IVAN DADIĆ, D.Sc.
Institut prometa i veza, Zagreb
TOMISLAV PETRINOVIĆ,
PREDRAG BRLEK, B. Eng.
Fakultet prometnih znanosti, Zagreb

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TRAFFIC SYSTEM ON THE ISLAND OF KRK

SUMMARY

The construction of the bridge mainland – Krk has integrated the island of Krk into a unique road traffic system of Rijeka and the Croatian seaside. The bridge, together with the ferryboat lines Senj and Baška, have significantly improved the traffic connections of the islands of Cres and Rab, especially with Rijeka and the seaside of the counties: Primorsko-goranska and Ličko-senjska and Istarska županija.

Apart from the connection of the island of Krk with the mainland and the neighbouring islands, also the interurban connections within the islands are very important.

The development of tourism will increase the significance of the Krk Airport, especially during the tourist season.

1. INTRODUCTION

The island of Krk is situated in the North-eastern corner of the Adriatic, enclosing the Rijeka Bay from the South-east together with the island of Cres which is situated at its Western side. Towards the South, Krk begins the sequence of other Kvarner islands. The island of Krk belongs to an ideally limited area covering some 410 km^2 and it is the biggest island in the Adriatic, with 13,110 inhabitants in 68 towns and villages, and only in four of them there are minor industrial plants. This paper considers the island of Krk primarily from the traffic point of view. The Romans expressed their admiration for the island with the words "Splendidissima civitas Kuryctorum" (The most splendid country of the Krk people)[1]. Because of various natural resources and traffic and geographic advantages, this island has geo-strategic significance and had been inhabited through history and centuries by the IIllyrians, Romans, Greeks, Slavs, i.e. Croats. It has also lived through various political transformations, changing its masters and serving them as a colony. As the masters kept changing, the inaccessible areas were cleared, and later turned into paths and dusty roads with the purpose of linking the island with the seaside and the neighbouring villages and thus controlling it entirely. They also defined and organised the traffic policy according to their needs and in accordance with their time and space. Such a differentiated spatial significance of the island in the past resulted in the unified dynamic elements of the geographic location, providing the island as a whole with the necessary energy.

In the traffic evaluation of the island of Krk a very important role belongs to the splendid bridge connecting it to the mainland. Out of all the Adriatic islands only Pag and Čiovo are connected with the mainland by bridges. Moreover, the traffic system of the island of Krk today and tomorrow provides a connection, especially because of the direct road connection with the mainland, for the islands of Cres, Rab and Lošinj. Since these islands "fill" the Kvarner Bay, their connections needs to be considered both in linking with the traffic system of the Istrian peninsula, but also with the mainland from Rijeka to Jablanac. Between the islands of Krk and Pag, the island of Rab serves as a kind of a bridge, close to Cres and Lošinj, and over Pag the Kvarner islands will get more and more connected with the wider Zadar area.

The construction of modern roads on the islands in general, supplemented by the ferry transport with the mainland, establish better connections towards the centre of the island.

2. EVALUATION OF THE TRAFFIC SYSTEM ON THE ISLAND OF KRK

"The most splendid island of Krk", as called by the ancient Romans, was isolated in the Adriatic for a long time. Its natural resources were frozen and it had no developed infrastructure nor any unique traffic system. Using its advantageous geographic position, it moves away from the mainland in the Southeast, but comes close to it in its Northest part, to a distance of some 500 m only.

By the social and traffic activation of this region, it began to flourish economically and in the traffic sense marked by three historic events. In 1959 the first ferry service was established between Crikvenica and Šilo, then in 1964 the second ferry service connected Črišnjevo and Voz, providing a break-through in the island isolation. The third event represented a turning point

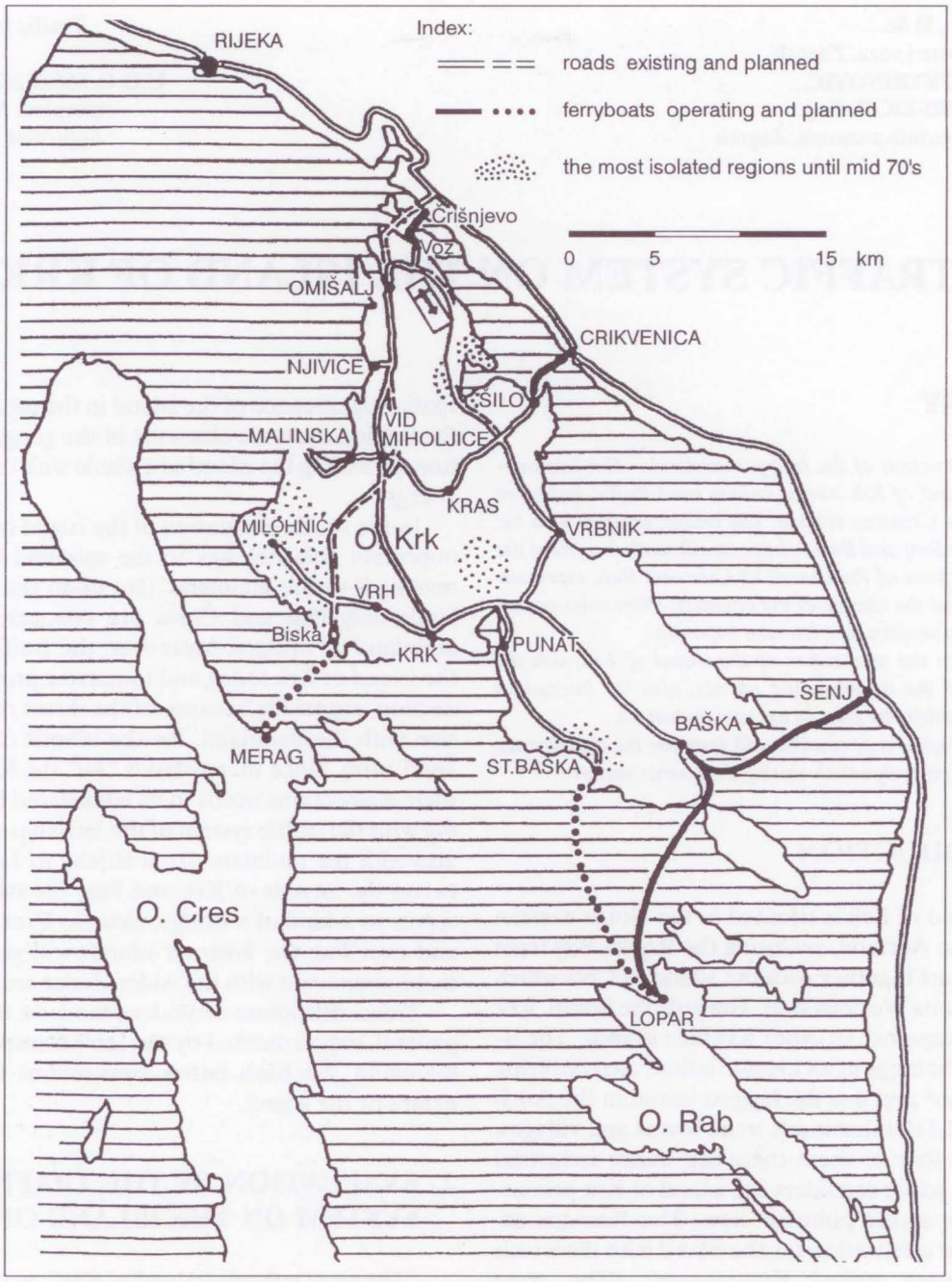

Figure 1 Modern and future traffic connections of the island of Krk

in the economic life of the island, and it happened in 1980 by the construction of the splendid bridge "Krčki most" connecting the Omišalj area on the island of Krk, via the island of St. Marko with the Kraljevica area on the mainland.[2]

By the construction of the bridge and the modernisation of the roads on the island both the island and its towns and villages became accessible and attractive to tourists, unified by the traffic system into a whole and economically evaluated. Apart from tourism, the other main factor in the development of all the functions on the island is the traffic which plays the primary role regarding tourist movements. The development of the Krk infrastructure and the defining of the traffic corridors make the island an exceptionally important transit area, especially through the following modes of transport: ferry, road, and air traffic, which will be discussed in the following sections.

2.1. Ferryboat service on the island of Krk

When tourism was still just beginning to develop, the seaside villages on the island had good steamboat connections with the area around the island, i.e. the

Table 1 - The Valbiska - Merag ferryboat line

VALBISKA – MERAG		
the peak traffic per months (passenger/year)	1994	1996
June	15,548	20,055
July	24,962	32,830
August	22,548	33,355
September	15,376	16,236
Overall traffic for the whole year	135,416	179,280

Table 2 - The Baška - Lopar ferryboat line

BAŠKA – LOPAR		
the peak traffic per months (passenger/year)	1994	1996
June	569	1,196
July	3,124	2,723
August	4,068	4,344
September	727	768
Overall traffic for the whole year	8,671	9,250
Average daily traffic in summer	115	114

mainland[3]. The growth of tourist traffic meant also the development of the white fleet which introduced modern vessels, ferryboats. The ferryboat traffic is a special mode of maritime transport, which, due to its amphibian effect and efficiency represents one of the modern multimodal traffic forms, because road traffic is the reason for the existence of ferryboat traffic, and it can be concluded that they are closely interconnected and difficult to separate. They represent a turning factor of the new traffic and economic situation on the island most closely connected with its tourist development. The main reason for the sudden increase in the number of tourists and road vehicles on the island was in the establishment of the three navigation corridors: Crikvenica - Šilo opened for traffic in 1959, Črišnjevo - Voz in 1964, and Senj -Baška - Lopar in operation since 1969, today still in operation but not including Senj.

The sudden increase in the road traffic frequency found the island with an unprepared road infrastructure, and the motorised tourists needed good roads from the ferryboat port Šilo to the rest of the towns and villages on the island. The statistical data show a progressive rise in the ferryboat traffic and a marked traffic dynamics of passengers and road vehicles on Crikvenica - Šilo and Črišnjevo - Voz lines. From 1964 to 1966 the Crikvenica - Šilo ferryboat line realised higher passenger traffic which amounted to 884,142, but at the same time showing some oscillations. For the first time these showed with greater emphasis in 1970, when the growth rate was 105, whereas it was 480 on the Voz - Črišnjevo line.

The "younger" line took over the majority of traffic due to multiple advantages of the closeness of the continental road section, short navigation corridor mainland - island, direct access to the island main road and the tourist settlements on the island, constant ferryboat operation regardless of the sailing schedule during the tourist season, and traffic circulation with a greater number of ferryboats.

In 1965, the "younger" line transported 167,802 passengers and in 1977 this number increased to 1,447,484 with the growth rate 862. At the same time the traffic of passenger cars increased on both ferryboats from 35,330 in 1964 to 444,572 in 1977, with the growth rate 1,158[4]. It can be noted that passenger cars follow the movement of passengers and it is obvious that the majority of passengers relies on passenger cars. By the construction of the bridge in 1980, the traffic system is unified, and the ferryboat lines are discontinued. Today, the ferryboat traffic uses two navigation corridors: Valbiska - Merag and Baška - Lopar.

By analysing and comparing the statistical data presented in Tables 1 and 2, it can be concluded that the Valbiska - Merag ferryboat line shows a growth rate of 24.4% compared to the Baška - Lopar ferry-

boat line which amounts to 6.27%. This means that the Valbiska - Merag line is a markedly transit - dynamic area due to its geographic location gravitating towards Cres, and shortening the distances, whereas the Baška - Lopar line is in operation mainly during the summer tourist season[5].

2.2. Road traffic on the island of Krk

The traffic of the highest intensity on the island of Krk is the road traffic. A good basis is provided by the Krk road infrastructure including a total of 200 km, out of which 110 km are the main roads. According to the concept of traffic policy, and the gradual traffic development the dusty island ways are being modernised and reconstructed into roads. In the beginning the roads were exclusively macadam, narrow and badly laid out, but they fulfilled the needs of the elementary road traffic existing at that time, connecting the major and few settlements. The inter-town connections were very poor.

The foundation stone of the Krk road network is the island main road Baška - Omišalj. This section was widened and paved with asphalt in 1964, it was extended from Voz to Omišalj by 5 km, and in 1970 the phase-like asphalting was completed and the dusty path turned into a single 53 km section from Omišalj to Baška. Accordingly, the construction of the secondary sections followed, which access the main road from the seaside resorts, Njivice and Malinska - 1 km each, and from Punat 2 km, and Vrbnik 5 km.

In the central Eastern part of the island of Krk, the road Šilo - Gostinjac - Risika - Vrbnik in the length of 15 km was reconstructed in 1972, and then in 1975 it was extended by a transversal in the length of 17 km Dobrinj - Kras - Gabonjin - Sv.Vid with exit towards Malinska. The section from Krk via Šotovento towards Glavotok and Malinska has been reconstructed, and the section Krk -Vrh in the length of 5 km was reconstructed in 1977.

The traffic situation over the period from 1962 to 1972 is best represented in Table 3.

Thanks to the ferryboat there was a very high traffic frequency of passenger cars with an average growth rate of 39%, and of cargo vehicles with the growth rate of 91%, since that was the time of intensive building on the island of Krk, and the truck-operators transported the building material.

By the construction and opening of the Krk bridge, the traffic system was unified, fulfilling the age-old dream of the Krk generations, and announcing a new economic era in tourism and industry.

The statistical situation in road traffic on the Krk bridge presented in Table 4, shows that by constructing and opening of the bridge, the island of Krk became physically a part of the mainland, and a markedly transit-transport dynamic area where the road traffic is of very high density during the tourist season[6].

Table 3 - Ferryboat traffic towards the island of Krk from 1962 until 1976

Year	Passenger cars	Cargo vehicles	Total
1962	47	8	55
1963	64	12	76
1964	–	–	–
1965	100	19	119
1966	152	32	184
1967	189	53	242
1968	174	59	233
1969	–	–	–
1970	–	–	–
1971	431	72	503
1972	639	95	734
1973	827	107	934
1974	879	95	974
1975	1,098	95	1,193
1976	1,163	94	1,257

Source: SGJ for the corresponding years

2.3. Air traffic on the island of Krk

The Airport Rijeka has been built in the Northern part of the island of Krk, stressing the connection to the whole Kvarner region as well as the wider region of the Croatian Primorje (Seaside), and the whole county "Primorsko-goranska županija". It was opened on May 2, 1970, before the construction of the Krk bridge. The airport was expected to fulfil high business ambitions and provide good economic profit. As a very important factor, the airport had to intensify the tourist traffic with prevalence of charter flights. Until 1974 the air traffic was growing, and later it started to decline gradually. That same year proved to be a turning point in the type of passengers, since foreigners prevailed up to 1974 with a proportion of 52.8 - 75.7%, followed by an increase in domestic passengers and tourists later. Most of air traffic develops during summer, the tourist season, and the airport justifies its existence but not its capacity and power. In spite of optimistic and successful traffic forecast, the Krk airport "Rijeka" has not succeeded in continuing in the positive direction. The reasons are various, but we shall mention the two main ones: lack of fast and qualitative connection to the mainland, in spite of the nearest fer-

Table 4 - Traffic over the Krk bridge in 1994 and 1996

VEHICLES PASSING OVER THE KRK BRIDGE			
Peak traffic per months	1994	1996	
June	145,308	179,979	
July	286,632	300,419	
August	304,621	359,611	
September	131,280	152,609	
Total annual traffic	1,552,515	1,851,243	
Average annual daily traffic (PGDP)	4,253	5,058	
PGDP in '96 for domestic and foreign vehicles	–	Domestic vehicles 3,840	Foreign vehicles 1,218
Average summer daily traffic (PLDP)	9,537	10,646	
PLDP in '96 for domestic and foreign vehicles	–	Domestic vehicles 6,182	Foreign vehicles 4,464
Growth rate to '94	16.1%		

ryboat line Črišnjevo - Voz which could not meet the higher passenger capacity.

These disadvantages were overcome later by the construction of the bridge. The second very important factor is the fact that the airport is exposed to the *bora* (seaward North-eastern wind). *Bora* is the strongest in the Southern and Northern parts of the island, thus subjecting the aircraft in landing and taking off to intensive turbulence. The Krk airport is located in the barren, uninhabited part of the island, topographically very suitable, but lacking long-term detailed systematic meteorological study[7]. The statistical data show that, unlike the road-ferryboat traffic, the situation in air traffic is completely different. During the seven years of its existence, the total realised number of passengers has hardly exceeded the absolute value of half a million passengers (516,658), which corresponds to the one-year ferryboat passenger traffic in 1966. In 1977 the arrival of aircraft and passengers was by 90.2% lower than the estimates for that year, with the deviations for the previous years being somewhat less severe.

The real crisis of the Airport Rijeka started in 1991, due to, among other things, the aggression on the Republic of Croatia, when 220 aircraft with 19,703 passengers in domestic and international flights landed on the Krk runway. In 1992 the number of aircraft fell to 48 with 4,663 passengers, out of which 131 were domestic. There was a somewhat greater number of landings in 1993 and 1994, and in 1995 a new decrease to 84 aircraft followed, and in 1996 only 62 aircraft landed on the Airport Rijeka. During the first six months in 1997, only 24 aircraft with 875 passengers landed[8]. These disastrous data show that a scientific-research study on air traffic on the island of Krk should have been made in advance, and that transport market should have been consulted as well.

3. CONCLUSION

The seaside areas on the Croatian islands represent a very big problem regarding traffic. The main problem is not how to connect the islands with the mainland, but the essence of the problem is how to connect the island interior by quality and fast roads connecting all the towns and villages of the island, i.e. how to establish traffic from the ferryboat ports to the settlements and among the settlements.

The island of Krk is one of the examples of a relatively good solution of traffic internal and external connections to the mainland. Due to the extremely intensive road-ferryboat traffic, it had to meet the traffic demand of vehicles and develop its road infrastructure. A good internal road network has successfully interconnected the villages and towns of the whole island. The construction of the Krk bridge provided a connection of the traffic system with the mainland, connecting it to the Adriatic Highway.

Thanks to the Krk bridge, the island of Krk has become a big traffic and transit area, for the inhabitants and visitors of the islands of Krk, Cres, Lošinj and the neighbouring little islands, and thus also a satellite place of Rijeka. The traffic routes of the island of Krk developed as a consequence of the economy and tourism through successful defining of the development policy and modernisation of the traffic infrastructure.

The integration and modernisation of the traffic system of the island of Krk have created new chances for the combined transport including air, road and maritime (ferryboat) traffic. The very high traffic den-

sity on the island is the result of tourist and economic development.

In order to satisfy the growing traffic demand, the existing road network, especially the intersections, need to be reconstructed and extended by careful and systemic traffic and physical planning. Here, the environmental protection as well as regional protection need to be taken into consideration.

SAŽETAK

PROMETNI SUSTAV OTOKA KRKA

Izgadnjom mosta kopno-Krk, otok Krk postao je dio jedinstvenoga cestovnoga prometnog sustava Rijeke i Hrvatskog primorja. Taj je most, zajedno s trajektnim vezama između Senja i Baške na otoku Krku pridonio i bitnom poboljšanju prometnih veza otoka Cresa i Raba, osobito s Rijekom i obalnim dijelom Primorsko-goranske ali i Ličko-Senjske i Istarske županije.

Pored veza otoka Krka s kopnom i susjednim otocima, važna je i unutarnja povezanost urbanih prostora na otocima međusobno.

Razvitk turizma pridonjet će i sve većoj ulozi krčkog aerodroma, osobito tijekom turističke sezone.

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2. The construction of the Krk bridge began officially on March 25, 1976 and the opening was planned for November 29, 1979, but was realised on July 19, 1980.
3. Seaside resorts connected to the mainland by a steamboat were Omišalj, Njivice, Malinska, Krk, Punat, Baška, Vrbnik and Šilo.
4. Taken from the documents of "Jadrolinija", Rijeka (The Analytical Service of the Inner Navigation)
5. Data obtained from "Hrvatske ceste" (Croatian Roads), data on road traffic counts in RH in 1994 and 1996
6. Data obtained from the Statistički godišnjak (Statistical yearbook) of the then Yugoslavia (1959-1977)
7. Data obtained from "Hrvatske ceste" (Croatian Roads), data on road traffic counts in RH
8. The airport is topographically very well located regarding all the major summer resorts of the Primorje - Kvarner Riviera.
9. Statistical data taken from the statistical yearbooks (1966-1977) and (1991-1995)

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