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## THE INFLUENCE OF *TRANS EUROPE LINES PROJECT* ON TELECOMMUNICATIONS DEVELOPMENT IN THE CENTRAL AND EASTERN EUROPE

### SUMMARY

A multinational Project *Trans Europe Lines (TEL)* is of great importance for the present development as well as for the future role and situation of telecommunications in the countries of Central and Eastern Europe (CEE). The idea of the necessity of constructing a fibre optic (FO) telecommunication bridge between Eastern and Western Europe was initiated by the Deutsche Bundespost Telekom and presented to some of the telecommunication administrations in that region in the year 1990. The basic aim of the Project is to enable all countries to improve and satisfy the telecommunication needs on international and national levels, to ensure sufficient transmission telecommunication infrastructure in international traffic, to enable establishing of intense economic interrelations, to provide the basis for the development of future telecommunication services, and to support complete economic development in the CEE region.

After its initialisation, the TEL Project was gradually joined by new Members and by the end of 1996 it included 16 countries. Since initialisation until the end of 1996 TEL almost tripled in size regarding the physical area covered, and it became twice as big regarding the involved number of inhabitants (potential subscribers).

Various reasons were the "driving force" for the numerous countries insufficiently developed in the field of telecommunications and involved in the Project (as, for example, for the Republic of Croatia, in which TEL strongly supported its telecommunications development in spite of the difficulties of the war period 1991-1995 in the country).

Thanks to the FO cable transmission systems which have been or are still being built within the framework of the TEL Project and which represent the infrastructure for the true CEE information highway, in the field of telecommunications, the Project Members are not only connected among themselves but also with the whole world, since the direct access points to TEL are at locations of numerous "landing points" of the international FO submarine cables.

### INTRODUCTION

In the beginning of the nineties in Central and Eastern European countries where there were signifi-

cant political changes which very quickly caused also changes in the economic streams in that wide region, several telecommunication projects were initiated by numerous institutions: Central European Initiative suggested the project *Central European Broadband Interregional Network (CEBIN)*, ITU started with *Trans-european Telecommunication Network (TET)* and US West with *Central European Fibre Optic System (CEFOS)*, Deutsche Bundespost Telekom proposed *Trans Europe Lines (TEL)* Project, etc. (Figure 1).

Figure 1 clearly shows that geographically Croatia, especially her important part along the Adriatic coast, has been totally neglected without any good reason. This, as well as a number of similar examples, prove that those who made plans for us either lacked good intentions or did something beyond their comprehension...

However, this has been to a great extent "made up for" by Croatia, i.e. Croatian Post and Telecommunications, joining the multinational project *Trans Europe Lines (TEL)* in February 1993. Due to the systematic overall approach to the realisation of the Project, in *bona fide* co-operation manner between all participants, TEL has achieved great efficiency during the implementation stage of the project. The Project has also had the stimulating influence on the development of our telecommunications, as well as the telecommunications in all the other CEE countries.

Although formerly mostly bypassed in telecommunications traffic transiting, Croatia has nowadays become a respectable partner to a number of telecommunication operators by:

- joining the Project, and
- spreading the relevant capacities within its frame which best correspond with the overall development of Croatian telecommunications, mostly internationally.



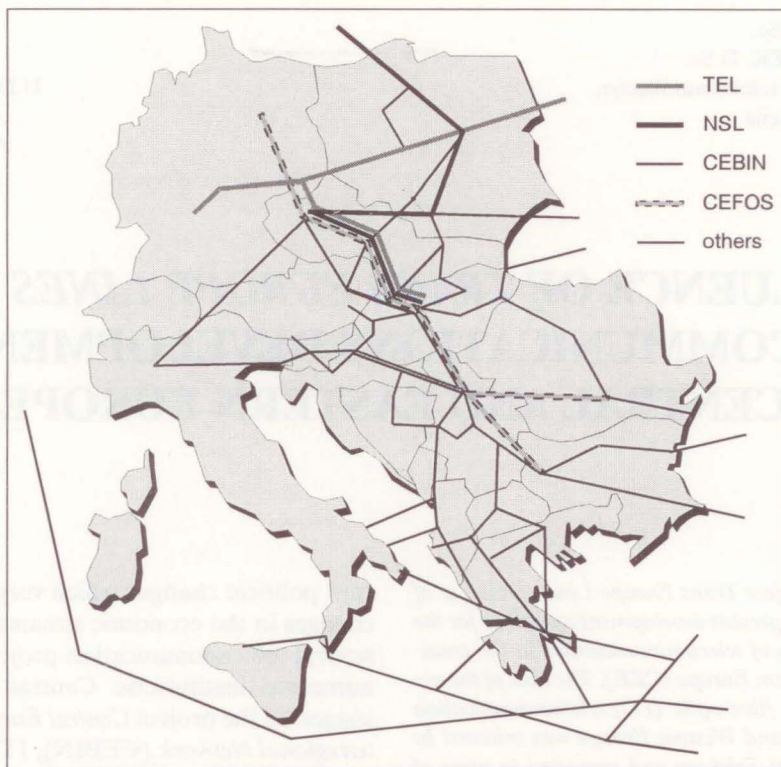


Figure 1 - Some European regional telecommunications plans at the beginning of nineties

**1. INITIAL CHALLENGES AND THE TEL PROJECT CONFIGURATION**

The basic idea of the necessity of building a fibre optic (FO) telecommunication bridge between the Eastern and Western Europe, i.e. an international FO transmission system from Frankfurt, across the Central European countries to Moscow, as well as the

study of implementing the project, were presented by the Deutsche Bundespost Telekom in 1990. They were presented to some of the telecommunication administrations in the region. Consequently, during the year 1991 *The Construction and Maintenance Agreement for TEL system* was signed. Its initial partners - TEL Project Members - were national telecommunication operators of Germany, Poland, Czech Republic,

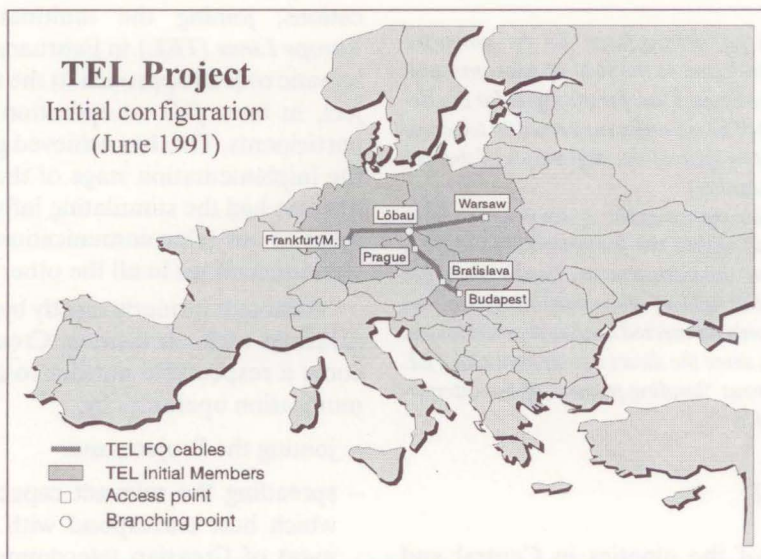


Figure 2 - Initial TEL Project configuration



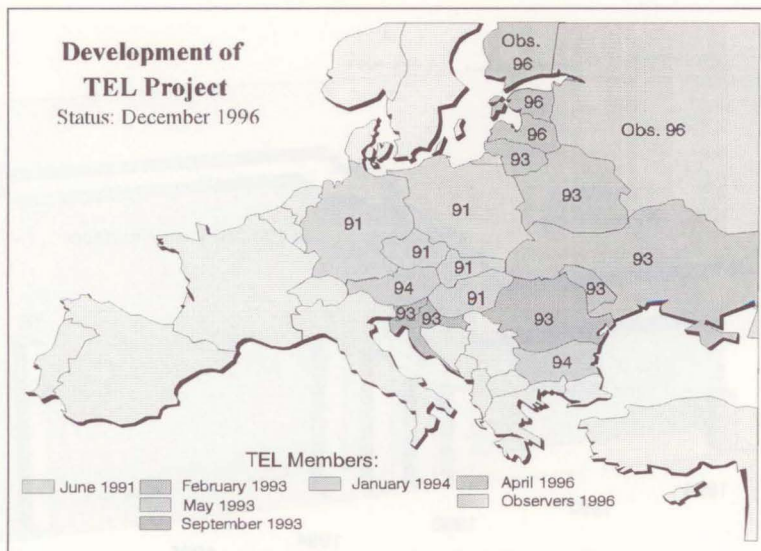


Figure 3 - The joining of new Members to TEL Project

lic, Slovak Republic and Hungary, and this Agreement planned the construction of FO transmission system between Frankfurt, Warsaw, Prague, Bratislava and Budapest with the total length of about 2 100 km (Figure 2).

The basic aims of the Project for all its Members are:

- to contribute to the improvement and satisfying of telecommunication needs on international and national level,
- to provide sufficient transmission telecommunication infrastructure in international traffic,
- to enable the establishment of intense economic interrelations,
- to provide the basis for the development of future telecommunication services, and
- to support the total economic growth in the region of CEE.

TEL needs to provide all its users with high quality digital capacities for all kinds of telecommunication services at market acceptable prices.

## 2. THE AREA COVERED BY TEL

After its initialisation the TEL Project was gradually joined by new Members, so that at present it includes 16 countries - beside the founding countries there are Rumania, Croatia, Slovenia, Belarus, Ukraine, Moldova, Lithuania, Austria, Bulgaria, Latvia and Estonia (Figure 3).

The evolution of the importance of the TEL Project for the European telecommunications can best be shown by the growth of the Project covering area and the total number of inhabitants in Member countries included in the Project during the period observed

(Figure 4). From its initialisation till the end of 1996 TEL almost tripled in size regarding the physical area covered, and doubled regarding the number of inhabitants involved.

In the telecommunication sense TEL area covered 39 million main telephone lines (MTL) in 1991. Germany, a country of great strength in telecommunications, participated in this number with 82 %. In 1996, in the extended area of the Project, there is a total number of 81 million MTLs, and the relative participation of Germany is 54%. This results from a relatively high average telephone density in that area (27 MTLs/100 inhabitants in 1991 and around 30 in 1996). Considering the area covered by the TEL Project excluding the telecommunication capacities of the dominant Germany, the telephone density in 1991 was only 11 and in 1996 it was around 20 MTLs/100 inhabitants.

## 3. THE PROJECT GROWTH

From the configuration shown in Figure 2 which assumed the construction of FO cables till the year 1996 the TEL Project has developed to the size shown in Figure 5. The total route length of FO cables has gradually grown to 26 337 km, which is even 12 times more than the initial length. The reasons for such an intense Project development are various, and the dominant ones, beside the realisation of the basic Project aims and the growth in the number of Members involved, are as follows:

- the strong wish for an international recognition and for confirmation of the proper telecommunication identity of less developed (especially new) countries covered by the Project;



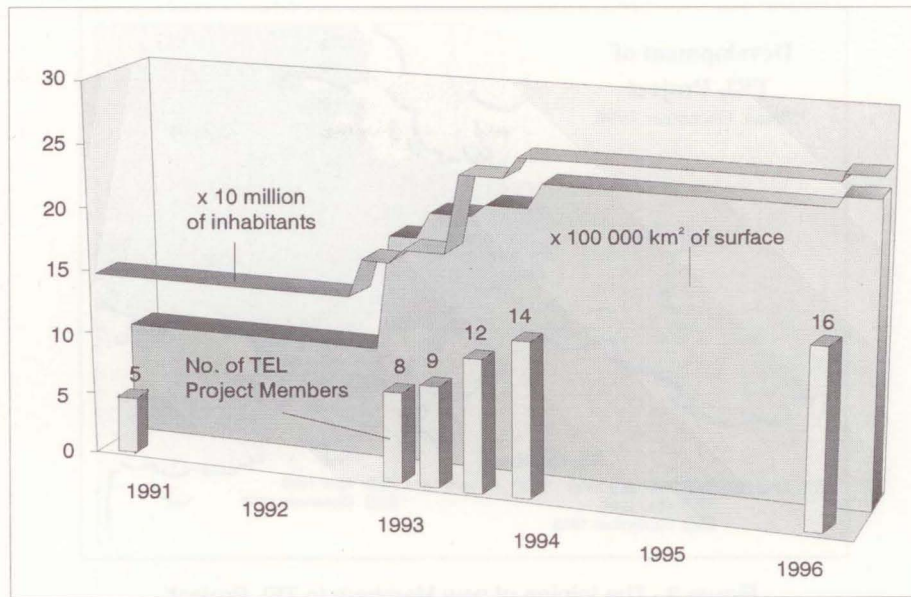


Figure 4 - The spreading of TEL Project covering area

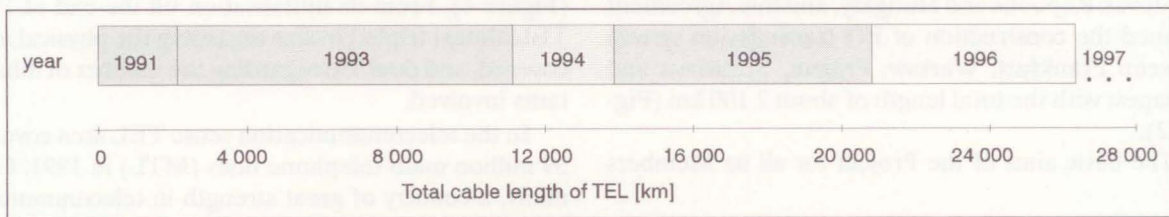


Figure 5 - The growth of the total length of fibre optic cables in TEL Project

- the recognition of the TEL Project as the originator and the important factor in the development of national telecommunications;
- the wish for the opening and commercialisation of numerous new transit routes which is being reflected in the connecting of cables included in TEL with numerous submarine FO cables in the maritime countries;
- the need for a common performance and presentation on the market of numerous countries insufficiently developed in the field of telecommunications.

#### 4. THE NATIONAL PARTICIPATION IN TEL

##### 4.1. TEL infrastructure in Croatia

Initially, during preparations for joining the TEL in autumn 1992, the presence of Croatia in the Project was foreseen as the FO cable connection between international exchanges in Budapest and Zagreb via Varaždin. This idea has evolved later on, so that today TEL connects all the international switchings in Croatia, as well as landing points of international subma-

rine FO cables Cro-Ita 1 and Adria 1 (segment 2&3). Multiple connections have been realised towards the neighbouring countries that are also Project members, Slovenia and Hungary, as shown in Figure 6.

Taking into account the described FO cable infrastructure, including the parallel one intended mostly for national traffic, Croatia presents a reliable link in the chain which directly, and for some in the shortest way, connects Central Europe with the Mediterranean region.

##### 4.2. The presentation of the participation of national TO in the Project

The area and time of FO cable network spreading within the framework of TEL (which is at present the most important feature of the Project itself) is shown in Figure 7. It also shows the total present absolute size of the Project in the area of every particular country.

Considering the volumes shown in Figure 7, as well as general geographic and demographic data, one can review relative participation of particular Member countries in TEL in relation to the surface area of every country, the number of its inhabitants and MTLs (Figures 8 and 9).



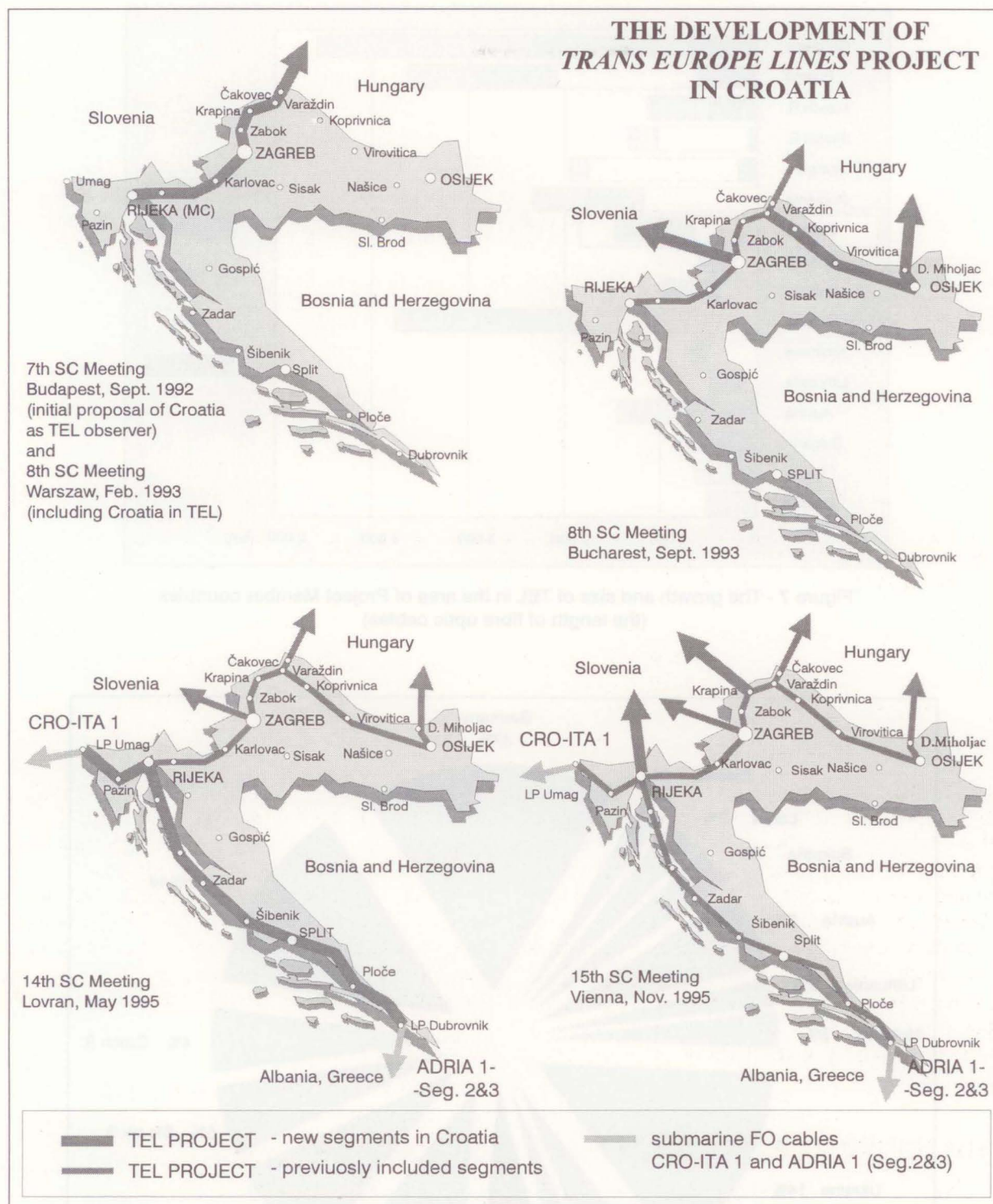


Figure 6 - The phases of TEL evolution in Croatia

## 5. PUTTING OF TEL SEGMENTS INTO OPERATION

The basis of TEL are FO cables with single-mode fibres whose characteristics are defined according to ITU-T Recommendation G.652 and are planned to be used at 1300 nm and 1550 nm. The cables are installed

(or are planned to be installed) mostly in specified-purpose pipes.

The average number of optic fibres in the cables per particular Member country is from 10 to 30, and it is 24 in the whole of the Project. Consequently, the total fibre length within the framework of the Project is more than 632 000 km.

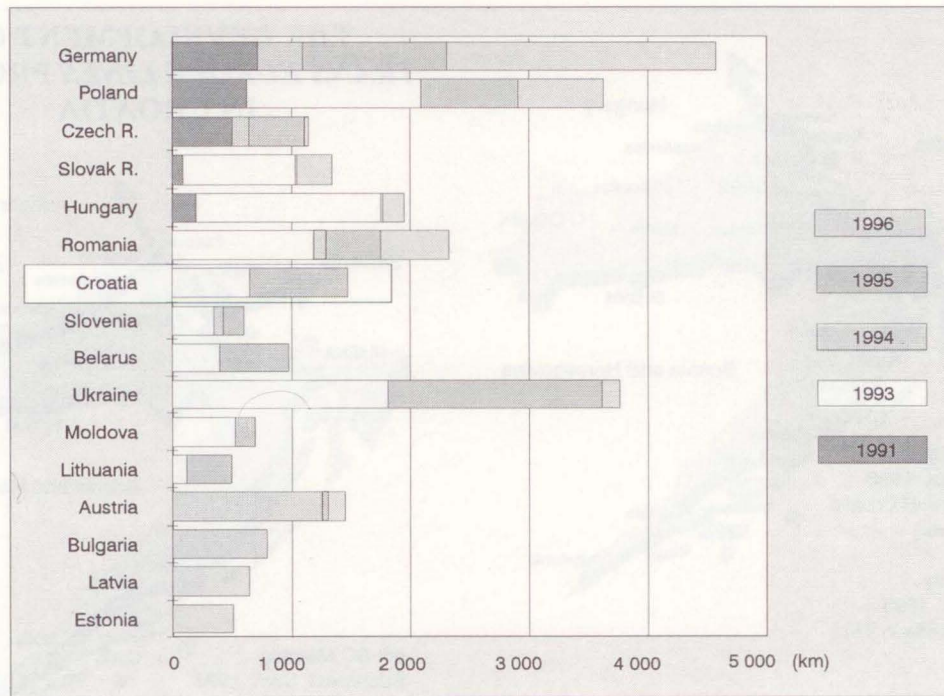


Figure 7 - The growth and size of TEL in the area of Project Member countries (the length of fibre optic cables)

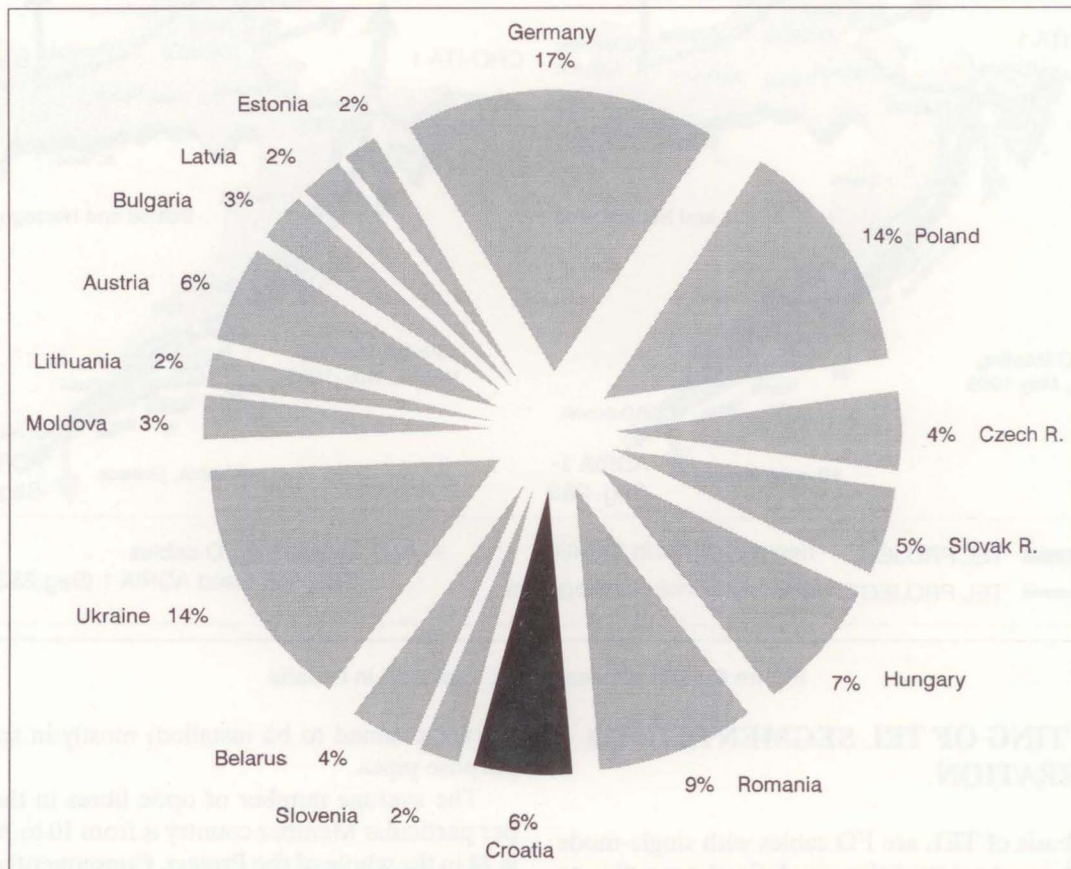


Figure 8 - Relative participation of Members in TEL in 1996 (according to the length of fibre optic cables)



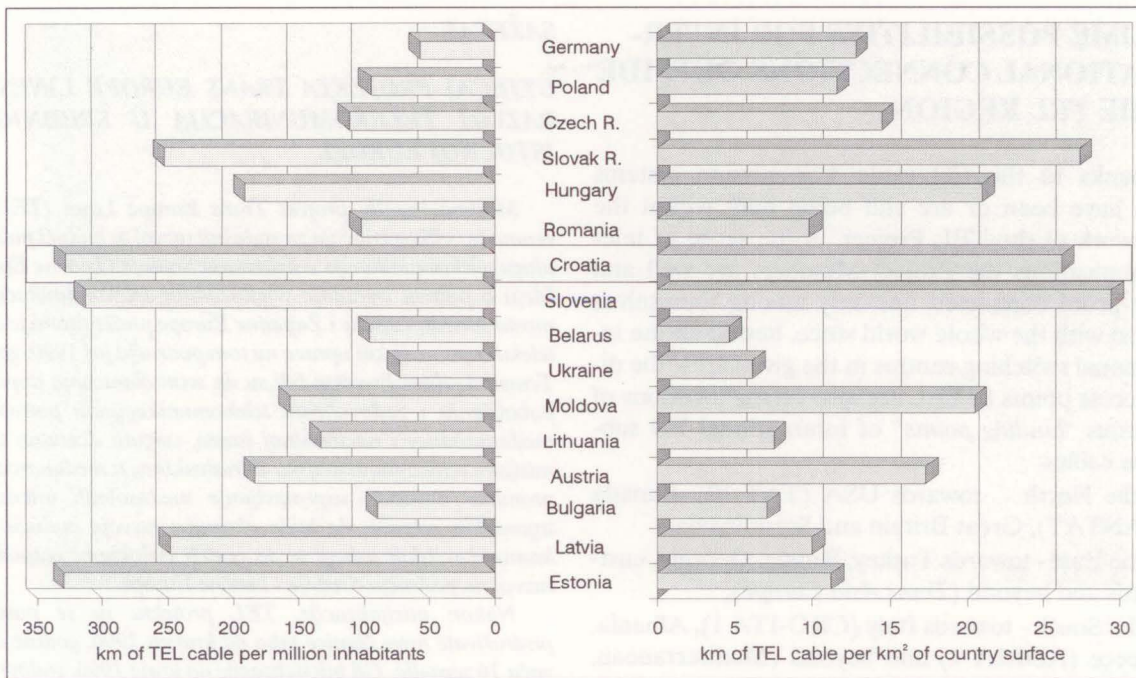


Figure 9 - The participation of Member countries in TEL Project in relation to their surface and the number of their inhabitants

The system started to operate within the framework of the TEL Project, formally in 1994, by putting into operation the segments in the total length of 3 708 km, which is even 75% more than initially agreed capacities (cable routes). Till the end of 1996 transmis-

sion systems on the segments with the total length of 16 899 km were put into operation (see Figure 10). The construction of the Croatian section of TEL was completed by the end of 1997.

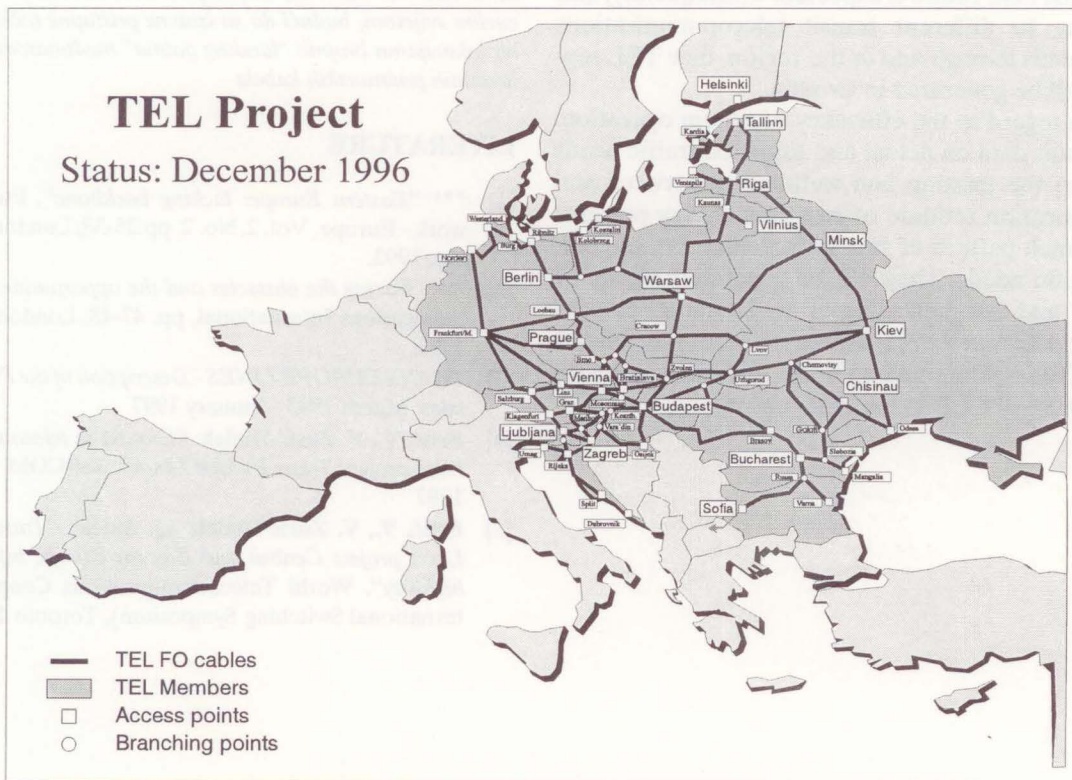


Figure 10 - TEL segments (end 1996)



## 6. SOME POSSIBILITIES FOR INTERNATIONAL CONNECTIONS OUTSIDE THE TEL REGION

Thanks to the FO cable transmission systems which have been or are still being built within the framework of the TEL Project, in the sense of telecommunications the Project Members are well and future-proof connected not only among themselves but also with the whole world since, beside all the international switching centres in the given area, the direct access points to TEL are also on the locations of numerous "landing points" of international FO submarine cables:

- in the North - towards USA (TAT 10), Canada (CANTAT), Great Britain and Scandinavia;
- in the East - towards Turkey, Russia, Georgia, eastwards and beyond (*Trans Asia Europe*);
- in the South - towards Italy (CRO-ITA 1), Albania, Greece (ADRIA 1) and beyond (Mediterranean, Near-East, Africa).

## 7. CONCLUSION

Although well spread in CEE today, the TEL system continuously grows in the countries of the current members in accordance with their national needs. Moreover, further joining of additional members of TEL in the near future is expected. Consequently, and according to different transit telecommunications traffic needs *through* and *in* the region, new TEL segments will be generated in Croatia.

With regard to the efficiency of system operation, all relevant data on actual and expected traffic needs based on the existing and well-known services and communication attitude of customers today presents only a small pattern of fast-approaching future communication needs. They will be generated mostly by the new and fast-increasing or forthcoming services. These will all together justify the inherent possibilities of the TEL system, making it the real informatics infrastructure of CEE in the 21st century.

## SAŽETAK

### UTJECAJ PROJEKTA TRANS EUROPE LINES NA RAZVOJ TELEKOMUNIKACIJA U SREDNJOJ I ISTOČNOJ EUROPI

Multinacionalni projekt *Trans Europe Lines (TEL)* od veoma je velikog značaja za sadašnji razvoj te budući položaj i ulogu telekomunikacija u državama Srednje i Istočne Europe. Ideju o potrebi izgradnje svjetlovodnog telekomunikacijskog mosta između Istočne i Zapadne Europe prezentirana je dijelu telekomunikacijskih uprava na tom području još 1990. godine. Temeljni ciljevi Projekta bili su da svim članicama doprinese poboljšanju i zadovoljenju telekomunikacijskih potreba na međunarodnoj i nacionalnoj razini, osigura dostatnu trans-misijsku telekomunikacijsku infrastrukturu u međunarodnom prometu, omogući uspostavljanje međusobnih intenzivnih trgovačkih odnosa, da bude okosnica razvoja budućih telekomunikacijskih usluga te da podrži cjelokupni gospodarski razvoj na području Srednje i Istočne Europe.

Nakon inicijalizacije, TEL projektu su se postupno pridruživale nove članice tako da krajem 1996. godine obuhvaća 16 zemalja. Od inicijalizacije do kraja 1996. godine TEL se po prostornoj rasprostranjenosti gotovo utrostručio, a po broju obuhvaćenog stanovništva udvostručio.

Različiti razlozi bili su "pokretačka sila" brojnim telekomunikacijski nedovoljno razvijenim državama uključenim u Projekt (npr. za Republiku Hrvatsku, u kojoj je TEL, usprkos brojnim i velikim teškoćama tijekom ratnog razdoblja od 1991. do 1995. godine, znatno podupro svekoliki razvoj telekomunikacija). Putem svjetlovodnih kabelskih sustava prijenosa koji su izgrađeni ili se grade u okviru TEL projekta članice nisu samo dobro telekomunikacijski povezane međusobno, već i sa cijelim svijetom, budući da su izravne pristupne točke TEL-u na lokacijama brojnih "landing points" međunarodnih svjetlovodnih podmorskih kabela

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