The development of air traffic in Sicily

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Abstract

The aim of this work is to analyse the air traffic development that interested the airport system in Sicily, consisting of the airport of Palermo "Falcone – Borsellino", the airport of Catania "Fontanarossa" and that one of Trapani-Birgi "Vincenzo Florio".
The analysis of the possible growth of air traffic volume and performance in Sicily was mainly suggested by the growing importance of the Mediterranean region like a new crossroad of the worldwide traffic on the East-West line. It gives a new chance for the development of this area that mustn't be loosed. Globalization and the migrant flows from South and East towards the Western Europe, makes of the southern Italy a strategic knot for passengers and goods movements. So, new investments and infrastructures improvements that will be realized in this area are a value added not only for the southern Italy but also for the whole country.
We have examined the potential demand attraction for passengers and goods movements in the Sicilian airports considered.
For a more careful evaluation of the changes occurred into Sicilian air transport system, the research aimed to:

- determine their "catchment area" through the evaluation of accessibility (isochrones);
- analyse the air traffic data and the existing degree of integration, not only between the airports and the area, but also in terms of demand in the short and in the long period.

Finally, we have evaluated the possibility of integration of traffic flows management among the two airports of Palermo and Trapani, in order to analyse if this two airports are complementary rather than competitors.

1 Introduction

Air transport activities after the Second World War were organized within a highly regulated market. The system was based on bilateral agreements between governments with regard to capacity.
By relying on the single designation principle, it was common practice in the European countries for only one carrier to be allowed to offer international air transport services. As most of these flag carriers were public enterprises so governments were reluctant to deregulate the airline sector.

In this highly regulated legal and economic environment, fair competition between airline companies was impossible resulting in inefficient services and high fares.
Deregulation packages gradually liberalised market access conditions. Since April 1997 cabotage has been allowed in the EU.
The air transport market in the EU actually is no longer restricted with regard to capacity, common rules have been adopted for market access, freedom has been introduced for price setting, and legal environment of fair competition as been established. Free pricing is one of the main achievements of the deregulation process in the EU.
At the same time, a deregulated market tends to increase the number of market players, at least in the beginning, ad creates additional pressure on airport infrastructure and airspace congestion.
The expected introduction of Free Flight around 2008, based on the Galileo satellite navigation system, and the creation of a Single European Airspace should guarantee control over airspace congestion in the future.
In order to maintain a balanced equilibrium between air traffic growth and impact on safety and environment, a number of actions have been adopted.
The Commission recognises that the full implementation of deregulation requires additional air transport policy actions in the future. The focus will be around six diverse objectives:

- reduced congestion in the skies and at airports;
- protection of the environment;
- safety policy;
- protection of passengers;
- enhanced international dimension.

The problem of airspace congestion today is less dramatic than it was before 11 September 2001 and since these data special emphasis has been placed on security in order to prevent terrorist action.

2 An analysis of air traffic demand in Sicily.

Air transport makes an increasingly vital contribution to the economy and society, and it's at the heart of globalization.
In an economic environment where growth is important for creating wealth and wellbeing, transport provides a necessary or even indispensable input. Within the transport sector, air transport occupies an even more important position because of the growing number of trips over long distances and the increasing value of time factor.
Sicily is the widest region of Italy; it's area is equal to 25.710 km squared; it's the most extensive island of Mediterranean Region and it's placed in the centre of Mediterranean basin.
Sicilian transport network is still less efficient than the Italian transport network not only for the insufficiency of infrastructures but also for the lack of intermodality. The poor accessibility is determined by the low quality of services and infrastructures.

The main points of weakness of Sicilian transport network are:

1. the inefficient transport linkages between local, national and international network and a low degree of integration between different modes;
2. a disequilibrium in the supply side of transport between hinterland and coastal area;
3. the lack of efficient east-west and north-south interconnections;
4. a poor level of efficiency and safety of transport network;
5. the congestion of transport network along some routes and in the metropolitan areas;
6. a level of service lower than that of the national standard;
7. poor reliability and regularity of transport network system;
8. an inefficient use of transport supply, with a prevalence of road transport on maritime and railway ones, which determines more accidents, environmental impact, energetic consumes and higher costs.

However, it's useful to underline that Sicilian transport network is also characterized by a road network ramified all over the island.

Air transport can be considered the best answer to the peripheral allocation of Sicilian island and to the distance of its firms from European market and from the main suppliers of raw materials.

The insularity condition and the marginality position of Sicily respect to the main Italian and European centres gives to air transport an important role for the economic growth of the island.

The airports actually existent in Sicily are:

1. Palermo Punta Raisi;
2. Catania Fontanarossa;
3. Trapani Birgi;
4. Pantelleria;
5. Lampedusa.

The first two belong to the Trans European Network like European link points; the other three are regional and access connection points.

We have taken into account only the airport that are not over the third level. The international airports of Palermo Punta Raisi and Catania Fonatanarossa represent the two main airports of Sicily; instead the airport of Trapani is a regional one.

The international airport of Palermo Punta Raisi has two runways intersecting each other. It has a good radio aid equipment and it has just inaugurated the new equipment of Wind-shear.

The international airport of Catania Fontanarossa has one runway limited at East by the sea and at West by the railway. It doesn't have a taxiway and this determine a capacity reduction of the airport in terms of number of movements per hour. The existing air terminal is insufficient to serve 4 million passenger per year.

The regional airport of Trapani Birgi has two runways which are in co-use with the Air Force. The terminal is wide and oversized respect to the actual level of

traffic. The closeness to the airport of Palermo could be one of the main reason of the low air traffic development of Trapani Birgi.
Recently was presented ad approved by ENAC (the National Agency of Civil Aviation) the project for the airport of Comiso (nearby Ragusa); it should improve the competitiveness of the production system in the south-west of Sicily.
Also the air transport network presents some lack and the infrastructure outfit are lower than the national average with a value of 87,1%. First of all, linkages between metropolitan areas and airports is poor and inefficient. Therefore, generally air transport its suitable to other transport modes for distances over 800 km, for its cost/time relationship. If we think to Southern Italy air transport becomes suitable for lower distances due to the supply conditions of the other transport modes.
At the same time it's useful to underline that Sicilian catchment area of air transport is delimited by the coastal external boundary.
The catchment area of an airport is dependent upon the time necessary to cover the distance to reach the airport infrastructure.

Figure 1 – Catchment areas of Palermo and Catania Airports

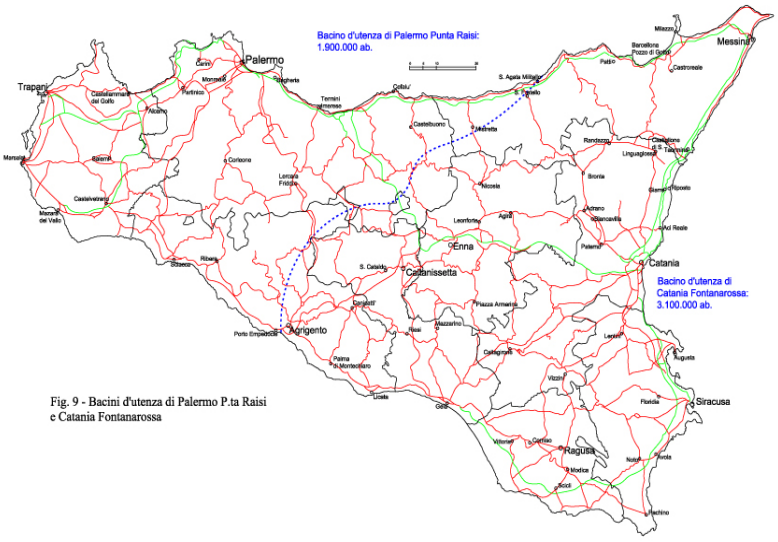


Fig. 9 - Bacini d'utenza di Palermo P.ta Raisi e Catania Fontanarossa

The catchment areas of the two main Sicilian airports of Catania Fontanarossa and Palermo Punta Raisi are determined by the subdivision of the Island into isochrones. The catchment area is not dependent only by the ratio time/distance, but it's also dependent by:

- the scheduled flight and charter to the main Italian and European destinations (which is the same for the two airports);
- the pricing system adopted by the airline companies (which is very similar);

- the accessibility to the airport.

The catchment areas are reported in the previous map in which the blue line determines the points at the same time distances from the two airports.
Sicily, with its 8.703.611 passengers and 17.793 tons for cargo in 2003, represents respectively the 8,6% and 2% of the national air traffic.
Data reported in table 1 shows a growing trend in the period 1993-2003 for the air terminals of Catania and Palermo. At the same time table 1 shows a discontinuity point in the development of air traffic for the terminal of Trapani that is mainly influenced by the tourist demand of Pantelleria and Lampedusa island's terminals to which it's linked.

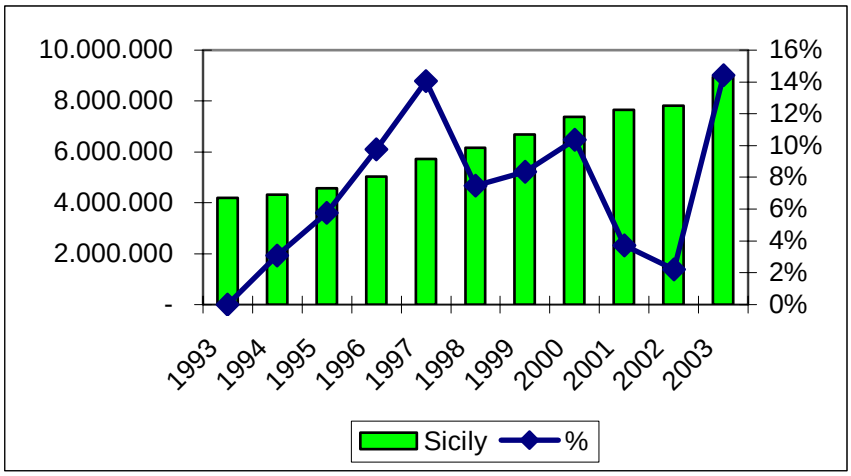
Table 1 – Passengers at the Sicilian airports, 1993- 2003

Year	Catania	Palermo	Trapani	Sicily
1993	2.050.000	1.950.000	41.000	4.199.000
1994	2.150.000	2.000.000	30.000	4.329.000
1995	2.300.000	2.100.000	20.000	4.579.000
1996	2.505.000	2.300.000	30.000	5.026.000
1997	2.900.000	2.600.000	25.000	5.733.000
1998	3.158.103	2.750.000	45.000	6.162.103
1999	3.557.716	2.900.000	52.000	6.677.716
2000	3.957.561	3.200.000	28.312	7.370.883
2001	4.181.080	3.185.860	50.437	7.645.315
2002	4.025.039	3.516.860	42.785	7.814.839
2003	4.807.643	3.649.494	246.474	8.703.611

The air traffic development recorded in the second part of 2003 for Trapani's terminal is mainly influenced by the fare applied to passenger tickets; the policy pricing adopted is due to the subsides granted by the EU. This subsides have permitted to obtain a competitive advantage for passenger air transport, but it'll end in 2006. To be real this price advantage should help to improve the level of service offered by the airport of Trapani.
The market of regional airports can be defined along two axes of geographic allocation and market segmentation. The location of any airport and other competing airports combined with the demographic, economic and social characteristics of its hinterland, determines its growth profile and market segmentation. It follows that the shaping of demand at any regional airport reflects a complex fusion of process relating to hinterland (or catchment) attributes, combined with airport and airline characteristics and business strategies.
In the specific context of regional airports, it's implicit in the ambiguous statement that each airport cannot be viewed in isolation from other airports. Airport both compete with each other and complement each other to some extent. That competition, which is as much for services as it is for passengers, is however, largely a legacy of the municipal ownership of airport in which each city and region had have its own.

The catchment area of an airport is dependent upon the distance that the passenger or shipper is prepared to cover in order to use that airport. Generally, in the densely populated parts of Western Europe, these catchment areas overlap, so that customers have a choice and hence competition exists. In Sicily there is a really low competition between alternative modes of transport.
The question is therefore of many airports, particularly regional airports, are able to reach the threshold of profitability. Consequentely, allocation in a densely populated area as benefits as well as drawbacks: the potential market is bigger but so too is the inconvenience caused.
As it was already underlined, the regional airport of Trapani is very close to that of Palermo and their catchment areas are coincident. So in order to reach economic profitability of the airport is necessary to compete on a different level. For a regional airport is very difficult to compete on frequencies and number of destinations offered to the customer. It would be better to offer different services, to specialize the supply, to cover a market niche, e.g. to look more to suitable services for tourism, in particular to charter traffic.
Air traffic data recorded between 1993 – 2003 for Sicilian air transport system, show a growth of the regional transport demand equal to an average annual rate of 8%. Figure 2 shows the historic trend and the annual rate growth of air traffic passengers carried in the Sicilian air transport system.

Figure 2 – Air traffic passengers carried in Sicily and annual rate growth



In succession, respectly to Palermo, Catania and Trapani airports, are presented:

1. the 2000-2003 trend for passengers;
2. the 2000-2003 trend for cargo (tons.).

Data relative to Trapani airport about some months of 2000 and 2001 are still lacking.

Figure 3 – Passengers movements at the airport of Catania

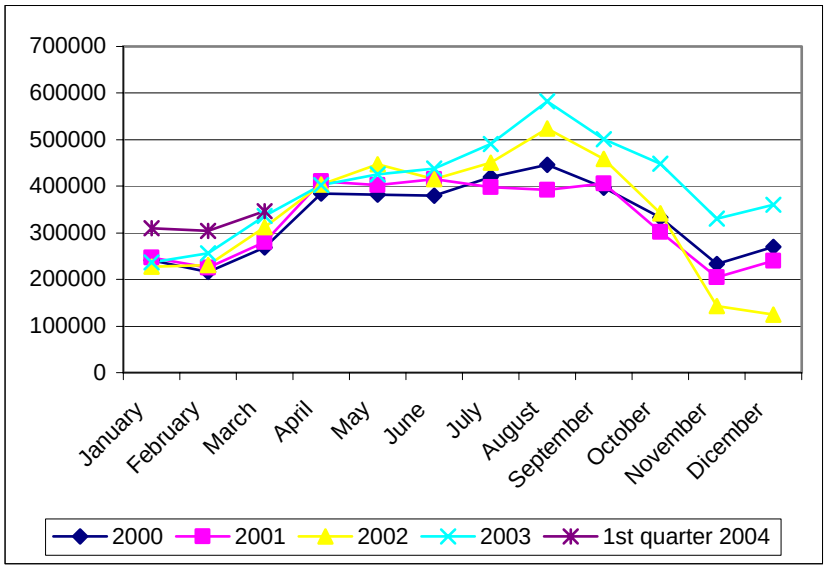
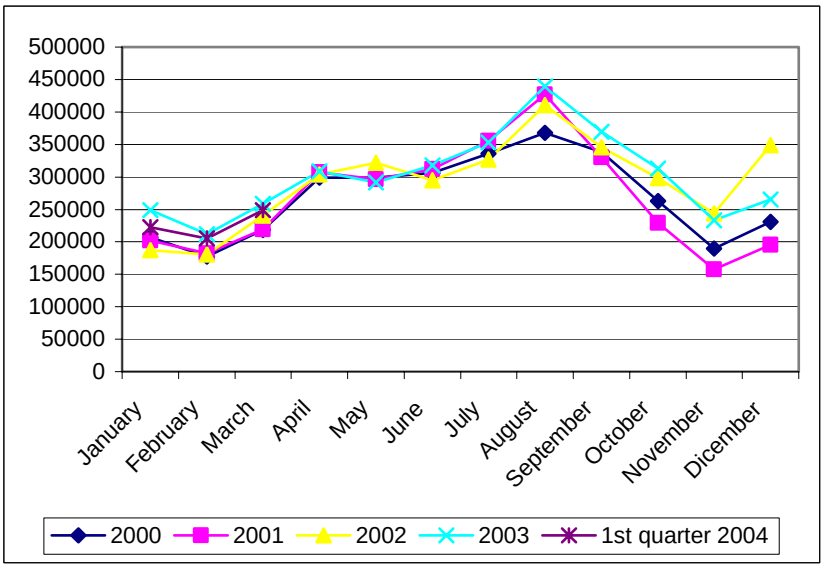


Figure 4 – Passengers movements at the airport of Palermo



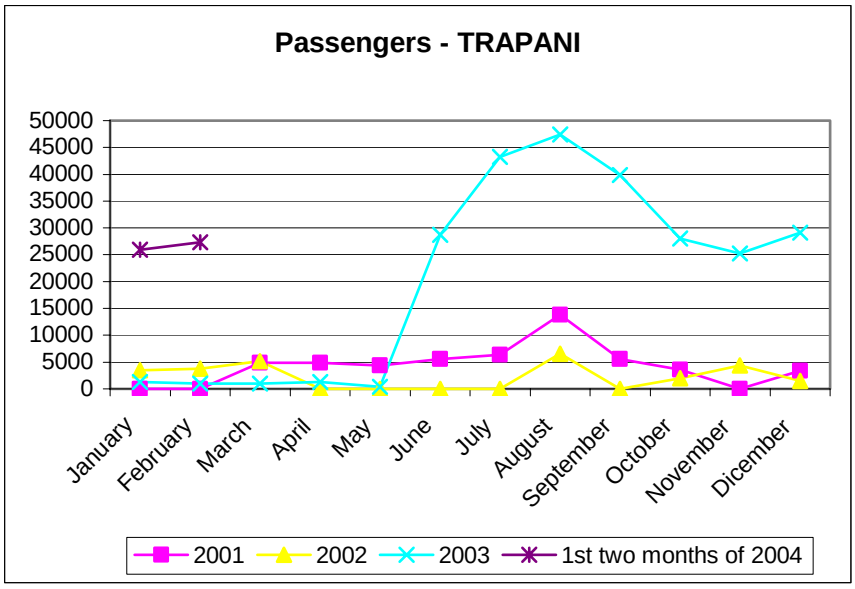
The airports of Palermo and Catania show a similar behaviour:

1. a growing trend of air traffic for all the period analysed;
2. an annual trend in which is possible to note three phases: the first one called off-peak which characterize winter months; an average one in

which air traffic demand increases of about 50%, that characterize spring months, and the last phase, in the summer time, in which the traffic demand reaches double values respect to winter months, and it has its peak values on August.

The airport of Catania always presents air traffic demand grater than Palermo's ones.

Figure 5 – Passengers movements at the airport of Trapani



The airport of Trapani shows an interesting development of air traffic passengers' demand in the second part of the year 2003. The peak values presented are really interesting and should represent a good power of attraction and development especially for leisure market.

Air traffic demand for cargo (mail and freight) are negligible for both the main Sicilian airports and it shows a steady trend.

The cargo traffic is really poor (near to zero) for the airport of Trapani and so data related to it are not reported here.

Figure 6 – Cargo movements at the airport of Catania (tons.)

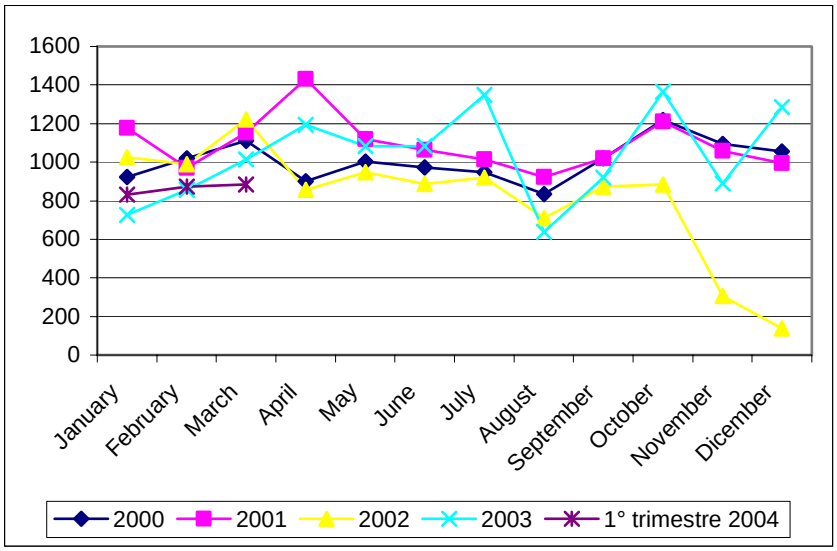
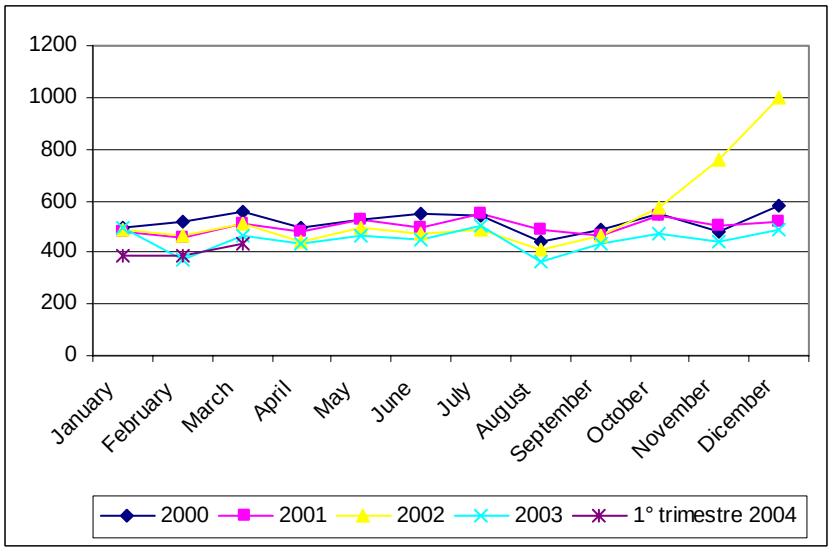


Figure 7 – Cargo movements at the airport of Palermo(tons.)



3 An analysis of the air traffic development in relation to the "Context Programme Agreement" for air transport in Sicily.

It is immediately apparent that the failure to develop a national aviation strategy, combined with a general lack of understanding of the interaction between air transport provision and regional economic development, constitutes a major impediment to assessing air transport's role in evolving an integrated transport policy. As it could be easily understood is really important to assess the role of regional airports in economic development, the aim being to maximize the contribution of airports to their local economies, while also relieving pressure on the congested airports and reducing the need for long road journeys to them from the regions.

In order to guarantee a good level of competitiveness to Sicilian air transport system it's so necessary to consider the Sicilian transport network as a whole and first of all to evaluate and to put into effect all the projects as soon as possible.

The congestion phenomena is a real problem for the Sicilian airport system. For this reason some intervention on Sicilian terminals were provided for in order to reduce congestion and to be able to serve the forecasted increase of air traffic demand according with the implementation of Messina bridge.

The intervention were established in the Context Programme Agreement for air transport in Sicily signed by the Region, the National Government and the National Agency of Civil Aviation (ENAC). The realization of the infrastructure intervention established for the Sicilian Region's air transport system have the aim to increase its competitiveness. The table below shows all the intervention foreseen.

Table 2 – Context Programme Agreement for air transport in Sicily 2001

N.	Intervention code	Type of intervention	COST (millions of euro)
1	ENAC-PA-05	Airport of Palermo – Geological studies	**3,099**
2	ENAC-PA-06	Airport of Palermo – New landing-stages and gangways for passengers and the related works of adjustment of passengers air terminal	**24,015**
3	ENAC-PA-07	Airport of Palermo – Control system for hold luggage safety	**5,165**
4	ENAC-PA-08	Airport of Palermo – Water and sewers networks – Plants for the treatment and draining of cesspit and sewer – adjustment of technological plants	**9,814**
5	ENAC-PA-09	Airport of Palermo – Adjustment of air side infrastructures first lot	**9,296**
6	ENAC-PA-10	Airport of Palermo – Adjustment of air side infrastructures second lot	**10,329**

Table 2 – Context Programme Agreement for air transport in Sicily 2001(continued from previous page)

N.	Intervention code	Type of intervention	COST (millions of euro)
7	TA-PA-05	Airport of Palermo – Realization of a service building	**9,296**
8	TA-TP-06	Airport of Trapani – Restructure of passengers air terminal of operating buildings and plants	**9,296**
9	TA-TP-07	Airport of Trapani – Operating adjustment of aircraft service area	**6,197**
10	TA-TP-08	Airport of Trapani – Transfer of fuel depot JA 1	**2,324**
11	TA-TP-09	Airport of Trapani – Building depot means of ramp	**0,413**
12	TA-TP-10	Airport of Trapani – Restructuring goods area	**0,723**
13	TA-TP-11	Airport of Trapani – Adjustment of air terminal	**1,033**
14	ENAC-CT-01	Airport of Catania – Widening of air terminal	**80,567**
15	ENAC-CT-02	Airport of Catania – Realization of taxiways	**12,911**
16	ENAC-CT-03	Airport of Catania – Widening of aircraft service area	**7,747**
17	ENAC-CT-04	Airport of Catania – Improvement of land side	**5,165**
18	ENAV-CT-01	Airport of Catania – Updating of Air Traffic Control systems	**13,888**
19	TA-CT-01	Airport of Catania – Improvement of accessibility	**2,582**
20 / **21**	TA-CT-02	Airport of Catania – Hydraulics layout Infrastructures	**7,747**
22	ENAC-CT-21	Airport of Catania – Feasibility study of new runway	**0,258**
23	ENAC-CT-22	Airport of Catania – Feasibility study of the 2nd aerostation	**0,258**
Total amount of the intervention into the airports of Palermo, Trapani e Catania			**222,123**

Criteria adopted to determine priority's intervention were referred to the improvement of:

- infrastructures efficiency;
- infrastructures functionality;
- safety;
- integration of the intervention with the others considered in the programme;
- environmental conditions;
- interconnection and interaction with other measures adopted;

- accessibility for tourism and regional system production.

All the intervention have the aim to improve air traffic system supply in order to be able to support the actual and the forecasted demand growth and to prevent congestion.

Growth in air traffic is still persisting. In the past decades, one of the most important sources of uncertainty has been forecasting of future air traffic levels.

The air traffic demand for passengers in Sicily was determined using the past series data since 1993 until 2003 (see data reported in table 1).

In the study are forecasted two possible scenarios of traffic growth. The methods adopted were: the linear progression and the logistical increase. The first method determines an optimistic scenario of air traffic development; instead the second one determines a precautionary scenario.

In the first scenario, in order to estimate passenger movements in Sicily, has been used a linear function that better fits the trend presented by the series data reported. This method take into account the long period traffic increase (1993-2003) and it was calculated using the following formula:

Pt = Po + (r*t)

where:

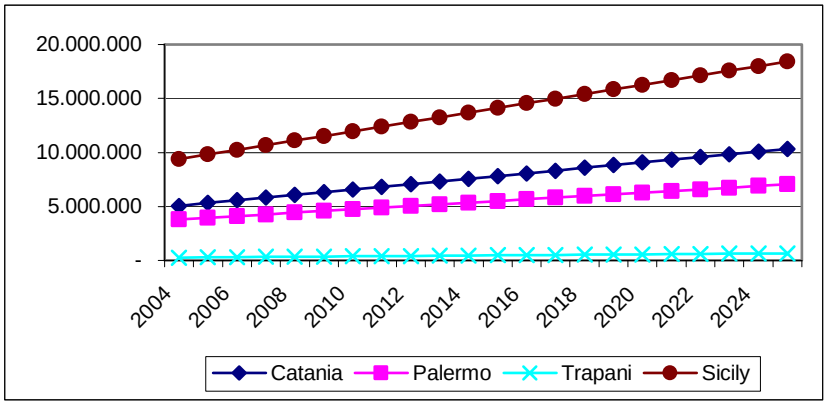
Po = passengers at 1993

Pt = passenger at the year t

r = annual rate increase

In the following figure are reported the forecasted passenger movements from 2004 to 2025 for the optimistic scenario.

Figure 8 – Passenger traffic trend forecasted in the optimistic scenario

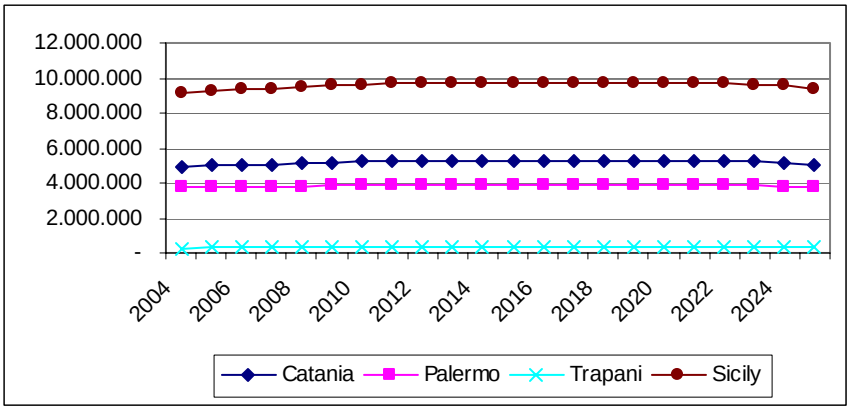


The logistic curve method is based on the hypothesis that the actual trend of passenger movements will end during next time, first with a growing rate than a steady one and finally it'll vanish. The formula adopted is:

$$P(t) = P(t-\Delta t)\left[1 + r\left(1 - \frac{1}{\left(1 + b \cdot e^{c \cdot \Delta t}\right)}\right)\right]^{\Delta t}$$

where:
r = annual rate increase
P(t) = passenger at the year t
P(t-Δt) = passengers at Δt years before
b and c = two parameters

Figure 9 – Passenger traffic trend forecasted in the precautionary scenario



4 Conclusions

The primary distinction between a regional airport system and a state airport system is that the former is defined on the basis of a geographical grouping of airports while the latter is defined on the basis of political control over funding and planning. The planning of airports system has been institutionalised where the hierarchy consist of local, regional and state tiers of responsibility.
A regional system comprises a collection of airports within a defined geographical area for which there is a need to plan their development in a coordinated way.
The analysis of air traffic development on a regional level couldn't set aside a coordinated plan of the airports like a system. As highlighted in the Context Programme Agreement for air transport in Sicily the development and the intervention of air transport must look at the integration and coordination of different transport modes into a more coherent and sustainable network.
First of all this integration should be reached between the existent airports in the region.
The increasing trend recorded by the three airports analysed in the study here presented shows like the role of any airport should be considered as a part of an integrated system.
In order to reach profitability of the whole system, to improve the quality of service offered and to prevent congestion, the air transport network of Sicily is to be managed like a system. Also the ENAC (National Agency of Civil Aviation)

foresee the realization of two regional pole airports: one of Eastern Sicily with Catania and Comiso, and the other of Western Sicily with Palermo and Trapani.

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