much noisiest one in the country, and the air pollution is also the highest here (especially NO_2).[14]

The over centralized structure of the road and railway system also determines the problems of the capital. These systems are also the heritage of historic Hungary. The road system is radial with the lack of transversal elements (the main circular roads and also the railways were detached with the large historical Hungarian cities). As a consequence, the east-west traffic and transport can hardly bypass Budapest, since only low-capacity bridges are located over the river Danube between the capital and the southern border (Budapest itself has 8 bridges and other two for the railways). The motorway system of the country is in an embryon-

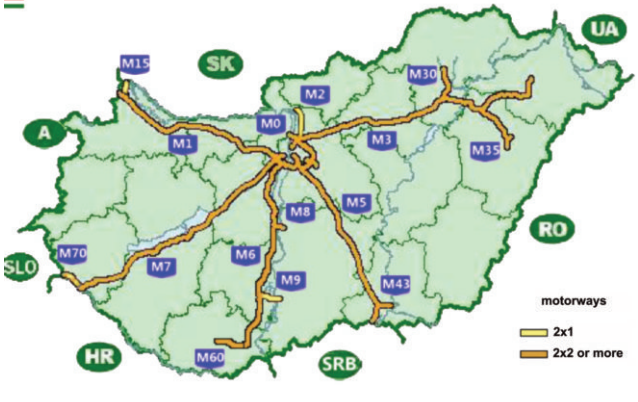

Figure 6. The highway system of Hungary, 2010 (Source: http://www.skyscrapercity.com/showthread.php?t=460510&page=148).

ic stage and will also be centralized (Figure 6). These facts also support, accelerate, or at least preserve the uncontrolled growth of the capital and the increasing imbalances of the regions. But for this self-generating process Trianon cannot be accused any longer.

Breaking out from the environmental trap situation

Hungary's problems summarized by this paper are only a small but considerable fraction of recent environmental issues of Carpathian basin rising from the historical past, (but causing a basis of the possibility of continuous environmental injustices). Certainly the most dangerous of them is the new wave of the *ecocolonialism* in this region, after collapsing communism (intensive Western investments to the HPPs, gold-silver mining, etc.).[15] Perhaps, the facts outlined here can illustrate the problems and also the possible solution. Hungary's problems not only considerably differ from that of the Balkans and the former Soviet Republics, but - rising from the special geographical and historical situation - also differ from that of the other three medium-developed Visegrad (V4) countries: Czech Republic, Poland and Slovakia.[16] It was thought that the only way of a solution to the problems was to access membership of the European Union. Not alone, rather together with the neighbours. The European Union stated that a key condition for eastern countries to access EU membership entails realization of severe environmental regulation and control. The membership requires completely different attitude in many fields, including even handling the environmental, public health issues, as well as, nature conservation and last but not least the ethnic affairs. Nevertheless, the membership does not solve all problems automatically, indeed, new issues have also arisen. Following the EU joining of both Slovakia and Hungary in 2004, there has been no movement in the talks on the Danube issue. The situation is the same in the case of Romania (EU joining: 2007) regarding the cyanide pollution. Water quality problems of a common river (Rába/Raab) of Austria and Hungary also serve as a cause of a new environmental debate. By-products from Austrian leather factories have continuously caused the river to foam downstream. The new EU members have nowadays faced further new challenges: illegal waste import from the old member states and food safety scandals. In 2004, European companies perpetrated a fraud on the famous Hungarian paprika (red pepper) by mixing with aflatoxin- and ochratoxin-contaminated Brazilian product. Some companies seem to be established just for relabeling and trade unsafe food products, which can be called a new type of the bioterrorism. Nonetheless these problems can be studied from historical perspective by future analysts.

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