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Resumen

Este trabajo analiza cómo se ha implementado la red italiana de autopistas en dos fases diferentes (1922-1935 y 1958-1974), con características originales, y en cierto modo innovadoras, a nivel europeo. En esos dos períodos, la precocidad de la realización italiana debe atribuirse a razones de orden geográfico, histórico y económico. La falta de adecuación de la red de carreteras ordinarias (a causa de la orografía de gran parte del territorio y de la escasez de inversiones previas) indujo a la clase política (convencida de que, en un país todavía atrasado, una red viaria eficiente constituiría un poderoso factor de modernización) a tomar en consideración la presión ejercida por las grandes empresas interesadas en el desarrollo de la automoción (fabricantes de coches, de neumáticos, productores de cemento y empresas petroleras). La ejecución y financiación se llevaron a cabo principalmente a través de los instrumentos de intervención en la economía de que el Estado italiano se había dotado a sí mismo a partir de la década de 1930 (IRI). En el artículo se presta especial atención a las conexiones internacionales (es decir, el cruce de los Alpes), aunque la construcción de una red de autopistas tenía como objetivo principal el mercado nacional. Concluye el artículo con algunas consideraciones sobre la cuestión de la intermodalidad.

Palabras clave: Autopistas; Italia; intermodalidad.

Abstract

This work will analyse how the Italian motorway network has been implemented in two different phases (1922 - 1935) and (1958-1974) with original, and in some ways innovative, characteristics on the European level. In both the periods the precocity of Italian realisation is to be ascribed to reasons of geographic, historical and economic order. The inadequacy of the ordinary road network (due to the orographic characteristics of great part of territory and to the scarceness of previous investments) induced the political class (convinced that, in a still backward country an efficient road network constituted a powerful factor of modernization) to take into account the activity of lobbying of the great enterprises interested to the development of the automotive field (manufacturers of cars, of tyres, cement producers and oil industries). Realization and financing happened mostly through the original instruments of intervention in the economy of which the Italian State equipped itself from the 1930s (IRI). Particular attention will be given to the international connections (that is the crossing of the Alps) even if the realisation of a motorway network was intended mainly for the domestic market. Finally some considerations will be given on the subject of intermodality.

Key words: Motorways; Italy; intermodality.

The making of the Italian motorway network (1924-1974)

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1. The first phase of the motorway construction in Italy (1922-1935)

Two phases characterised the construction of the motorway network in Italy and, while they have been very different in terms of historical period and manner of execution, they are similar in the reasons at their origins. In the first phase from 1922 to 1935, 500 km of “motorways” were laid - meaning by “motorway”, a road intended exclusively for motor-vehicle circulation, apart from the ordinary road network, without level crossing, with toll-gate, single carriageway road and two lanes. Even though at the eve of the second world war the Italian motorway network was inferior, in terms of improvement and technical features to the one built in Germany between 1933 and 1939, it had from the very beginning some characteristics of originality. The second phase running between 1958 and 1974, will lead to the realisation of what will become the widest European motorway network following the German one, taking as its model the technical features of the American instead of the German motorways.

In the 1920s, among the leading European countries, Italy had the lowest ratio of vehicles per capita¹. In 1925 only 117,000 motor vehicles were circulating, even if substantial differences were found among regions. In fact, in the developed areas of the Northwest - in towns like Milan, Turin, Genoa - the average was 100 inhabitants per vehicle. The fact that Italy, with such a low car density, was the first country to start a programme of motorway building is only apparently contradictory. The overloading of the ordinary road network - its den-

¹ I.e. the highest ratio of inhabitants per circulating vehicles.

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sity and development being inferior to those of the principal European countries and often badly maintained - with all kinds of vehicles slowing down the traffic, gave good reasons for the demand of roads intended for motor vehicle only.

The first motorway was planned in 1922 and opened in 1924-1925 on the initiative of Piero Puricelli, an engineer-entrepreneur, the owner of a road-building company who in 1922 planned and built in only three months the motor racing circuit in Monza to give way to the first Italian car racing prize (Gran Premio Automobilistico d'Italia)². Puricelli, to whom the fascist propaganda gave credit for the "invention" of the motorway, travelled to the United States to buy equipment for his enterprise. There he appreciated the American highways, drawing inspiration from them for his own projects. Rather a motorway, he was the inventor of the term *autostrada*. In fact, in those years both in French and in German the

Number of inhabitants per circulating cars in 1927:

COUNTRY	INHABITANTS PER VEHICLE	COUNTRY	INHABITANTS PER VEHICLE
USA	5	SWEDEN	55
CANADA	10	BELGIUM	79
UK	37	NEDERLAND	120
FRANCE	40	GERMANY	148
		ITALY	254

Source : Reale Automobile Club d'Italia.

² The history on Puricelli is rather limited. He was born in 1883. His father, a road and bridge builder, founded his own company in 1870. Puricelli studied at the Politechnic in Zurich and from 1905 had been involved with his father in running the family firm. In 1917 he became the only owner of the Puricelli Strade e Cave Ltd. In 1922, having built the car racing circuit in Monza, he planned the first motorway, Milan-Laghi. In the spring of 1922 one of the supporters of the initiative was Mussolini, at that time editor of the fascist newspaper *Il popolo d'Italia* that had his headquarters in Milan. It is said that Puricelli was among the sponsors of the "March on Rome", anyway he became a member of the fascist party only in 1925. In 1923 the Puricelli Strade e Cave Ltd. became a joint-stock company, with capital worth 5 million lire. The Banca Commerciale Italiana had a 40% share in its profits (Puricelli 3 million, BCI 2 million). In 1925, on the occasion of his enrolment in the fascist party, Puricelli proposed the constitution of a public corporation with the object of building and maintaining first class roads (state roads). He convinced the top of the regime saying that "Italy as a nation is not rich enough to afford dirty roads". The Ministry of Public Works accepted the proposal and founded the Azienda Autonoma Strade Statali (A.A.SS). The Puricelli Strade e Cave Ltd. was awarded many contracts for the construction and maintenance of roads in Italy and in the colonies and in 1929 it raised its capital to 150 million lire with the increased participation of the Banca Commerciale Italiana (Puricelli 50.4%, Commerciale 49.6%). In 1926 (untill 1942) Puricelli became president of the Ente Fiera in Milan, which just then was beginning to build a fixed centre for expositions, which up to then took place in temporary accomodations (parks and gardens) with provisional stands which would have been dismantled after their use. Being a very bad administrator, Puricelli got into a debt of 405 milion lire with the Banca Commerciale (almost three times the value of the capital stock), also by disadvantaged terms of payment of state orders (payable after 15 years, in practice long-term bills, difficult to place). The situation did not improve even after he obtained a new order of 1600 km at the beginning of the 1930s, sponsored within a public works programme to face the effects of the crisis.

terms used were *autostrade* and *autostrasse* instead of *autoroute* and *autobahn*, which later came into general use³.

The motorway planned by Puricelli linked, in three sections and 85 km as a whole, Milan - a town with a considerable motor vehicle density even when the car ownership was still an elite phenomenon - with very popular holiday resorts such as the Lombard lakes (see Fig.1).

The project was written in spring 1922 on the hypothesis of 2000 daily passages⁴. The project had already won the approval of Mussolini, who looked with favour upon the development of the transport system based on the automobile, because he aimed at linking the image of the new regime to the promotion of road construction. Two weeks after Mussolini came into power and after meeting Puricelli, the legislative measures were brought forward to allow a fifty-year license for the management of the plan. After five days the *Autostrade Ltd.* was founded with a capital of 50 million lire. Numerous Lombard entrepreneurs were directly interested in the promotion of the development of a road transport system: tyre, lubricant, car magnet manufacturers and cement manufacturers⁵. The go-

After the failure of the joint bank system and the foundation of the IRI Puricelli's capital decreased by 55% (to 67.5 million) but Puricelli's indebtedness with IRI worsened, until in 1934 the firm passed under the IRI control, changing its name into *Italstrade*. Puricelli kept the presidency but he lost any managing responsibility. The engineer distinguished himself in numerous initiatives held to promote the construction of roads. In 1919, in collaboration with the Italian Touring Club, he founded the *Istituto Sperimentale Stradale*, aimed at research in the field of construction, and in 1925 he promoted a qualifying course in road engineering with a legacy to the Politecnico of Milan. He also sponsored some philanthropic enterprises, promoting charitable foundations and hospitals in Milan in the early first postwar period (Institute for cerebral wounded, then Neurologic institute "Carlo Besta", The Franchino Home for war orphans, the Home for the blind, donations to the obstetric clinic Mangiagalli). After the fall of the fascist regime, he did not join the Salò Republic. Between 1943 and 1945, after retiring to his family homeland, near Varese, notwithstanding his frequent journeys to Switzerland, was said to be supporting the resistance movement and could not escape a purge. He died in 1951. Some references on Piero Puricelli are in L. Bortolotti, *Origine e primordi della rete autostradale in Italia 1922-1933 "Storia Urbana" XVI* (1992): 75, 5-28; L. Bortolotti-G De Luca, *Fascismo e autostrade. Un caso di sintesi: la Firenze-Mare "Storia Urbana"* (1996: 75, 5-28. More specific information is in A. Galleni, *Un imprenditore milanese tra le due guerre: Piero Puricelli, 1883-1951*, Thesis defended in 1992-93 in the Università Statale of Milan, Facoltà di Lettere e Filosofia (Duccio Bigazzi supervi.), A. Galleni, *Strade autostrade e fascismo: un memoriale di Piero Puricelli, "Imprese e storia"* (1999), June: 47-82.

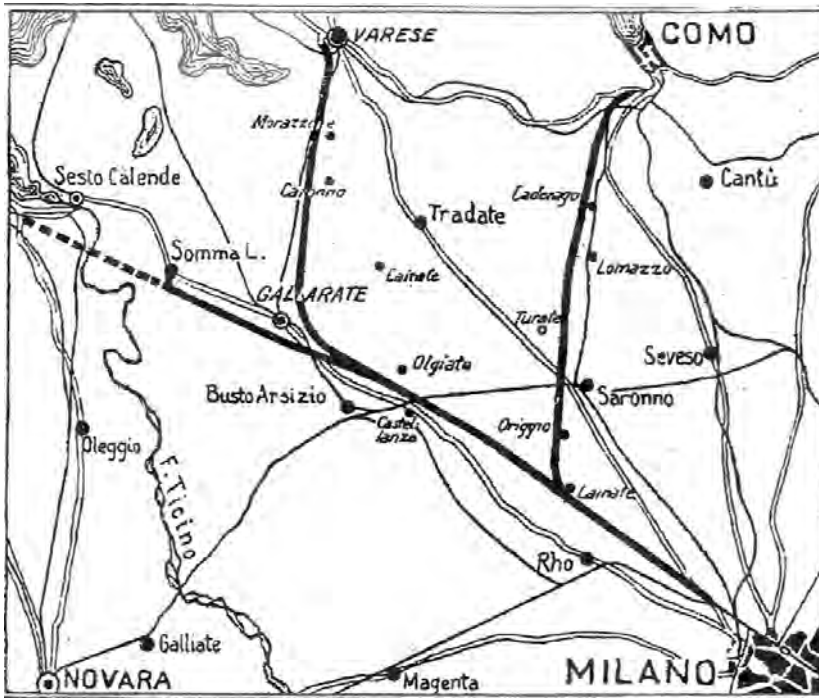
³ In 1912 a six-lane road was built between New York and Washington, four of them were toll lanes. See L. Bortolotti, *Les premières propositions d'un système européen d'autoroutes, 1926-1937*, in A. Carreras, A. Giuntini, M. Merger, *European networks, 19th-20th centuries. New approaches to the formation of transnational transport and communication system*, Proceedings Eleventh International Economic History Congress, Milan, September 1994.

⁴ In 1929 while in Italy the average was 200 inhabitants per vehicle, the average decreases to 66 in Lombardy and to 48 in the Milan area (see "*L'auto italiana*" (1929): december 15th, more than a quarter of the circulating vehicles in Italy were registered in Lombardy).

⁵ It was a fifty-year license and the State had the right of redemption at any time. The president of the society was Silvio Crespi, Puricelli was the managing director. Among the others Stefano Antonio Benni (Marelli, magnets and accumulators) and president of the Italian Manufacturers' Association, Ferruccio Bolchini, Piero Pirelli (tyres) and Ernesto Reinach (petrols and lubricants) sat on the board. The concrete pavement was a speciality of Puricelli's enterprise.

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Fig 1 First Plan for Milano-Laghi motorway (Puricelli's design in 1922)



vernment granted a 1,500,000 lire allowance per year to pay the interest on a 24,000,000 loan contracted with the Cassa di Risparmio of Milan⁶.

Even if the experience was not satisfactory⁷ in terms of economic and traffic results, many other groups of local entrepreneurs lobbied to start new plans for the construction of new motorway sections following the example of the Milan-Laghi project and with the same kind of company. Their execution would have been focused on a design based on important tour itinerary (Firenze-Mare, Napoli-Pompei, Roma-Ostia, Padova-Venezia.) or joining towns with a relevant car density and strong commercial relationship. (Milan-Bergamo, Bergamo-Brescia, Milan-Tourin, Genoa-Valle del Po). Piero Puricelli took part in almost all of these initiatives as project engineer and owner of the firm to which the works were assigned, because of the know-how it gained. The new companies financed the works in the same way: investment of the company capital collected among

⁶ The expense for the works was faced with the social capital, the loan obtained by the Cassa di risparmio (granted by the State) and 16 million floating debt and also local authorities venture investments (Municipalities, and Chambers of Commerce of the interested areas).

⁷ The average daily transits on the Milan-Laghi was 1,155 vehicles in 1926, 1,268 in 1927 and 1,497 in 1928. The traffic exceeding 2000 daily vehicles was recorded only in summer months. In the first three years of exercise the Società Autostrada distributed very modest dividends.

private citizens (local manufacturers and constructors), a loan contract warranted by a State subsidy to pay the servicing, investments of venture capital from local authorities, who were as a matter of fact “forced” by the central authority to concur in the realisation of the motorway⁸.

The only exceptions were the construction of the motorways Roma-Ostia and Genoa-Valle del Po realized directly by Azienda Stradale delle Strade (AASS), established on Puricelli's suggestion. The first section, according to the peculiar fascist eloquence, meant to “bring the sea to Rome” helping its inhabitants with a quick escape toward the seacoast; for this reason, it was a freeway even if it was for motorised vehicles only for populistic purpose. The second one was the last realisation of the pre-war period. The works, which started in 1932, aimed at providing an easy connection between the most important Italian ports and their economic hinterland through the Apennines, and fighting unemployment during years of crisis. In 1928, the heavy traffic passing through the Giovi pass showed an average figure of 105 heavy motor vehicles daily, and it increased three fold in the following four years. The motor car road that was inaugurated in 1935 was 50 km long with a very difficult route through the mountains, two tunnels 1500 m long as a whole in addition to smaller ones. Its total cost was 175 million lire, making 3.5 million lire per kilometre the highest cost among all the motorway constructions realized since then⁹.

The construction of the motorway Milan-Turin was another exception to the prevailing model. It was a thoroughfare connecting two of the heaviest-road-traffic towns, where the most important car factories (Fiat, Lancia, Alfa Romeo, Isotta Fraschini) were located, and which were linked by intense commercial relationships. The first promoting committee was formed in 1926, following a well established mechanism, with the participation of the most important local manufacturers, of Puricelli and of the local bodies. In 1928, the government decided to support the construction of the “submontan” road from Trieste to Turin so Giovanni Agnelli (FIAT), in spite of his taking part in the former committee, founded the Autostrada Turin-Milan Ltd. with an initial 30 million lire capital, with the participation of some friends of the Turin car factory. Due to the crisis effects, the traffic on all the motorway sections fell sharply and the budget of the motorway companies began to show heavy deficits. The government therefore proceeded to the anticipated redemption of the fifty-year licenses; and management passed to the AA.SS¹⁰ with the exception only of the Turin-Milan section which was almost always profitable.

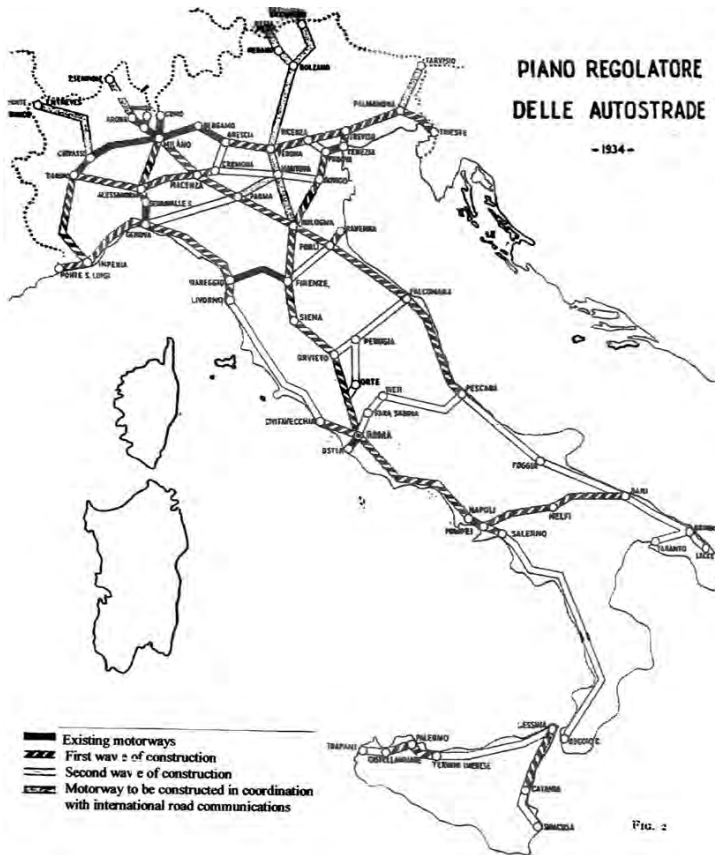
⁸ In the case of the Milan-Turin section, the local bodies made a venture investment to cover the 30 % of the construction expense.

⁹ It has been calculated that the construction of the Motorway employed an average of 5,000 workers every year, with a maximum of 25,000 workers employed in the Genoa – Valle del Po section. See I. Gasparini, E. Marelli, *Le autostrade nella situazione economica del tempo*, “ *Le autostrade della prima generazione 1922-1935* ” Milano (1984) : 13-19.

¹⁰ About the transfer of the managing of the motorways to the State, Puricelli asserted, “The transfer happened in such a way that not only was it not taken into account the huge loss to the private investments, due to non-payment of the interest on their capitals, but also the promoters had to sell out

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Fig 2 The “Commissione Pimi” project for a motorway zoning plan in 1934



In 1935 what had been achieved was in substance far from being a “network”, nevertheless it could be possible to go from Turin to Brescia on a nearly 220 km way; along the line Turin-Trieste a short stretch between Padova-Venezia was also in function. Two other roads, the first coming from the lakes, that it is to say Switzerland, the second from Genoa, met in Milan, which assumed the role of the first Italian motorway junction. The Roma-Ostia, Napoli-Pompei and Firenze-Mare motorways were isolated sections of exclusively tourist interest. (Fig. 2 black lines)

Concerning technical characteristic and building procedures, the motorways of the first generation had only two lanes one in each direction, this resolution being justified by the limited traffic moving on the new arteries (see. Tab I).

at such a low price that they were forced to lose from 30% to 90% of their capital (after they took the place of the state in making a work for the public interest). To myself and the Puricelli firm, it cost many millions of lire”. See the Puricelli memorial in A.Galleni, *Strade autostrade e fascismo*: 64.

Table I. Motorways built in Italy during interwar period

Motorway	Length (Km)	Vehicles per day 1938	Vehicles per day 1952
Milano-Laghi 1924-1925	84.8	2,165	4,000
Roma-Ostia 1928	22.5	Toll-free	Toll-free
Firenze-Mare 1933	91.5	897	6,200
Venezia-Padova 1933	24.6	646	-----
Napoli-Pompei 1936	20.9	889	4,600
Bergamo-Milano 1927	48.9	734	5,600
Brescia-Bergamo 1931	45.2	495	3,100
Torino-Milano 1932	125.8	1,606	6,500
Genova-Valle del Po 1935	50	1,065	6,300

Almost all sections, especially the ones built on Puricelli's projects (Puricelli found in Mussolini the supporter of his constructive conceptions), adopted long, never ending, monotonous straight stretch of roads (from 10 to 18 km long). They also used levelling techniques, shaving high spots and filling depression, because they thought it was a motorway's concern to shorten the distance between two points with no consideration of any environmental concern. This trend was to be changed when Germany launched its construction programme in 1933. At last, the pavement of every motorway was made of concrete slabs, 20 cm thick on average, with transversal junctions any 30 metres, except the Turin-Milan and the Genoa-Valle del Po motorways. It was a particular technology elaborated by the Puricelli firm and it was adopted also for the resurfacing of many ordinary roads. For the regime it had the advantage of utilising concrete, a material produced domestically, an "autarchic" material, in opposition to the bitumen and tar which were petrol derivatives and to had be imported¹¹. The toll gates were controlled by men who were in charge of the collection of the toll and maintenance of the stretches under their control.

¹¹ Such pavement was very durable but was stiff and made the vehicle bounce over the slabs' junctions. It was also difficult to replace as the slabs had to be removed and rebuilt. In order to avoid such an inconvenience on the Milan-Turin, which was designed in the FIAT offices, they used a tarmacadam roadbase (a paving material consisting of coarse crushed stone covered with a mixture of tar and bitumen) which is more flexible. The traditional concrete roadbase was not used on the last built motorway, Genoa-Valle del Po while they adopted "superficial treatment with tar sand". (See G. Pini, *La camionale Genova-Serravalle Scrivia, "le Strade"*: August.

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Finally, the motorways of the first generation were constructed for three principal reasons: the ordinary road network was inadequate; lobby and business groups having an interest both in road construction (concrete manufacturers and builders) and the car world (car, tyres, petrol, oil manufacturers, and so on); the support of the public authority to building, both in order to intend to be the standard-bearer of modernisation by promoting road traffic, and public works as anticiclic measures. The same reasons will be met in the second phase of motorway construction in Italy, after the second half of the 1950's.

However in 1934 an organised plan was drawn up for 5000 km of motorway construction. It provided for numerous international links to be built with the consent of the neighbouring countries, taking also into consideration the projects of a European motorway network, which will be shown in the next paragraph. Besides the passes at sea level such as Ventimiglia and Trieste, the mountain chain was passed at Mount Blanc, Simplon, Resia pass, Brennero and Tarvisio.

2. International connections and the projects of a European motorway network 1926-1934.

In a society such as Europe between the two wars, where the car was still a luxury good intended for a small élite, travelling on roads was meant for "pleasure" or tourism in short, or at the most medium, distances. The chance of improving the long-distance automobile traffic was possible only supposing that a reliable road network, suitably conceived for motorised circulation, could be realized; but the traffic produced so far, limited to a élite, would not be enough to justify such a huge investment. Thus, as it has been already affirmed, "aside from the outskirts of some metropolis or some most developed areas, motorways were not necessary"¹².

Nevertheless, in 1928 the 5th Congress on roads was held in Rome and promoted by different groups - representative of the élite themselves - as the Automobile Clubs and the Touring Clubs. On this occasion at the suggestion of the Italian delegation, among which Piero Puricelli stood out, it was stated that "in the near future every capital and the major holiday resorts of the continent should be connected with a road network"¹³. He also suggested to get the Society of Nation interested in the matter of international roads and motorways. But this suggestion was carried out only in the years following the world economic crisis of 1929.

Moreover, in 1926, in the Germany of Weimar, the project of a toll motorway had already been suggested in order to revitalise the commercial role of the ports in Hamburg, Bremen and Lubeck. It was meant to connect the Hanseatic towns to Basle, via Frankfurt. The name of this artery and of the company promoting it was HAFRABA, a name derived from the initial letters of the towns involved in the

¹² See L.Bortolotti, *Les premieres propositions d'un système européen d'autoroutes* p.48.

¹³ *Ibid.*, p.49

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project. The company had published a Bulletin for a short period of time and on the occasion of the first international congress on motorways in 1931 it promoted a great European programme on motorway construction, which they had already published in the Bulletin of their Company. Piero Puricelli himself had contributed to finance the studies on HAFRABA. In 1927 he completed the original project, lengthening the route towards the Swiss territory as far as the Italian border, through the Gottardo pass and then in the Italian territory up to Genoa passing through Milan (for this purpose he organised a conference in Zurich - the town where he had studied in his youth). (Fig.3)¹⁴.

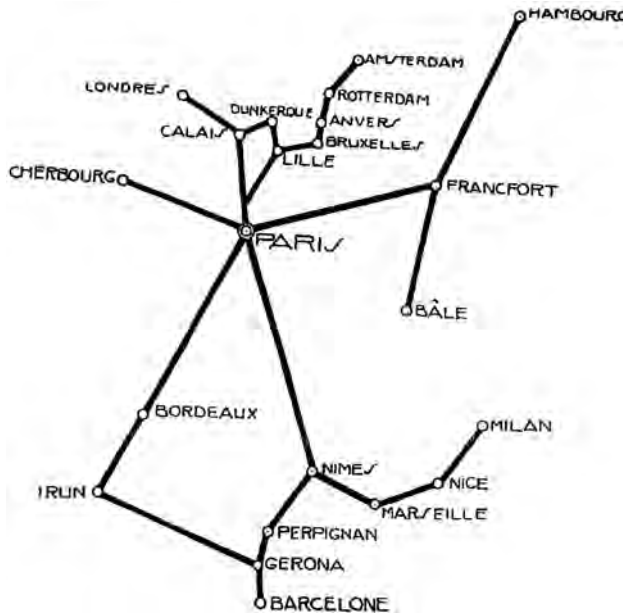
**Fig 3. Hafraba (Hamburg-Frankfurt-Basel). Motorway plan 1927
(Extended to Milan and Genoa through Gothard 1930)**



¹⁴ On the HAFRABA project see Hafraba. Bundesautobahn Hansestädte – frankfurt-Basel, Rückblick auf 30 Jahre Autobahnbau, Wiesbaden-Berlin, 1962. On Puricelli's interest in the Hafraba project, see L. Bortolotti, Les premières proposition d'un system Européen d' autoroutes p.53. See also S. Maltese, L'autostrada Amburgo, Basilea, Genova, « Rivista tecnica delle ferrovie italiane »(1931) p.12

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Fig 4. European motorway network centered around France, Pigelet proposal, 1930



Source: "Science et industrie", numero "La route", 1930

In 1930 Mr.Pigelet, an engineer of the Ecole des Pont et Chaussées (Fig.4)¹⁵, introduced a project on the European motorway network, centered on Paris, incorporating the Hafraba project and branching out to Belgium, Holland, Spain and Italy. It is worth noting that the Italian branch was to start in Nice, passing the chain of the Maritime Alps through the Tenda pass.

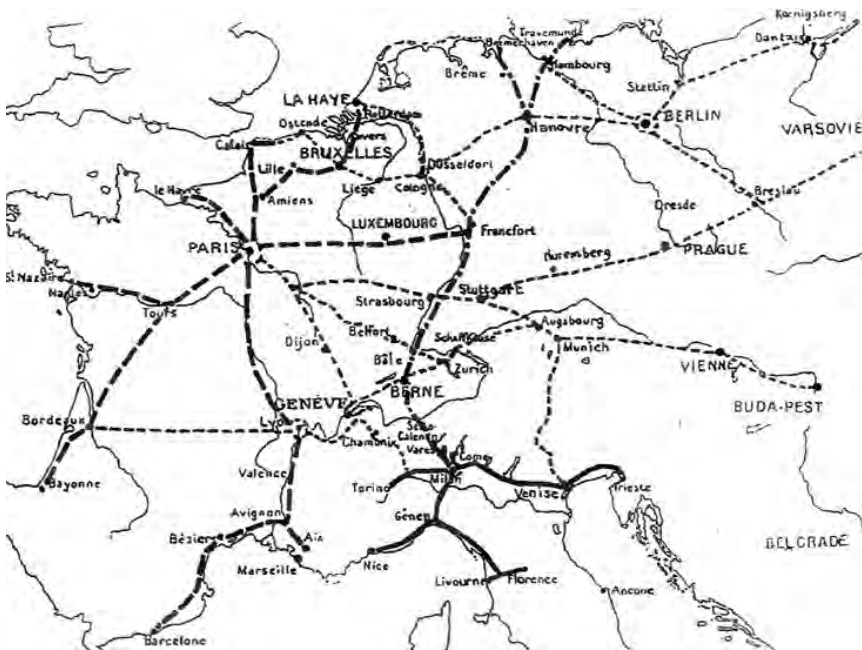
Just at the beginning of the 1930s the hopes of the 1928 Conference on roads, about the necessity to put the subject of international road and motorway connections under the aegis of the Society of Nations, began to materialise in order to face the serious problem of unemployment in Europe. The interests of those who wished a wide programme of public works to relieve unemployment, added to that of entrepreneurs in the automotive field and led to the conception of wide programmes of motorway construction in Europe and to the realisation of two great congresses on motorway between 1931 and 1932.

At the head of this project was the Bureau International du Travail (BIT) in Geneva, which was founded and directed by the French socialist reformer Albert

¹⁵ See *Science et industrie*, "la Route" (1930).

Thomas¹⁶, who was closely connected to the Society of Nations. The crisis could be faced by promoting motorisation through the construction of a wide network of motorways (there would be an increase in employment in the iron works, and also in the unskilled labour employed in the road works). Actually during those years the BIT also planned to promote other public works at the international level, for instance, power lines construction. In particular, some entrepreneurs as André Citroen and Herbert Austin suggested the founding of an international trust

Fig 5. European motorway network presented to the International Congress in Geneva (1931). (Pigelet, Hafraba, Puricelli)



Pigelet proposal (bold broken lines)
Hafraba proposal (dotted lines)
Puricelli proposal (bold continuous lines)
Others (thin continuous lines)

Source: "Revue générale des routes", sept. 1931

¹⁶ On Albert Thomas and the BIT, see M.Fine, Albert Thomas : A reformer's vision of modernisation., 1918-1932, " Journal of Contemporary History ", (1977), p.3.

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to spread motorisation abroad in countries where the car industry was underdeveloped, in order to succeed in “selling cars through the construction of large motorways”¹⁷, which were to be constructed mostly in Central-Eastern Europe.

The first international congress on motorways was held in Geneva on Lucien Lainé’s initiative, president of the Compagnie des Autoroutes founded in 1929 (who had sponsored the Pigelet’s project). The congress was sponsored by the BIT and Thomas, under the honorary presidency of Puricelli. The only result of that congress was the founding of the Bureau International des Auto Rutes (BIAR). At the second international motorway congress, which was held in Milan the following year, the BIAR presented a huge plan for construction (14,000 km), which aimed at putting together and harmonising the projects of Puricelli, Pigelet and HAFRABA; it also provided for the employment of 2,500,000 work days and an investment of 4 billion gold francs. (Fig 5). Such a pharaonic project would have needed a well-constructed international co-operation, much capital and, most of all, an income distribution in the different European countries enabling agents to start the diffusion of mass motorisation. All this remained a mere proposal, the suggestion made by Puricelli to finance the works with the custom revenue on petrol, as well. The sudden death of Thomas, the BIAR lacked any kind of initiative.

**Fig 6. European motorway network (Km 37.000)
Envisioned by Puricelli (1934)**



¹⁷ Bortolotti, Les premières propositions d’un système européen d’autoroutes, p.50

From the workings of the two motorway congresses a great new project for a European motorway network (37,000 km) emerged. Puricelli proposed it in 1934 and it was published in four languages on the *Die Strassen*, fusing the original BIAR project and the new motorway construction plan which had been worked out in Germany in their national-socialist epoch.

In Germany, after Hitler got into power a huge building programme was launched. It was planned by Fritz Todt who also made use of former studies and brought to the realisation of a 4360 km motorway network with the following characteristics: double carriageways, with a 5-metre green median strip, no toll and open to the ordinary road network. Thus the characteristics of the German network were opposite to those of the Italian motorways, and this was due to the fact that engineers and architects contributed to harmoniously introduce the motorways in the environment they went through. The realisation of this plan was not really justified by the level of the German automobile traffic¹⁸, but on the one hand it aimed at limiting unemployment following the old BIT project while on the other it was meant to have a military function. In fact, they were meant to facilitate internal manoeuvres in accordance with the lesson of Frederick the Great, from whom Hitler found inspiration¹⁹.

Although Puricelli, while showing Hitler his project for a European network in 1934, had asserted that building motorway was meant to act as a peacemaker, Europe was marching very fast toward war; it was not by chance that one of the last projects he devoted himself to was the Rome-Berlin motorway, which had to emphasise the political alliance of the Axis on the matter of infrastructure.

Thereafter motorways were not been spoken of for a long time. In 1952, during reconstruction, an Italian military officer, Gen. Curreno, drew up the layout of a network of motorcar roads, in order to mark a new road network in Northern Italy that would have fit into the wider European area, through special motorway mountain passes. Taking into consideration a quadrilateral area marked by St. Didier (Southern France), Vienna, Marseilles, and Ancona, Curreno noticed that the most important ports on the Ligurian and Adriatic Sea and the most important economical, demographic and industrial urban centres were set in an almost symmetric order along the meridians and the parallels. Also, the principal passes of the Alps and the Apennine chains were located on the same lines. It would be easy to find different automobile routes joining these ports, passes and urban centres together. (Fig.7).

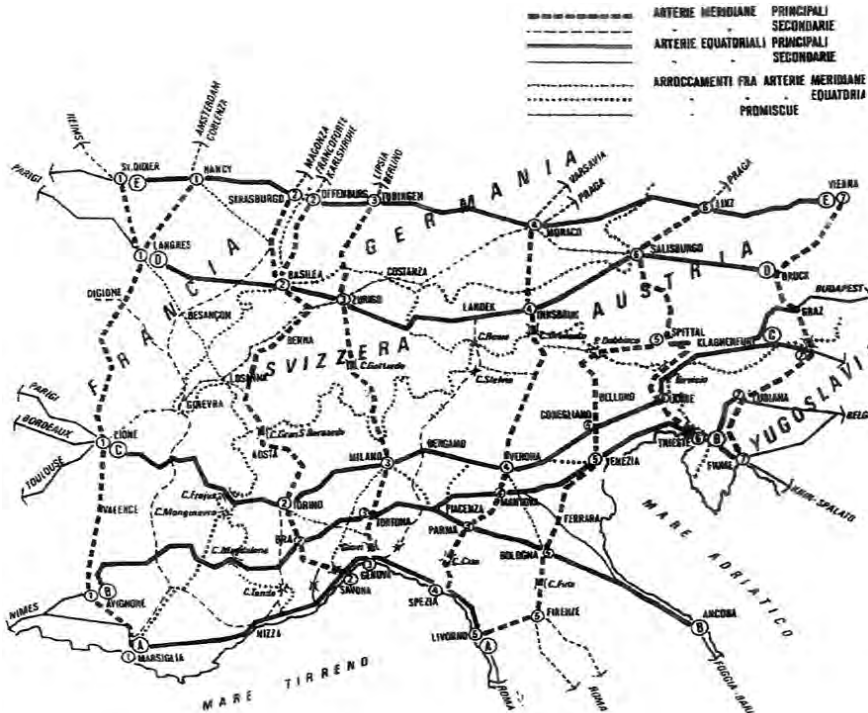
The resulting motorway network was formed by seven transversal lines and five longitudinal ones, crossing one another. The Alps were crossed by seven passes (Maddalena pass, Fréjus, Gran San Bernardo, Gottardo, Brennero, Dobbiaco, and the Tarvisio pass), excluding the passes at sea level on the Cote

¹⁸ However in 1938 1,305,000 cars were circulating in Germany, 313,000 lorries and 1,582 motorcycles. In Italy only 391,000 cars and lorries altogether were circulating. (See A Di Renzo, *Qual è il traffico delle autostrade tedesche ?*, in « *Le Strade* », A. XXI (1993), June.

¹⁹ In addition the motorway sections could have been used as aerodromes, as actually happened during the Second World War.

[110]

Fig 7. The motorway network envisioned by Curreno (1952)



d'Azur and Trieste. The realisation of these twelve routes needed many hundreds of billion lire investments, and Curreno suggested the ERP funds could be used, which according to him, the Allies "seemed to be very inclined to put to this purpose"²⁰. But the project made no headway.

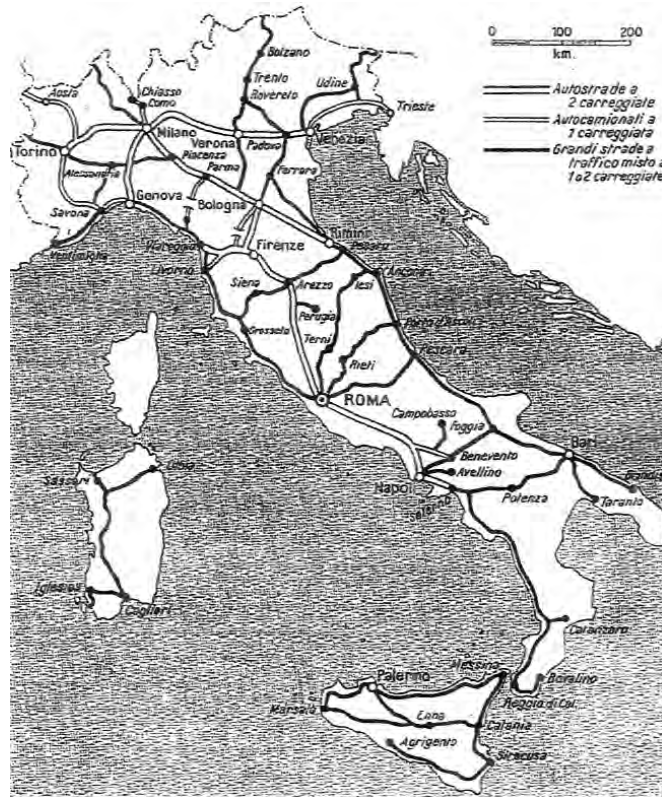
3.The second phase of motorway construction in Italy (1956-74)

At the beginning of the 1950s, Italy was very far from knowing mass motorisation. However the political authority supported an effort toward modernisation in order to improve the ordinary road network following the plan of the great European road which had been approved in Geneva in 1950.

Someone thought about the resumption of the construction of motorways which had not improved at all since 1935, while there had been a considerable

²⁰ G. Curreno, Lineamenti della futura rete autostradale nazionale, in « Turin, 1950 ». In 1956 Gen. Curreno became the president of the Autostrada Ceva-Savona Ltd., belonging to the FIAT group.

Fig 8. Aldisio plan (1952)



increase in traffic.(Tab I). In 1952 at the 9th International Conference on Traffic at Stresa, the Ministry of Public Works presented a plan on road improvement which, in addition to bolstering ordinary road construction, provided for the construction of 1800 km of new double-lane motorways in addition to the doubling of the existing ones (Fig. 8)²¹. However, the plan appeared rather indefinite due to the lack of executive plans, financial profile and timing.

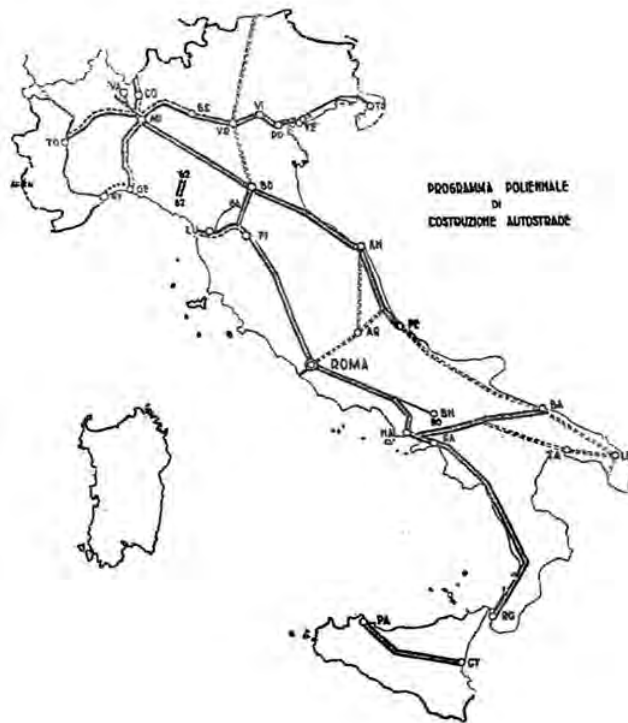
In 1953 FIAT, Italcementi, Pirelli, Agip (that were the major car manufacturer, the major cement manufacturer, the major tyre manufacturer and the state petrol agency) being very interested in a fast resumption of the motorway works, founded a corporation (SISI)²² to plan an executive project of a motorway from Milan to Naples, passing through Bologna, Florence and Rome. It would become the Autostrada del Sole and it would form the spine and be the model of the future

²¹ The plan was named by the Ministry of Public Works in office, Aldisio, but it was edited by the director of the agency for State roads (ANAS), Mr. Gra, an engineer.

²² SISI stood for Società Iniziative Stradali Italiane S.p.A.

[112]

Fig 9. Romita plan (1955)



Italian motorway network. The definite project was given to the State. The model the planners had been inspired by was not the German, but once again the American one²³, characterised by two separate carriageways with two driving lanes and an emergency one each. It was a toll system completely separated from the ordinary traffic; with cloverleaf intersections. Regarding petrol stations and relief services, the motorway was a closed and self-sufficient system. (In Florence, at the Firenze Mare junction, they even built a church). The works started in 1955 and the first sections of the motorway were opened in 1960. At the same time (in 1955) the new Ministry of Public Works Romita, presented a plan for the construction of 2450 km of new motorways, double the existing ones and other interventions to improve the ordinary road conditions. The 1300 billion lire expense was to be charged to the State, who would build some sections directly leaving the others to private corporations - in which the commitment of local bodies was to prevail. The Romita plan, which resumed the projects of the pre-war period, was approved with only few objections. This project laid the foundations

²³ Some inspections on the spot were made in the United States to examine the know-how and the road sign system in American motorways.

Fig 10. I.R.I Motorway plan submitted to the government in 1960



of the construction of the great thoroughfare (Milan-Reggio Calabria; Turin-Trieste; Bologna-Bari) which should "shorten Italy".(Fig.9).

Between 1955 and 1960, together with a consistent increase of the GNP there was an increase in consumption mainly of durable goods and in particular cars, especially low-powered ones that were being manufactured by the Italian car makers, who then became specialists in this field. In this way due to the rapid increase of the fleet of vehicles, the existing road network proved to be insufficient²⁴.

At the origin of the second phase of the construction of the Italian motorways there are the same elements that had characterised the first phase, that is, on one side was the wish of the political body to improve the infrastructures (they in fact considered the road system as the real modernisation of the XX century); on the other side was the inaguate development of the ordinary road system in a coun-

²⁴ Italy had the lowest European index of road improvement in relation to the area : 0.65 km per km² against 0.66 in West Germany, 0.93 in Holland, 1.13 in Switzerland, 1.20 in Great Britain, 1.27 in France, 1.33 in Denmark, 1.57 in Belgium. Even the USA (with wide deserted areas) had a higher value:0.66.

[114]

Fig 11. Italian motorway network in 1973



try characterised by mountainous terrain and by the pressure of the economic world on the improvement of motorisation.

In 1960, IRI completed the previous plan with a new one bringing the road network to 5,000 km length (fig.10) while assuring safer financial backing for the works. Between 1958 and 1965 the number of vehicles circulating increased five fold and in 1963 the number of cars overtook the number of motorcycles. The vehicle fleet doubled thereafter between 1965 and 1970. In 1973 when 10 million vehicles were circulating, the motorway network had reached 5,000 km length, built in accordance with the model proposed by the SISI for the Autostrada del Sole, while another 1,000 km were under construction. (Fig 11). In the middle of the 70s the building of the motorway network was in fact concluded: nowadays the network has improved to 6500 km. In 1973 Italy turned out to be, among the EEC countries, the one with the lowest rate of ordinary road system per km but with the widest motorway network (Tab II), with the highest vehicle density on the ordinary road network and the lowest on the motorway network (except the Netherlands and Belgium, which cannot really be compared because of their limited territory).

Table II. Comparative Analysis of European Network in EEC Countries in 1973 (Luxemburg and Ireland excluded), absolute figures.

COUNTRIES	Motirways (Km)	Roads (Km)	Total vehicles*	Inhabitants per vehicle
Belgium	1,009	93,600	2,698,000	3.62
Denmark	345	65,100	1,467,000	3.40
France	2,836	793,200	16,720,000	3.09
West Germany	6,071	459,900	18,384,000	3.35
Italy	5,167	289,000	14,508,000	3.75
The Netherlands	1,421	82,400	3,576,000	3.72
United Kingdom	2,027	363,600	15,325,000	3.64
TOTAL	18,903	2,144,800	73,274,000	3.48

Comparative Analysis of European Roads Network in EEC Countries in 1973 (Luxemburg and Ireland excluded), relative figures.

COUNTRIES	Road network (Km each 10,000 Km ²)		Vehicles density (Vehicles each Km)	
	Roads	Motorways	On roads	On motorways
Belgium	30,700	331	29	2,700
Denmark	15,100	80	23	4,300
France	14,500	52	21	5,900
West Germany	18,500	244	40	3,100
Italy	9,600	172	50	2,800
The Netherlands	20,200	348	43	2,500
United Kingdom	14,900	83	42	7,600

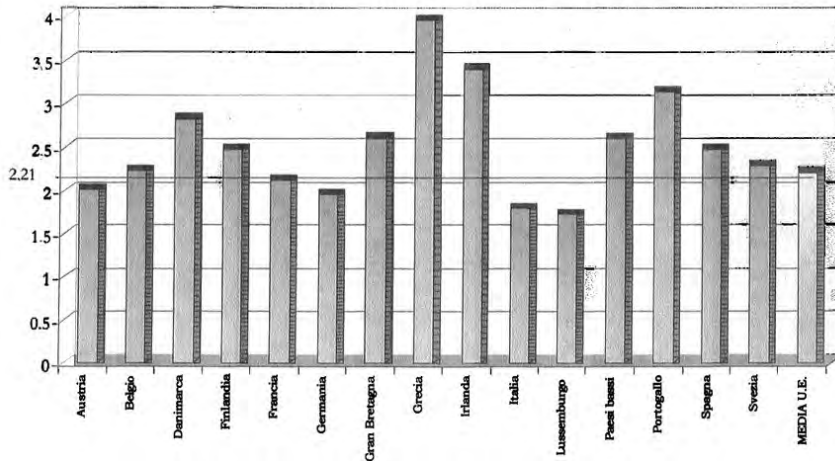
* Total vehicles including cars and trucks

The construction of motorways, which had been caused by an enormous development of traffic, triggered a sort of chain reaction then favouring a further increase in traffic. It doubled once again between 1970 and 1985, and between 1985 and 2000 it increased again of 50%. Italy now has the highest car density on the continent with one car for every 1.7 inhabitants against the Community average density of one vehicle for every 2.2 inhabitants (Fig 12).

If we consider the data of the evolution of the different types of traffic between 1958 and 1995, regarding both passengers and goods traffic, we notice a clear ten-

[116]

Fig 12. Person to cars ratio in U.E. countries (2000)



dency toward private transport on road (Tab III) and a definite decline in railway transport. Most of the European Countries have undoubtedly experienced the same phenomenon, but in Italy it has assumed much more relevant proportions than anywhere else, as it is shown in Figure 13. At the root of this phenomenon there are different causes typical of the Italian economic system and its transport infrastructure. On one side there stands the bad quality of the railway service compared with an efficient motorway network, on the other side there is the tendency of the myriad of small or even very small manufacturers to privilege (and to expect) a “door to door” delivery of goods, which is typical of the road transport.

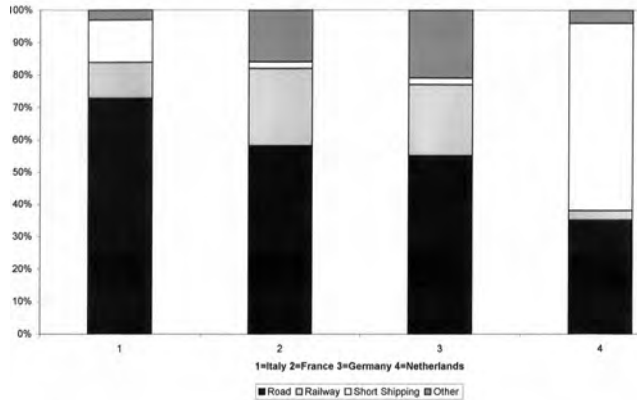
The progressive shift towards road transport has also affected the international traffic, as can be seen from Figure 14, showing the enormous increase in goods transport by road towards France and Austria, through the Mont Blanc and the Frèjus tunnel and the Brennero pass between 1970 and 1995. The only country still preserving the supremacy of railway traffic is Switzerland.

When the transalpine tunnels were built, they were far from being connected on both slopes, with the motorway networks of the respective countries. Only the Gottardo pass was rapidly connected with the motorway network, while for the other tunnels the gap is still being filled²⁵. The long transalpine tunnels have dramatically shown all their vulnerability; in fact the accidents and the lengthy clos-

²⁵ Length and opening year of the most important transalpine road tunnels

Gran San Bernardo	km 6	1964	Gothard	km 17	1980
Mount Blanc	km 12	1965	Frejus	km 13	1980
San Bernardino	km 7	1968			

Fig 13. Overland transport of goods in the main U.E. countries (2000)



ing of the Mounth Blanc first and then the Gottardo have nearly paralysed the traffic through the Alps, isolating Italy from Central-west Europe. The best alternative for going through such a huge natural barrier seems to be found in long railway tunnels, open to intermodal (integrated) traffic, adopting technical standards similar to the Eurotunnel, about 50 km long.

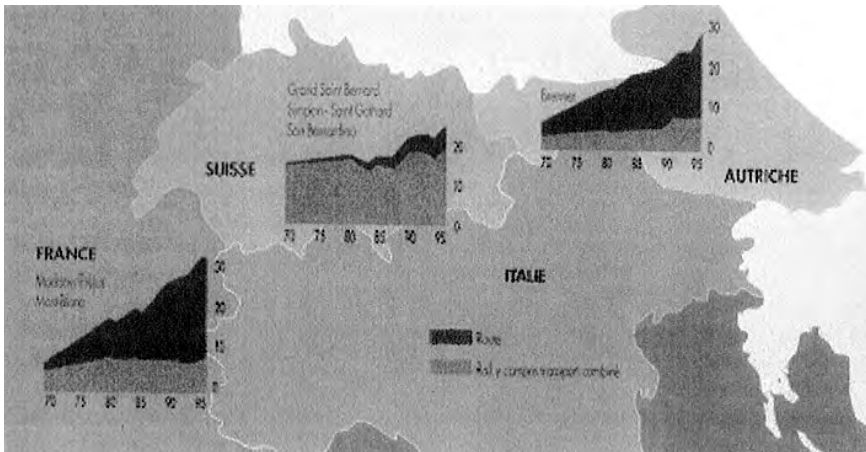
If only one tunnel is enough to hurdle the barrier represented by the English Channel, in order to cross the extremely long barrier of the Alps, which directly involves four countries besides Italy, a higher number of railway tunnels of a new generation is needed. This implies very high investments and a very long time of realisation with the construction of high speed railway lines, which even run the risk of rising the opposition of environmentalists. Some are already being built (Lotschberg by 2008, New Gottardo by 2012), others are either in an advanced planning phase (New Fréjus presumably by 2015) or still being planned (New Brennero).

Speaking of intermodal transport seen as the remedy to road traffic congestion and the consequent inefficient allocation of resources, alternate solutions have been put forward in order to complete the road transport with carriage by sea, by means of ferry-boats capable of transporting heavy vehicles over a long distances. This kind of transport could easily be applied to a country such as Italy almost entirely surrounded by the sea and extending into the Mediterranean for almost 1000 km. In fact, the expression “Motorway of the sea” has been coined for the routes of the ferry-boats employed in this kind of service.

This kind of intermodal (integrated) transport, which can be profitably applied to very long routes (for instance Sicily-Genoa or Barcelona-Genoa, or Salerno-Valencia), becomes more problematic when applied to middle-length routes such as those prevailing in the Italian domestic market. Table IV compares delivery time and transport cost on the Salerno-Milan route (about 900 km on road) in the case where the rules, regulating the maximum daily non-stop driving time, are respected, and in the case where such rules are not respected (as often occurs). It

[118]

**Fig 14. Development of goods traffic on railways and roads (1970-1995)
(million of t. per year)**



Source: Alpinto

is evident that as far as delivery time is concerned, over this kind of distance (quite common in Italy) the sea-road transport is convenient only when the body of legislation in force is respected and it is not when it is eluded. In the comparison of costs it is assumed that the vehicle could be either accompanied by the driver (in which case the whole articulated lorry travels) or non-accompanied (in which case only the trailer travels). In the second case the carrier, besides paying a lower rate on the ferry²⁶, will be able to assign both driver and tractor to other services, yielding a further reduction in costs. The carrier must have an average dimension such as to be able to grant the management of the transport from and to both terminal ports of the sea route, or at least it should have an agent at the destination for the subsequent handling of the cargo.

Consequently, an integrated sea-road system of transport will generally prevail also over middle-length routes only in the case where the rules concerning the non-stop driving time are respected, also in view of the operator's security and if the forwarding agencies, which are usually very small and family run, start a process of growth and concentration; in fact they will be able to fully exploit the system of transport only if they reach adequate dimensions and management capacities. See Table IV.

²⁶ There is no " hotel service " on board to be paid for.

Tab. III. Distribution % of passengers traffic (pass/Km)

Year	Railways	Airways	Inland navigation	Suburban bus	Urban transport	Private road transport	Total
1958	27.0	0.1	0.4	14.1	12.4	46.0	100
1965	17.0	0.3	0.2	11.0	8.5	63.0	100
1970	11.5	0.5	0.3	7.2	4.5	76.0	100
1980	9.4	0.7	0.3	9.0	4.5	76.1	100
1995	6.4	0.8	0.3	9.1	2.0	81.4	100

Distribution % of goods traffic (t/Km)

Year	Railways	Airways	Inland navigation	Short shipping	Road transport	Pipelines	Total
1958	25.1	0.0	0.3	10.5	62.8	1.3	100
1965	21.1	0.0	0.2	17.0	58.7	3.0	100
1970	16.8	0.0	0.3	23.1	51.8	8.0	100
1980	10.5	0.0	0.1	17.1	65.8	6.5	100
1995	9.2	0.01	0.1	13.2	72.8	4.7	100

Tab. IV. Transport of goods: comparison between motorways and “motorways on the sea” (2002)

**Time of delivery (hours)
Salerno Milan**

Roads		Intermod. road/sea
According to the rules	Breaking the rules	
28	14	22

Maritime fares (euro)

	According to the rules	Breaking the rules
Salerno-Genoa (non-accompanied by drivers)	430	300
Salerno-Genoa (accompanied by drivers)	630	500

[120]

Conclusions

The precocity of the highway realizations in Italy, in both the periods evidenced above, is to be ascribed to reasons of geographic, historical and economic order. The inadequacy of the ordinary road network (due to the orographic characteristics of great part of territory and to the scarceness of previous investments) induced the political class - convinced that, in a still backward country, the development of an efficient road network constituted a powerful factor of modernization - to take into account the activity of lobbying of the great enterprises directly interested to the development of the automotive field (manufacturers of automobiles, of tyres, cement producers and oil industries). Realization and financing happened mostly through the original instruments of intervention in the economy of which the Italian State equipped itself from the 1930s (IRI). The propulsive function of the construction of the network (1954-1974) on national income and on development of the automotive field was considerable. In the long period, however, the existence of a motorway network able to reduce the times of distance in a more meaningful measure than railroads (which in the meantime did not receive the necessary adaptations), contributed to address, in a very greater measure than in the other European countries, passengers, and above all goods, towards the transport on road. Thus, it is difficult not to lead back to the precocious realization of the motorway network the fact that Italy has the most elevated automotive density in the continent and the most elevated quota of goods transport on tyre than on track. This increasing distortion of the transport home system has been extended, later, to international traffic making completely inadequate the already weak complex of the transalpine tunnels, axis of connection of the motorway networks of the five Countries that insist on the chain of the Alps. For overcoming such an important barrier, the only viable way out is the recourse to intermodality by the realization of a new generation railway tunnels on the model of the Eurotunnel. Instead, unless on long routes, less immediately evident seem to be the advantages - in the control of the traffic on tyre - reachable by an intermodal approach "road-sea".

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