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THE TIMES THEY ARE A-CHANGIN'

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Land Use, Mobility and Environment

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The cover image is a photo of impacts on transport infrastructure of typhoon Hagibis in Japan (October, 2019)

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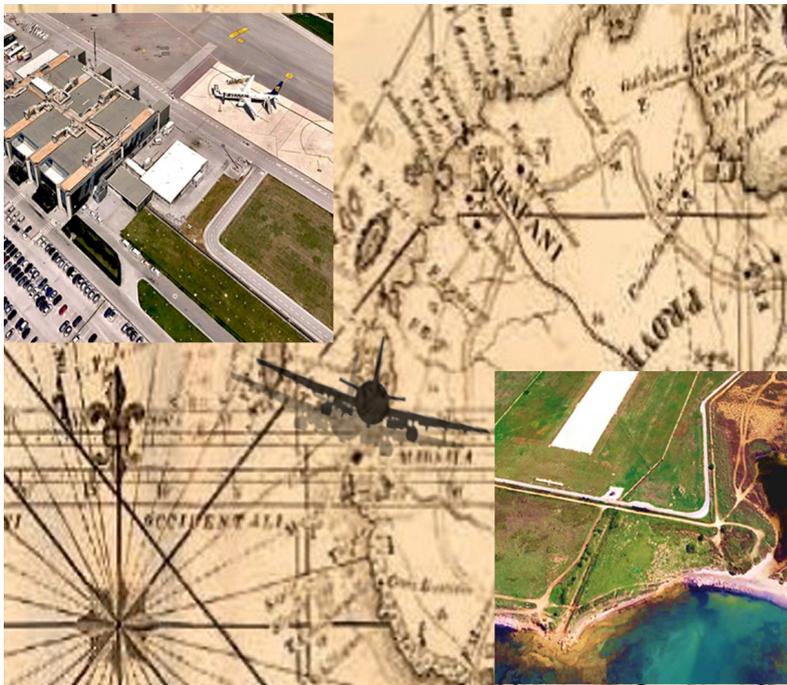
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TRANSPORT IMPLICATIONS IN TOURIST DESTINATIONS

THE TRAPANI AIRPORT IN WESTERN SICILY

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ABSTRACT

This search following the Sicily, the largest island in the Mediterranean Sea (25,460 sq km) and a self-governing Region, located in the southernmost part of Italy, has at least four tourist-related airports, sited between the eastern and western coast, separated from each other by a vast territory without efficient transport links and suffering from many diverse environmental problems. Utilizing a desk search methodology based on GIS software, this paper discusses the impact upon the regional development of the tourist traffic of the Trapani Airport situated in the westernmost part of Sicily. Ultimately it analyzes the critical role of connectivity and accessibility in the development of the area and tourism, seeking a maximum involvement of stakeholders. The recent growth of low-cost carriers have had a definite impact on the economic growth of the entire territory, where those choices could determine the life or the death of firms and, inevitably, their annual incomes. Tourism and connectivity are strictly related, thus showing deficiencies of the area in terms of accessibility, as well as the trade-offs between the different government (central and local) investment policies and the specific benefits emerging from the airport in the regional mobility.

KEYWORDS:

Regional and Urban Planning; Network; Tourism; Connections; Economic Data; Accessibility; Environment

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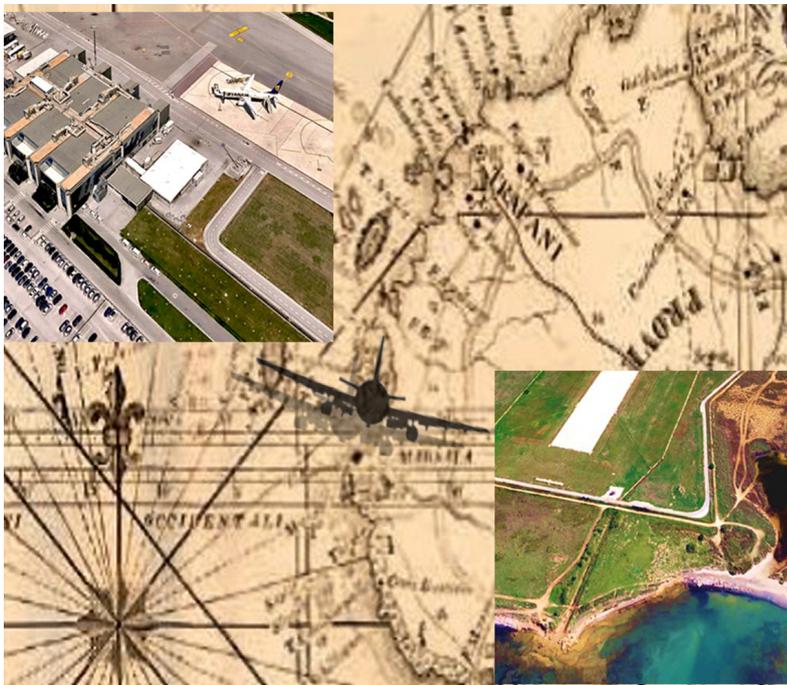
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航空运输对旅游目的地的影响： 西西里岛西部的特拉帕尼机场

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摘要

本研究针对地中海最大的岛屿（25,460 平方公里）——西西里岛，这一位于意大利最南端的自治区在其东海岸和西海岸之间设有至少四个与旅游相关的机场，但彼此之间被辽阔的土地所分隔而缺少有效的交通枢纽，同时还受到各种各样环境问题的困扰。本文利用基于 GIS 软件的桌面研究方法，讨论了西西里岛最西端的特拉帕尼机场对地区游客流量发展的影响。最后，它分析了连通性和可达性对该地区及旅游业发展至关重要的作用，以寻求让各方利益相关者尽量参与其中。近期低成本航空公司的发展对整个地区的经济增长产生了一定的影响，这些选择可能会决定企业的生死存亡，并且不可避免地决定其年收入。旅游业与连通性息息相关，因此在可达性方面存在不足，并且不同的政府（中央和地方）投资政策与机场在区域流动性方面的具体效益之间存在权衡取舍。

关键词：

机场； 高铁； 集水区； 联运互补性； 方案

1 A SHORT HISTORIC OVERVIEW

A quick overview of the Sicily planning history shows the existence of three airports in the territory of Trapani since the '20s¹. For military reasons, the first base was built in Milo (1920-1949), followed by Chianisia (1955-1961), and lastly, in the '60s, Birgi, which is the only one still in operation. Close to the Balata river, the mouth of the Birgi river was thoroughly altered in 1961 to build the Airport, in the northwest regional coast of the island. It is essential to highlight the use of the airport today, both for civil and military traffic. Runway maintenance is still carried out by the Military Government. Thus, it is essential to stress the close collaboration with both the Apulian airport of Galatina (Military Airport) and Brindisi Airport, as well as with the Grazzanise Airport of Campania (Military Airport), in the Military Programs of the Mediterranean Basin Defense. Moreover, it is not a little notice that in 1975 Italian Space Agency installed a "stratospheric hot-air balloons launching base" in the currently disused Chianisia Airport, an issue that underpins the crucial role of the transportation system for the area².

Trapani Birgi Airport stays at the same distance, 15 km, from Trapani, about 60,000 inhabitants, and Marsala, about 80,000. The Palermo Punta Raisi International Airport location, instead, is approximately 90 km from Birgi. Trapani's origins probably date back to a village founded³ in the 5th century BC. Although a great deal of population passed through those lands and consequently through a port with a crucial importance in the middle of the Mediterranean Sea, the layout of the city, as well as of others alongside the entire west coast (Marsala, Mazara del Vallo, etc.), derive their form from the Medieval Age.

The urban distribution made by frequent migrations from and to the coast and the extensive urbanization carried out by Arabs and Normans is both related to the role of the sea and of local agricultural resources.

Today, it is possible to discover the transformed grid of ancient paths to the hinterland, as all along the coast. Some of those have become all-purpose roads, while others nowadays are new highways. Presently, the road network (1.781 km long) has a density index (km per 1,000 sq km of the territory) higher than the whole of Sicily and Italy, too⁴, strictly related to the Metropolitan Area of Palermo. The two provinces of Trapani and Palermo connect a particular territory that has a geomorphologic shape sloping down gradually from the mountains to the sea. Likewise, the flat land of Trapani province stretches out to the south, becoming the Trapani Valley. Along the coast, history records the intense activity of the 21 existing ports, most of them with an inadequate structure. The port of Trapani displays a particular hooked shape. Fortified from the 5th century, it continues to receive today a vital load of cargo traffic (particularly with origin/destination in Africa). Only recently, it was opened to the most significant tourist ferries, thus attaining a leading role in the ports system of Sicily, above all in the relationship with the port of Palermo.

The port of Marsala, on the other hand, is a vital hub for links with other islands, as acknowledged in the recent Regional Transport Plan. The deficiency of the port system lies in the connections with the hinterland, due to the road and railway systems inefficiency. A closer look at the railway system would provide many explanations about the functioning of connectivity in the region. The birth of the Sicilian railway system can be traced back to the debate on the unification of the whole national railway system, the arrival of Garibaldi in Sicily, and the sulfur production activities on the island in the first half of 18th century. Nevertheless, the link with the peninsula system played a crucial role in the connection between Catania and Syracuse and the exclusion and abandonment of the western cities. The first railway line started from Trapani to the southern ports of Marsala and Mazara del Vallo. In the same years, the railway linked Mazara to Palermo. The entire

¹ (<http://www.aerohabitat.eu>, s.d.) (<http://www.aeronautica.difesa.it>, s.d.)

² (<https://www.asi.it>, s.d.)

³ It was founded by the Elymians, a nation of not well-known origins that arrived in Sicily before 1000 BC.

⁴ Road Density Index: 718 (Trapani), 663 (Sicily), 551 (Italy), (<http://www.provincia.trapani.it>, s.d.)

railway network has a length of only 120 km. The shortcut from Alcamo to Trapani started in the '30s, but underutilized.

Significantly, later on, the railway network neglected that first grid, stopping the necessary maintenance and modernization from guaranteeing the right development and the linkage with the rest of the island. These facts underpin the critical role of the ancient postal liaison, with its dense connection grid and the part of the firm, historic coastal navigation network, although with inadequate intermodal infrastructure. Therefore, if the connectivity in the Sicilian Region were to be enhanced, the primary role of roadway and navigation network should be highlighted, as well as the secondary, inefficient, the role played by the railway system.

Furthermore, the ports of Trapani and Marsala have not an efficient railway connection. This fact hinders trade and the tourism of the entire province concerning the Eastern coast of the Region. Moreover, in a zone dotted by small ancient communities and a dense network of minor roads, the airport is isolated, if only 1 kilometer away from the old single-track railway line (Fig. 1).

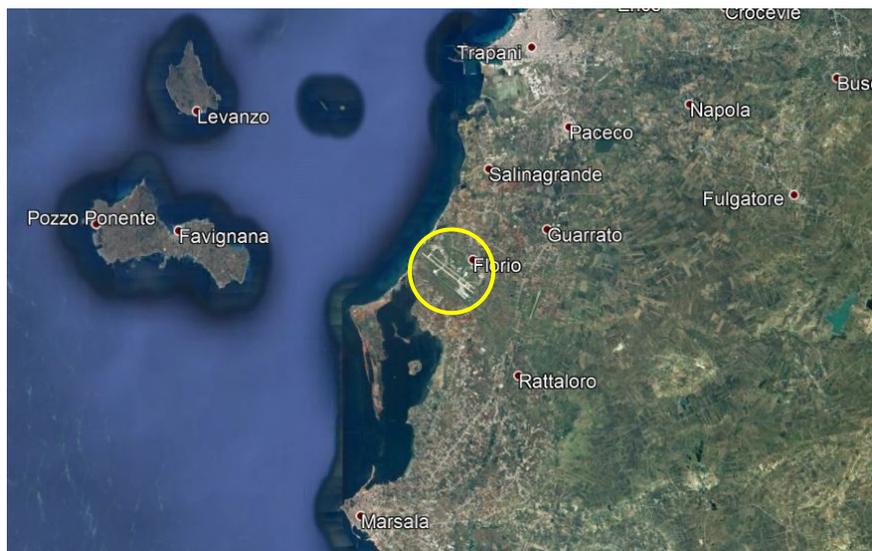


Fig. 1 Trapani Airport Location

2 THE TRAPANI BIRGI AIRPORT SITE AND ITS ACCESSIBILITY

Since the 14th century, the Municipalities of Birgi Nivaloro, Birgi Novi, and Birgi Vecchi occupy the territory around the Airport. The first rural settlements appeared in the early 19th century, and they are all now just south of the runway. Along the coast, near the Airport lie the Villaggio San Teodoro, an exclusive bathing resort to the south, and Posidonie with its little bath village of Tritoni, both of them part of the Marsala Municipality.

The ancient territories belonging to Vincenzo Florio⁵ are today part of the Air Force base and the NATO Base in the Trapani Municipality. The entire aerodrome (almost four sq km), the immediate agricultural land, and the mouth of the Birgi River (Balata River) are enclosed by the coastline to the west and by the roadway SP21 to the east. Almost all the Aerodrome Area is part of the Trapani Municipality.

Thus, Birgi Airport is a new center in the disperse lands between Trapani and Marsala, each one with its specific planning documents, not always adequately coordinated

Birgi Airport has a strategic role in the Italian context, as a part of the final section of the TEN-T network (the Scandinavian - Mediterranean corridor). Notably, the National Airport Plan considers the Sicilian Airports as part of two different strictly connected systems: the East Pole (Catania - Comiso) and the West Pole (Palermo - Trapani).

⁵ Vincenzo Florio (1799 –1868) was a wealthy Sicilian entrepreneur and politician.

Problems of connectivity and accessibility have soon arisen between the two poles and the hinterland. The National Airport Plan underlines the need to improve the connection between the nearest airports, stresses the two systems working model, and puts forward suggestions for the development of the roadway and railway links, which could boost up development opportunities for the south of the Island.

However, Birgi Airport accessibility enhancement requires significant infrastructure investments following the expected increase in passenger traffic. Thence, the Regional plan accepts the national hypotheses and consequent public works envisaged

At a sub-regional scale, the picture becomes more specific. The airport is connected to the main road via the A29 DIR motorway branch, linking the airport with the A29 Palermo - Mazara del Vallo motorway. Also significant is the SS 115, which connects it with the neighboring cities of Trapani and Marsala. From the Airport, it is possible to reach the cities of Trapani, Marsala, Palermo, Agrigento, as well as nearby locations. There is no direct access to the railway network, although the Alcamo, Castelvetrano, and Trapani railway line is less than 1 km away from the airport. The nearest station is Mozia-Birgi, 3 km from the airport, but there are no public transport connections between the two nodes. The Trapani and Marsala railway stations stay about 15 km from the airport. These connectivity issues should be improved with a new railway section between Trapani and Palermo, passing through Milo and Alcamo, as well as with a new road link between Mazara del Vallo and Trapani, consisting in one cat. C1 section with an overall width of 10.5 m. The road project has a total length of about 15.6 km plus a 900 m - the leg from the Marsala south junction to the Marsala Hospital roundabout. Furthermore, the new project boasts a viaduct of about 140 m, plus 5 m under - and 4 m overpasses. It presents some significant construction problems related to the numerous quarries and pits in the area. Moreover, the new link would not serve the population of the Southern territories of the island. The last version of the Regional Transport Plan details the maritime connections and accessibility links in the national Ports Plan. It confirms the Administrative reorganization of the Port Authorities in the new Port System Authority. The port of Trapani enjoys an excellent geographical position that allows it to be a reference point for traffic to and from the continent, Sardinia and North Africa. Furthermore, the presence of a large pool of consumers and the absence of production facilities give the node a potential logistic role. The location of the port and city center allows the independence of the commercial traffic from the urban road system. As in the previous Transport Plan of 2002, the New Regional Transport Plan highlights the synergy between the harbor and the airport of Trapani as relevant poles in the western transportation system. Specific programs for the port of Marsala, a critical connection with Egadi, Lampedusa, Pantelleria, and Africa, are, likewise, envisaged.

The New Regional Transport Plan notices that the airport lacks good road accessibility and that the single-track railway Palermo-Trapani line via Castelvetrano is underused, although it runs close to the airport. The port development seems aimed towards recreational uses. In May 2016 an agreement was signed between the MYR firm and the Sicilian Region to allocate the entire port basin to leisure uses. The highlighted planning applies choices of the National and Regional infrastructure to the Provincial and local planning.



Fig.2 Airport, Marsala and Trapani constraints around the aerodrome

A closer look at Airport accessibility and connectivity points out some relevant necessary additional interventions. Among those, fixing the connection with the A29 motorway (1,5 km); the railway connection with the Palermo-Alcamo line branch Castelvetrano-Trapani (1 km); some Airport Terminal renovation works and the linkage of the airport water supply system to the Public Aqueduct⁶. These elements show only a minimal part of the issues and programs on the broader planning scale and highlight other essential problems of environmental impact assessment that the airport traffic growth would generate. Water demands and pollution growth link the planning issues to the nearest river and the sea alike.

Local planning underpins the leading role of Birgi Airport. Its development is shared in the planning policies of both central municipalities of Trapani and Marsala, and considered an urgent problem to solve (Fig. 2). Only 4 % of the Airport surface area falls within the district of Marsala, but most of the small communities close to the runways are part of Marsala. Indeed, the Airport Risk Plan (2014), managed by Marsala Municipality, imposes specific prescriptions on the areas around the aerodrome. The Plan does not consider the adjacent areas north of the runway, because they are under the control of the Trapani municipality. On the other side, the General City Plan of Trapani (2010) encloses the aerodrome in different specific zones of constraint. Both plans could work better, and the implementation of issues be more effective if considering various stakeholders and a single management board established.

Sicily Airport system has an essential role in the Scandinavian - Mediterranean corridor, the longest of the entire TEN-T network. Sicily is the furthest point in this corridor, a natural contact point with Africa⁷. The focus on maritime connections among the EU states gives more strength also to the hallway between the North Sea and the Mediterranean Sea. Due to the priorities of the European Policy, the transport sector in the southern regions has attracted financial support for infrastructure projects to improve air traffic and maritime control and logistics services in ports. The establishment of the Trans-Mediterranean-Network-Transport-TMN-T⁸ has become a toolkit to develop the entire EU infrastructure system. This statement puts Sicily in the core of the investments, clearly as a strategic place in the south of Europe.

The location of the airport of Trapani-Birgi is 15 km from both city centers of Trapani and Marsala (TP), 115 km from Palermo center, and 168 km from Agrigento one. The airport has a strong tourist vocation due to the presence of low-cost carriers and the characteristics of a relevant catchment area of cultural, bathing, archaeological, and eno-gastronomic sites. Since 1992, the civil airport management is carried on by the stock company Airgest SpA, almost totally owned by the Regione Sicilia. The passenger terminal is sited southeast of the airport runway and covers 14,700 sq m, 66% open to passengers. The ground floor, of 9,500 sq², houses the arrival and departure halls, boasting 15 check-in counters. The first floor provides eight boarding gates, covering an area of 5.200 sq². There is a medium-long term parking area for cars consisting of 829 stalls. The runway for take-off and landing has a 13-R/3-L orientation, almost perpendicular to the coast, with a length of 2,695 m and a width of 44 m. The main taxiway of the same size, parallel to the runway, is used for take-off and landing, only by military aircraft, and is paved with bituminous conglomerate as the main runway. The other taxiways are partly in bituminous conglomerate and partly in concrete. The apron has an extension of approximately 64,900 sq² and contains nine stalls for aircraft, four on flexible flooring, and five on the rigid pavement (concrete).

⁶ (Territorial Provincial Plan, 2013)

⁷ Scientific literature highlights the important role of the Mediterranean Region in the international coordination, specifically in the development of transports connectivity, in the approval of multilateral agreements, plus the multi-modal maritime, road and rail corridors for connections. A report by the Ministry of Foreign Affairs of the Italian Government (MAECI), officially presented at the 3rd edition of the Mediterranean Dialogues-MED 2017, held in Rome, 30 November, 2017 did state - "Italian strategy in the Mediterranean: stabilizing the crisis and building a positive agenda for the region" – defines the Mediterranean as "a geopolitical paradox" because it has become "an increasingly fragmented region and - at the same time - more interconnected." (Giampaolo Basoli, 2018). The involvement of the investors in the connectivity is a structural issue of the development and growing with the years; it has finally changed the TEN-T programs, focusing on maritime services improvement, stimulating the transfer of road traffic to short sea shipping connections, with economic and environmental benefits.

⁸ (Bruxelles, 2013)

3 LEGAL REGULATIONS IN TURKEY AFTER GÖLCÜK EARTHQUAKE IN 1999

The Gölcük earthquake in 1999 caused a moral and economic collapse firstly but then caused an awakening in the overall country. As a result of this earthquake, 18,373 people lost their lives; 285,211 houses and 42,902 workplaces were damaged (Wikipedia, 2019).

These extreme damages have taught the reality which unplanned urbanization puts human life at risk, especially in disaster risk areas. The earthquake revealed that the country was not prepared at a sufficient level for many issues. For example, transportation and telecommunication nets were collapsed. Search and rescue works were inadequate. It was understood that there was no proper insurance system. Generally, emergency legal arrangements were always entered in the force in order to bind up wounds after every earthquake in the country (Şengün, 2007). In this regard, the Decree-Law no 574 was issued, immediately after the earthquake. However, this earthquake affecting the whole of Turkey expressed the necessity of some radical changes for this time. Renewal of urban areas which are collapsed and not resistant to earthquakes became the main topic. There were a few urban transformation projects in Turkey until that day and the projects could usually be applied by special laws. An example was the "Dikmen Valley Urban Transformation Project", which was adopted in 1990 in the capital city, Ankara (Demirci, 2004).

Another example was the "Northern Ankara Entrance Urban Transformation Project" implemented with the special law no 5,104 in 2004 (Resmi Gazete, 2004). Especially, it can be said that the purpose of the "Northern Ankara Entrance Urban Transformation Project" was a physical transformation. Until that date, there was still no clear legal regulation which defines urban transformation's purposes and control mechanisms. Article 73 with entitled "Urban Transformation and Development Area" of the "Municipal Law" No. 5393, which entered into force in 2005, provided a major expansion.

This article authorized municipalities to implement urban transformation in order to rebuild older parts of the city, to create housing, commercial, industrial and social areas, to take precautions against earthquake risk, to preserve the historical and cultural structure of the city. Unfortunately, many projects based on this article have received negative criticisms that urban transformation has diverged from its renewal and conservation purposes. Following the Van earthquake where 644 people lost their lives in 2011 according to Disaster and Emergency Management Presidency (AFAD)(AFAD, 2014), the necessity of regulating a specific law to reduce the losses before the disaster has become the main topic again. Finally, Law No. 6306 on "Transformation of Areas under Disaster Risk" was published on 16 May 2012.

This law sets out the principles of improvement, re-settlement, and renewal in order to create healthy and safe living spaces in disaster risk zones (Resmi Gazete, 2012a). Unfortunately, this law has caused many discussions and many of its articles have been rescinded or rewritten.

Besides legal regulations related to urban transformation, some other important regulations have been entered into force after the earthquakes in 1999. "Building Inspection Law" No. 4708 which came into force in 2001 can be given as an example (Resmi Gazete, 2001).

The purpose of this law is to ensure the construction of structures conforming to standards for safety of life and property. Also, one of the important regulations is the "Regulation on Buildings to be Constructed in Seismic Zone" which were arranged in 2006 but entered into force one year later (Resmi Gazete, 2006). This regulation includes many crucial changes to build resistant-constructions against earthquake. Unfortunately, this regulation was started to be implemented in some provinces, and it was decided to implement it all over the country after the Van earthquake in 2011. Another regulation is the decree-law no 587 named as "Compulsory Earthquake Insurance" was entered into force in 1999 (Resmi Gazete, 1999). This regulation was rearranged as "Disaster Insurances Law" No. 6305 in 2012 (Resmi Gazete, 2012b).

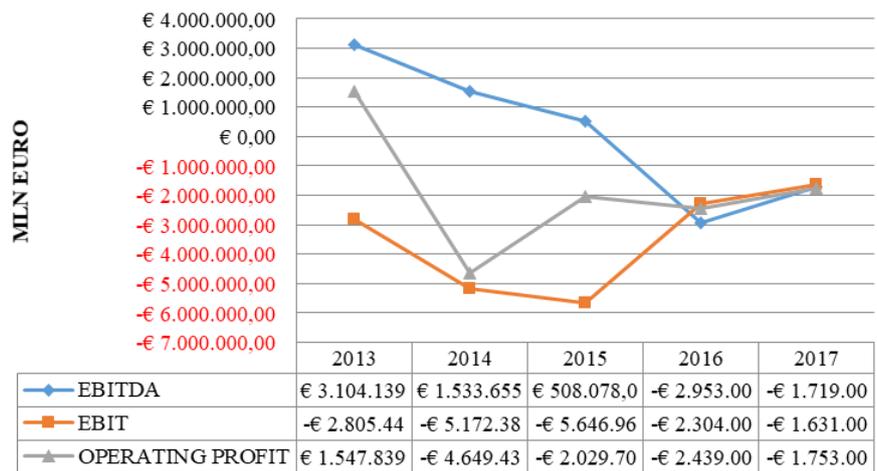


Fig.3 Comparing EBITDA, EBIT, O.P. of Airgest SpA

3.1 THE TRAPANI PROVINCE TOURISM GROWTH

The Regional Transport Plan (2017) stresses the relationship between the population and the job market in terms of GDP. Data show the evidence highlighted by ISTAT⁹ and MEF¹⁰ conclusions about the low employment rate of Trapani and Palermo provinces in the Sicily Region. Building construction leads the Trapani and Marsala's active population employment, followed by the agricultural sector, with a concentration in the Trapani district. Employment in tourism plays today a marginal role but it is expected to attain a leading position in the future. The income per capita calculated for the inhabitants shows a deflection in the Trapani curve over the years. Still, on the other hand, the same indicator for the occupied population shows a positive trend in recent years. This fact underlines the growth of different market types. The population decline explains the fall of the personal GDP and highlights the marginal role of Trapani Province in the Sicily Region. The income per capita in the Province of Trapani is significantly higher on the coast, due to building construction and the pervasive presence of tourist activities.

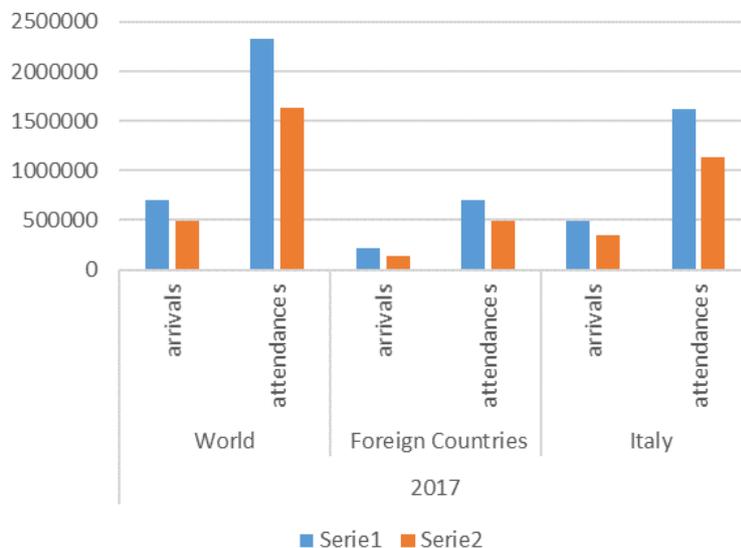


Fig.4 Tourism Facilities Use

⁹ (<http://www.istat.it>, s.d.) Italian National Statistic Institute

¹⁰ (<http://www.mef.gov.it/>, s.d.) Italian Ministry Economic and Finance

Arguably, all those issues related to planning, as discussed earlier, but also to the Airport's management joint-stock company and its specific point of view (Fig. 3). The balance sheet of Airgest SpA¹¹ shows continuous growth with a peak in 2012 (Fig. 4).

The growth of air traffic over the years, associated with low-cost carriers, as argued further ahead, has had an initial direct effect on the tourist facilities, increasing the number of beds made available to match the arrivals. Especially the percentage of international tourists from 2007 has rated high concerning all other airports (13%). This growth matches the territorial expansion of tourist facilities, industry, and commerce, enough to generate a noticeable escalation of the GDP in the entire Province¹². The Chamber of Commerce data show the relevant growth of the employment levels in the same period in the tourist and restaurant companies and in the building trade. The Chamber of Commerce provides monthly updates allowing to verify the direct correspondence with the tourist traffic, with its peaks in the warmer seasons.

3.2 THE COMPETITION OF PALERMO PUNTA RAISI INTERNATIONAL AIRPORT

The annual growth of Trapani Airport has to deserve the steady growth of Palermo Airport. The linkage and the cooperation with Palermo in the western part of Sicily undergo some overriding levels of planning, as argued before.

However, in the specific airport planning, it is challenging to introduce cooperation as a principal element. The airport management, in the hands of a stock company, creates competitiveness in the specific market sector. The complicated factors related to the proximity between airports are a further matter of research. The different types of influences play a leading role in defining a framework allowing a comprehensive assessment of the impact of various institutional market programs¹³. The time distance by road between Trapani and Palermo Airports is of about two hours. That time stresses the need for cooperation and a comprehensive, integrated approach, but also the need to consider the infrastructure problems throughout the territory. The accessibility to the airport of Palermo implements the links with the east regional area, especially with the provinces of Messina and Catania, applying a significant amount of the investments to facilitate that relationship. On the other hand, Trapani could catch the southern populations. These issues influence the use, modernization, and maintenance of the airport infrastructure. Punta Raisi Airport has faster connections to the east and to the peninsula, which is an advantage for carrier's attractiveness. So, the traffic flows of Palermo prove the positive effect of the presence of different air carriers. On the other hand, Birgi Airport has had a consistent growth between 2008 and 2015, paired with the presence of Ryanair. Still, now its withdrawal reveals the difficulties to match new carriers and new routes and to gain a steady growth similar to Palermo's.

3.3 THE ROLE OF LOW-COST CARRIERS: BENEFITS AND DRAMA OF THE AIRPORT COMPETITION FOR TOURISM

Arguably, in the last years, tourist traffic has slumped, and this has had profound consequences in airport management. The main factor in this story is the presence of Ryanair. The report of Airgest in 2012 emphasizes the neat link between the GDP generated by the Airport and the entire province.

¹¹ The Airgest SpA is a limited company made up by 99% of Public Bodies, which manages the Trapani-Birgi Airport since 1992. Airgest SpA, in June 27, 2012, has stipulated with ENAC (Italian National Civil Aviation Authority) a 30-year Concession for Managing the Trapani Birgi Civil Airport Infrastructures, which has recognized its role as Directing Manager of the airport infrastructures. Furthermore, Airgest is also a handling company– currently the only one at the Trapani airport – in charge of passenger, baggage, aircraft and goods services. (<http://www.airgest.it/>, s.d.)

¹² Results from 2004 to 2010: Trapani + 2.2%, Sicily +2.0%, Italy +1.1% (<http://www.airgest.it/>, s.d.)

¹³ The literature shows us, that airport costs are driven by external factors, such as traffic structure (percentage of international passengers, percentage of business passengers, LCC share and share of cargo traffic), delays or the degree of competition between airports. The type of ownership and the level of outsourcing also matter. (...) For small airports with inadequate passenger throughput, subsidies play a very important role for their financial survival (AA.VV., 2014)

The analysis of passenger flows reveals the essential role of low-cost traffic, primarily due to the number of Ryanair routes. In 2012, the Trapani province revenue amounted to 290 M euros, a sum that encompasses the GDP of all municipalities and all other market benefits. All Municipalities subsidize the cost of Ryanair base in the Birgi Airport for a total amount of 2,150,000 euro per year. This subsidy, even if the benefits are more than proportional to the paid amount, recognizes the monopoly of Ryanair and its specific costs. Moreover, yet if the territorial benefits balance the relative amount, it increases the uneven interrelations between Airport and Municipalities. The reason could probably lie in the dispersion of revenues and the consequent spillover effect, giving advantages to some zones as opposed to others. The specific market of the low-cost airlines in the years, the reduction of prices, the unrest of the workers and, last but not least, the difficulties on the specific territory of Trapani, the long-term measures to improve connectivity and to enlarge catchment areas, are all reasons that determine the reduction of routes from Birgi in 2017 only to four airports in Italy, slashing the number of international passengers. The agreement with Ryanair and the obstacles¹⁴ for other airlines evidence the marketing attempts to regain the traffic routes. This is perhaps the last step of a bad chronicle. Other companies were excluded following complaints from airliners interested in the low-cost traffic (Alitalia in this case). All those experiences affected the Airport management. The decline in passenger numbers and a parallel slump in the Airgest revenues led to a shrinking GDP and subsequent economic risks. In this framework, the Chamber of Commerce database is reassuring anyway. In fact, the benefits of the previous years have slightly lifted up the definite curve of GDP, demonstrating again the importance to look in perspective. Trapani commercial firms committed to significant investments are becoming scared by the fall of tourism-related revenues. The significant number of press articles collected in recent years bear witness to this situation. The cash flow and the Gross Operating Surplus (GOS) derived from the last Airgest balance sheet are negative. In the first half of 2018, passenger numbers fell by a hefty 67%, back to the figures of 2008. The reports about the future try to regain the past growth rate, but the solutions are just a part of the specific possibilities of the Airport. The overall corporate planning remains the same and does not provide a quick solution to this problem. The path to follow could be in the strategic marketing plans, and it should pledge for the return to positive balance levels. Probably now, the need to merge the two Airports in a single corporation as in Bari-Brindisi in Apulia or Milan is emerging.

4 TRAPAN AND PALERMO AIRPORTS: IMPACTS ON TOURISM DEVELOPMENT

The role of low-cost traffic in Birgi Airport is determinant, and closely related to the Ryanair vector, as disclosed in the Airgest SpA analysis of traffic¹⁵. Sicily complies with EU recommendations, and the Birgi Airport growth has been strictly proportional to the Ryanair decisions about routes. After 2009 the relative growth of traffic was higher than in other airports, and it continued so in the years till the recent downfall. The passenger traffic growth of Catania and Palermo airports is ranked among the first ten airports in Italy. Trapani, on the other hand, has experienced the most significant reduction of its traffic in the last years. This fact reflects the different load factors for vectors too. It depends not only on the tourism effect but on the possibility of extending the tourist passengers over to the winter season. Concerning tourist facilities, the difficulties of Trapani to extend its tourist catchment area towards the south and to attract other airliners depend on the overlapping with the Punta Raisi catchment area. The connectivity to the broader southern Region should be a pivotal issue to transform the competition between the two neighboring airports to enhance their cooperation. However, this brings about the problem between the plans for airport accessibility. The specific location of the Birgi

¹⁴ The Regional Administrative Court for Sicily has ruled against the restricted procedure issued by Airgest SpA for allocation of promotion and communication services for the creation of an advertising campaign aimed at favoring the increase of tourist presences in the territorial area related to the Trapani Birgi Airport, infringing free competition, as it contains conditions which are tailor-made to Ryanair, thus excluding other firms, especially Alitalia which has appealed (Palermo, 23.01.2018).

¹⁵ (<http://www.airgest.it/>, s.d.)

Airport could be a reason to extend its shape, to promote the airlines' attraction, and to meet the need for ground facilities: all costs should be jointly considered. The airlines have to comply with PSO programs and to bear their costs¹⁶. The distance between the two airports must be analyzed at a broader scale, where the current size of the catchment area may be extended¹⁷. Moreover, pollution and the mandatory environmental impact assessment are the elements on which the ideal development should be analyzed. Public service obligations, both for airports and vectors, depending on the possibilities to evaluate the increase the air traffic and the different benefits to be accrued by the affected territory. The impact of tourist traffic growth is well described in the Airgest SpA documents. At the same time, the local plans should put the Airport in its specific context: the benefits on the province GDP growth do not offset the problems of the urban settlements in the vicinity of the Airport and the territorial location. The Airport and the region, indeed, are strictly linked, as witnessed in the transformation of the mouth on Birgi River, carried out for the construction of the Airport (1961). The infrastructure is sited in a highly protected area between the Salt Flat of Trapani and the Stagnone of Marsala, home to different types of fauna and flora.¹⁸ Moreover, the lack of water resources affects the entire area, both an important territorial issue for agricultural development and one of the tourist assets of the whole Province. Again, regarding tourism development, the beaches close to the airport lack public lighting. A little bit more to South (less than 10 km) one of the most prominent examples of the archeological industrial heritage of entire Italy, the structures of the old seaplane base of Marsala, built by Pierluigi Nervi, a real point of tourist attraction, show a remarkable state of neglect. Sicily Region has now invested 17 M Euro to promote the development of the Province, trying to solve the problems of Birgi Airport following the Ryanair defection. Therefore, notwithstanding action about the problem of coexistence between aircraft and the birds, there are no other programs in terms of pollution or general territorial risks. The particular features of the Largest SpA management underpin this character in terms of regional adaptation. Still, in the recent past, the underassessment of risk determined the congestion of the airport. Therefore, from the perspective of new routes and touristic traffic growth, the analysis of risks acquires the central importance. All the highlighted problems have a distinct impact on the territory in terms of accessibility and connectivity, in terms of future costs to manage for the Airgest SpA and the tourist companies in general.

4.1 TOURIST SITES CATCHMENT AREAS

The Regional Transport Plan¹⁹ highlights the relationship between urban sprawl and the environmental problem in a system of analysis that starts with data acquired by phone calls (CATI). The following formula supports the results of the CUBE software model adopted:

$$S_{ij} = (E_i \cdot A_j \cdot f(T_{ij})) / (\sum A_j \cdot f(T_{ij}))^{20}$$

$j=1, \dots, n$

The OD matrix obtained through the application of the Friction Factor based on extensive phone calls (CATI model), was split between the different transport modes, the choice of one certain alternative being based on utility (Multinomial Logit). Crossing this evaluation with the matrix OD derived from home-based return trips,

¹⁶ Public Service Obligation (PSO) which involves the concept of Level of Service (LOS)

¹⁷ "From this finding, it can be concluded that an optimal long-term strategy for small-sized airports should be not to increase the capacity unless a certain threshold for the utilization of current capacity is reached." (AA.VV., 2014)

¹⁸ The archipelago of the Stagnone Islands covers an area of 2,000 hectares and extends between Punta San Teodoro and Capo Lilibeo. The Reserve, established in 1984, includes the entire lagoon bounded by the open sea from the island Grande or Longa, with three small islands in its interior, Mozia, Santa Maria and Schola. The lagoon has a very relevant naturalistic interest and great scenic beauty.

¹⁹ (<http://pti.regione.sicilia.it/>, s.d.)

²⁰ Formula deduct from the methodology applied by the Regional Transport Plan (Technical Report, Regional Transport Plan), which determines the distribution of occasional travels through a gravitational model, where: E_i is the number of total trips with origin in zone i ; A_j is the number of total displacements attracted by the zone j ; $f(T_{ij})$ is the impedance factor between zones i and j .

which provides a measure of the result of the mobility demand, confirms the metropolitan city of Palermo as the most important regional attractor of mobility, with a share of about 17% of the total movements, including home-based return trips. In the Region, Trapani generates the largest number of movements to Palermo with 21,100 daily trips. The CUBE software, using time as the deterrence factor: $TC = T_0 [1+a(V/C)b]^{21}$. The CUBE software explains that the metropolitan areas and the coasts are mostly affected by the transport system. Likewise, it shows the importance of the railway system and the difficulty of reaching the coastal zone of Trapani from the metropolitan area of Palermo. The investment requirements emerging from this analysis focus on the road and railway systems to improve connections between Trapani and Palermo and on to the nearest south zones. The weakness of this approach is to be found in the multiple management plans, in deregulation, but also in the absence of environmental considerations, the absence of bonds with risk analysis, above all related to the different time scheduling of the investments.

The current analysis places the Airport System of Sicily Region and, consequently, the Airport of Trapani as the key nodes of the network.

The network is built around the principal roads of Sicily Region, subdivided into different sections by typology, length, and maximum speed. The primary maritime routes which connect the Province of Trapani with its Islands are included too, converting average rate from knots to kilometers per hour. On the other side, railway lines and railway stations, always subdivided into sections with maximum speed and typology, complete the network. Sicily Region is mapped by Provinces and by Municipalities, and they are all subdivided by population from 2011 to 2018 and by GDP from 2011 to 2016. Thus, it has been possible to describe the variations in percentage both in terms of population density per year and GDP per year. The work about the Municipalities has been completed by the georeferenced districts subdivided by population with 2011 as the base year.

About the Province of Trapani, the tourism facilities have been georeferenced, classed by Municipality, Address, Typology, Bed Places, and Category (2016 values).

In the same way, Health facilities have been located and classed by Address, Name, Typology, Phone Number, Bed Places, Ward typology, Day Hospital, and Use (2016 values).

The connectivity measurement has been performed by Network Analysis tools, building the following matrixes:

- Origin - Destination Matrix between Municipalities and Airports (TP and PA Provinces);
- Origin - Destination Matrix between Tourist Facilities and Municipalities with small tourist villages (TP province);
- Origin - Destination Matrix between Health Facilities and Municipalities with small tourist villages (TP province);
- Origin - Destination Matrix between Trapani and Palermo Airport and Touristic Facilities (TP province);
- Location - Allocation Matrix between Airport of Trapani, Health facilities and Tourism Facilities.

Looking for the areas which have the best GDPpc variation and the highest lack of connections in terms of travel time, so the lowest accessibility, the structure of the work done, can be displayed as in the following scheme (Graph 3). The OD Matrix bases its development on the Dijkstra's algorithm on a graph with edges V and vertices A , expressed as a function of the number of edges, denoted $|V|$, and the number of vertices, denoted $|A|$, using big-O notation (a mathematical notation that describes the limiting behavior of a function when the argument tends towards a particular value or infinity):

$$O((|A|+|V|)\log_2 |A|)$$

It is useful to determine the distribution of journeys by minimum time and minimum cost, to build a classification of time-journey and time-cost between the different vertices and the demand points of the diverse using models.

²¹ Formula deduct from the methodology applied by the Regional Transport Plan (Technical Report, Regional Transport Plan, (<http://pti.regione.sicilia.it/>, s.d.))

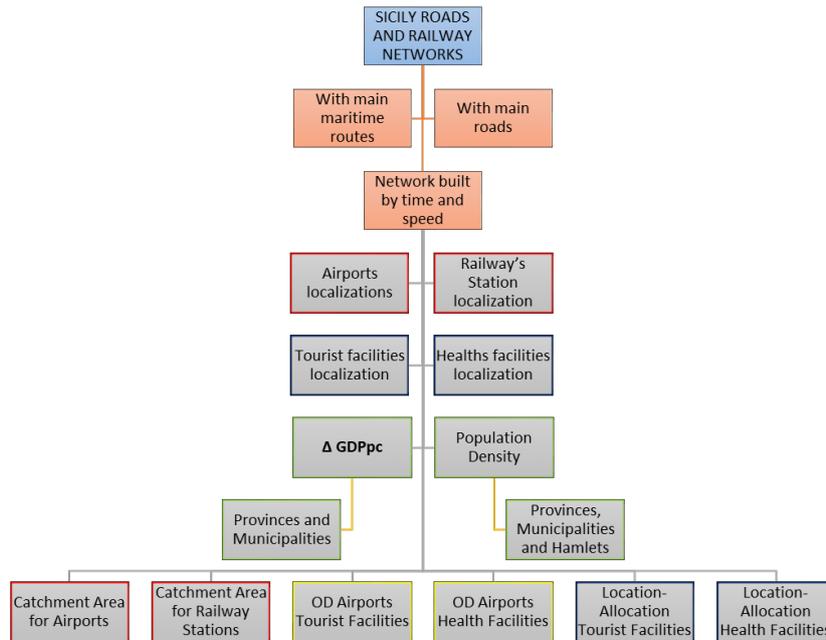


Fig.5 GIS Model

A direct survey of the catchment area for both airports (Fig.6), served by fast routes and railways, shows the difficulty for the Southern regions (especially the Province of Agrigento), to reach Birgi Airport. The consequent GDP reduction could be relevant for the Airport management. This means that in 2017 for 102 Municipalities in that area, the time-lapse to reach any of the four airports are more than 90 minutes and the corresponding sum of the same municipalities' GDP is almost of 900,000 euro, affecting nearly 700,000 inhabitants, 25% of the entire population of Sicily. For nearly 130,000 inhabitants, the travel time from the airports of the West coast is of 1.5 hours, involving GDP losses of almost 250,000 euros. Those data point out the possibility to extend the catchment area of the West Airport Node to the West part of the Provinces of Agrigento, Enna, Caltanissetta and Messina and towards the easternmost part of the Provinces of Palermo and Trapani.

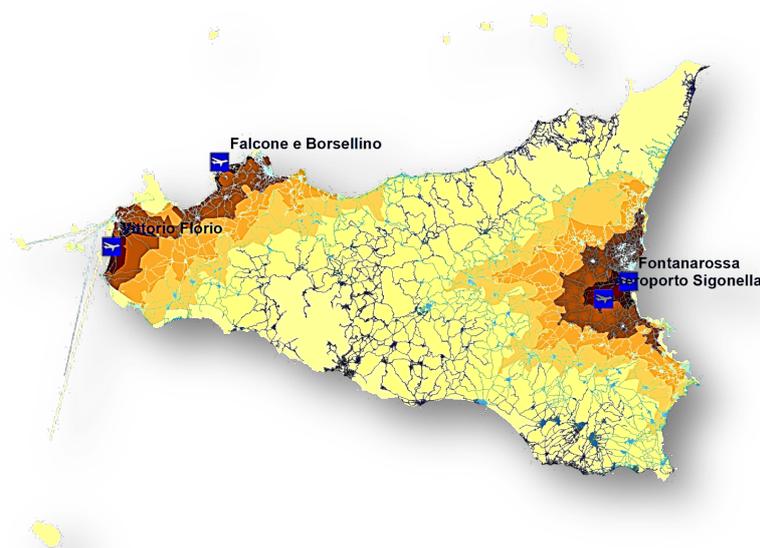


Fig.6 Sicily' Airports Catchment Area

In the same way, the analysis of the tourist and health facilities time distances, always made by travel time on road and railways, could be essential to appraise the possibility to improve the railway connections in the province of Trapani and to the others, provinces, to strengthen the railway capacity and to speed up the introduction of new technologies.

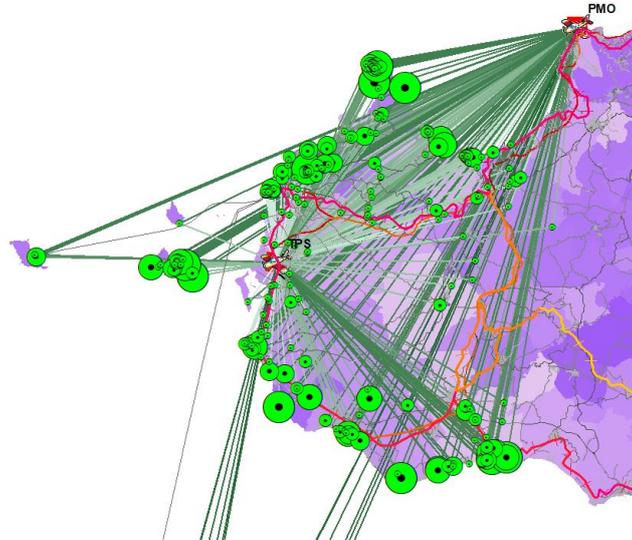


Fig.7 OD Cost-Matrix Facilities of Trapani' Province and the Airports of the West Pole

The OD Matrix between the two airports connects the 322 tourist facilities in the Province of Trapani (Fig. 7) with the two Airports of the West Node; results highlight the possibility to arrive faster from Palermo to a lot of facilities in the Province of Trapani, especially those located in the South of the Province.

Concerning health facilities, the network shows the most used hospitals of Castelvetrano and Alcamo with a deep connection to the tourist facilities of the territory, and this underlines the role of the two neighboring provinces, but also the risks of increasing demands of coastal tourism development. This simple consideration highlights the possibility to consider the links between the Airport and the towns: in the OD matrix between the two Airports and Towns (including their sections the Province of Trapani, the lack of the road and transport network towards the East and the South area of the province of Trapani appears obvious again. The analysis of the buffers (creating polygons around input features to a specific distance) shows the lack of linkages. The polygons are managed crossing data between the two new roads, built to connect the Airport of Trapani and both the Tourism Facilities and Towns (with hamlets, and villages) of the Province of Trapani (considering the main Island) in the highway network. The result shows a critical unserved area in the middle of the province and low service connections in the South-east. The gap follows the variation of the percentage of GDPpc, underlining the active link between the transport network, tourism, and GDPpc. But also the contrast with the significant number of overserved zones highlights redundancies in the network system. Likewise, the same GIS analysis shows in the maps, the edge of the GDPpc polygon emerging from the appraisal of the other polygons in the research area, also built around the railway stations. The GDPpc variation is underlined by the evaluation of the different regions, elaborated crossing data from the area's polygons built around the railway stations, too (the zone regards the 15 minutes to achieve the stations).

The development of the railway network can be beneficial for the Province and connections with the South and the central part of the Sicily. Still, it must be considered in the development of the roadway network in the central zone of the Province. Thence, the accessibility becomes a more significant problem, in regard not only to the specific Airport and Railway but also to the different possibilities to reach those. Railway and other systems of mobility could guarantee the growth of the central zone (Fig. 8), also addressing there the tourist growth, linked to an expected boom of passenger flows in Birgi Airport.

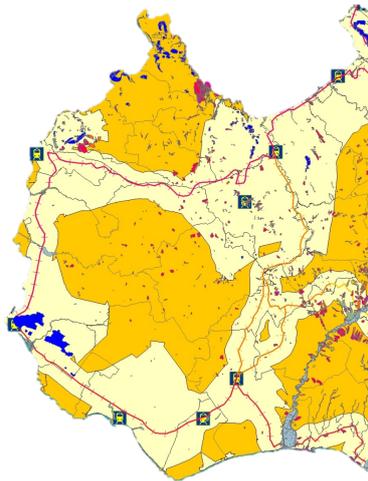


Fig. 8: Unserved Area

This should be for certain advantages in terms of time, costs, and connectivity, but also a way to reduce environmental pollution and to grant the public direct access to the airport's terminal. The links between the airport and surrounding areas should be considered in terms of quality and environmental assessment but a multi-scale coordinated growth plan. As in the Regional Transport Plan, the connections between the maritime routes acquire a crucial dimension in terms of capacity. Therefore, it all implies re-thinking the entire design of the coastal development in one organic and structured plan for accessibility, the centrality of the Airport, and the protection of its specific neighborhoods.

4.2 PLANNING COORDINATION AND MARKETING ALTERNATIVES

The dialogue between the infrastructure and its surrounding areas should be approached in terms of capacity and designed with a particular perspective of integration and preservation of the areas from the impact of pollution. This means to grant particular importance to the integration among the different structures of the landscape. Preservation of the different functions involves the development of the entire system: neighborhoods, coastal and other protected areas (water pollution, green preservation, bird's diversity, etc.); likewise, the development of the airport functions (civil, military, parking slots, etc.) should take care of the impact on anthropic growth.

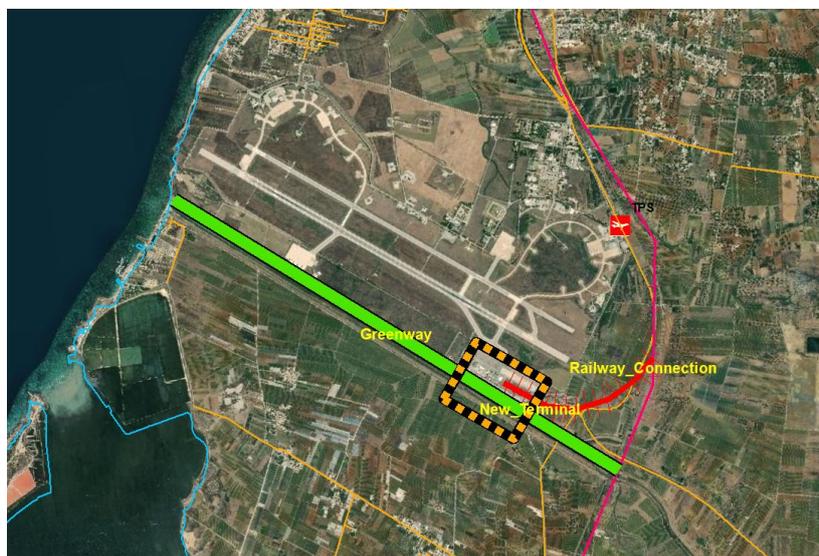


Fig. 9 Idea for a design planning of the node. 1) Connection to the railway; 2) Adequate, new terminal; 3) Green road to protect the existent canal to the sea (Font: Authors)

Thence, at least, the different air carriers could find in the specific airport the possibility to develop their traffic and to guarantee the presence of more vectors. Even if in support of the Palermo traffic growth, that type of development should ensure the independence of Trapani growth. In the overall consideration made about the companies of the Trapani Airport, design plays a crucial role in terms of different types of tourist traffic too. This feature could take advantage of the contraction of revenues from aeronautical and airport fees from the perspective of growth, playing on the differentiation of tourist traffic. Moreover, a complex design re-thinking of the aerodrome and its specific surroundings should guarantee the benchmark development of the non-aviation components (Fig. 9). In the GIS model described, the problems of impact assessment derived from the growth of tourism traffic related to the Airport go on unsolved.

The infrastructural development approached through a single perspective of control where the different interests live together, the distribution of revenue, and the military functions are the main topics upon which to build up the dialogue.

Both the regional infrastructure plans and the airports' marketing strategies may be considered a practical approach to increase tourist flows and the involvement of residents at a broader scale, which is the least served area at a greater distance from the airports.

In September 2018, after the first summer season without Ryanair, in the heart of the touristic crisis, newspapers and the media at large were focused on the visit to Trapani of the US ambassador, to promote tourism and the cargo operations with the US. This recent visit strengthens the importance of the other continents, and it underlines the freight traffic improvement too, as shown in the actual data furnished by the Chamber of Commerce, which highlights the primary role of Trapani's exports.

The importance of a comprehensive design plan finds its justification in the tourist hub and the single infrastructure design with the involvement of railways, roadways, and ports, there included the dialogue among municipal and provincial plans.

The simple SWOT analysis shown below can summarize the development perspectives to be implemented for the Trapani Airport (Tab. 1).

STRENGTHS	
The Traffic PAX growth	The increase of passenger traffic using Low-Cost Carriers is an asset for the business of the entire Province
The History of Trapani and the cultural tourism	History and the cultural framework highlight the main role of the city in the Sicilian heritage, by way of growth and business development. A key issue is that of contemporary engineering, architecture and artistic presence in the Province. The scenic reserve of Stagnone Island and its archipelago is another important attraction point.
Export Statement	The positive value of the export business gives both Trapani and Marsala a relevant role in the Sicily Region
Capacity Building	With its location in the middle of the West Coast transport system development, the Airport can be improved: there is some derelict land around it and runways could seemingly be improved. The possibility of using undeveloped areas to cater for growth adapted to the needs and in which to plan the desired expansion of the take-off and landing runways
Stock Company Balance Sheet	The reduction of debts in the last year, in the dramatic situation of the collapse of tourist flows, allows hope to reach a Pax growth.
WEAKNESSES	
Accessibility	The airfield suffers from limited accessibility, but also in the entire Province the transportation infrastructure is in a dangerous state of decay.

Setting up network connections	The disproportional surge in tourist traffic as well as a shortage of transport infrastructure in Sicily, make up a barrier to keeping part of the transit tourist flows in the area
Location	The management of the area in which the airport is situated, between the two cities of Trapani and Palermo has to be sorted out
Low-Cost Companies	The low-cost market increases the multimodal system while boosting tourist traffic growth and economic benefits
OPPORTUNITIES	
<i>Comprehensive</i> Airport near <i>Core</i> Airport	Trapani is a part of the Core Palermo Airport and a part of Scan Med in the Trans-European Transport Network
Terminal Building	Despite the last adjustment, the Terminal needs some upgrade to cater for the expected growth
Network attractiveness	Joint management for both airports may satisfy more effectively the urge of the area for the airlines business, thus triggering a key role for Trapani
Public Transport Linkage	To link the railway station to Trapani Airport could change the habits, but it should be accompanied by a better service, which could be easily assured by bus.
Harbor Linkage	The link between Ports (Palermo and Marsala) and Airport can be an asset for the whole city
NATO Base	NATO activities can bring in additional traffic demands to the Airport
West coast tourism growth	The Trapani tourist attraction affects Trapani Airport and its forecast growth plan
Environmental development	The Airport is situated close to the Tirrenic Sea and the urban centers of two historical cities, in a Protected Area of the Region. Further resources could be mobilized integrating economic development with the valuable landscape, under a comprehensive policy of tourist resource development
THREATS	
Empiric attitude and short period interventions	The business catchment area strategy finds its basis in new tourist routes. A problem-solving strategy apparently depends on economic reasons only.
Predominance of private sectoral interests	The Trapani airport system is strictly dependent on single management, in turn, reliant on the public decision-maker, who in turn is dependent on government decisions about fund allocations
Underestimate of environmental risks	The current absence of links with the Public Aqueduct, casts some doubts regarding the choices on the system Military – Civil of the Airport to guarantee protection for the sensitive areas.
Further urban development in dangerous areas closed to the runways	There is no Development Plan for the areas close to the Airport and this stresses the dangerous impact, an obstacle for those areas to become integrated in the city the problem affects the development of Airport fringe areas
Technocratic attitude ignoring stakeholders	Insufficient administrative capacity to prepare and manage EU-funded projects
Potential Impact	The prospect of an additional income of the area, the underestimation of entry barriers and the environmental risk
NATO Base	The military functions could hinder the normal airport activities

Tab. 1 SWOT Analysis

5 CONCLUSION

In the Airport of Trapani, different planning systems coexist, and the constraints increase the specific characters of the surroundings. Investment perspectives focus on overcoming constraints, but the absence of a comprehensive design plan stresses the overlapping effects, above all, on the airports' fringe areas. The impact of the Airport on the surroundings underlines the disruption of the areas prospicient the sea, anyway on the

canal that starts from there, on the south of the Airport. A perspective of growth should be considerate as the possibility to link the railway line to the terminal. This one has to be enlarged, acquiring different new functions. Moreover, it must find a way to protect the fringe area and to improve accessibility, so a greenway along the canal seems to be the first step to protect the environment in proximity to the existing transport infrastructure²². Solving problems for an airport and a city must press the collaboration among the two airports, giving positive effects to the airline competition. The analysis conduct on the Sicily Airport System underlines the importance of the underserved areas and the economic evaluation of the most distant clusters of the catchment area. Therefore, it seems that the strengthening of the relationships between the two airports can give more possibilities to equilibrate growth. The cooperation can be an effort to discover and transform in resource the historical heritage of the hinterland. Despite the considerable difference of traffic between the two airports, the Airport of Trapani, in this sense, can play a leading role, helped by the key part of Marsala city on the South Coast. These considerations follow the idea of the European Agenda 2020, try to find a way to dialogue between the different transport systems in the network, improving the existent infrastructures to gain the most collaborative planning growth. The tourist traffic is only a part of the air traffic managed by the two airports, and the studies of the network are ongoing to give an effort to the impact assessment regarding the improvement of domestic transportation, their frequencies, over the new international routes' search. A more equilibrate system of the internal traffic flows can be assured by the involvement of Trapani Airport, so to underline its specific role in support to Palermo Airport, as depicted in the National Transport Plan.

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²² Idea already promoted in TeMA Journal (Vinci & Cutaia, 2019)

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IMAGE SOURCES

Figg. 1, 2, 3, 4,5, 6: Generated by authors
Graph 1: airgest; Graph 2, 3: Generated by authors
Fig. 3: Image is obtained from Google Earth.
Fig. 4: Images are obtained from Google Earth.
Fig. 5: Generated by authors using ArcMap 10.1.
Fig. 6: Generated by authors using ArcMap 10.1.
Fig. 7: Generated by authors using Microsoft Office Excel.

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Paolo Ventura is full professor in Urban and Regional Planning, chaired the European Specialized Master's in Urban Regeneration (2014-2018) and the Graduate School of Architecture (2013-2016) at the University of Parma, where is member of the Doctoral School in Civil Engineering and Architecture and teaches Regional Planning. He has been National Delegate in the COST - Urban Civil Engineering committee on behalf of the Ministry of Scientific and Technological Research (1992-2006), member of the Architecture and Children Commission at UIA (2004-2010) on behalf of the Italian National Council of Architects. Since 1974 till 2006, he has done teaching and research activities at the School of Architecture of the University of Florence (PhD Program in Landscape Design within the Doctoral School in Landscape Planning) and other universities: in Nineties Regional and Urban Planning at Milan Polytechnic, at the University of Florence and at the Engineering School of the University of Brescia, then at the School of Architecture of Parma, since 2003. He has been President of the Council of Lombardy Boards of Architects (2010-2012) and President of the Board of Architects of the Province of Brescia (1993-2013). He has been chairman, organizer or invited speaker in many relevant international and national conferences. He is author of numerous national and international scientific publications with outstanding publishers (Mc Graw-Hill and Springer). He is author of important appraisals on Urban Planning and Construction on behalf of the Judicial Authority and of various urban and architectural plans and projects. He directed a several National or International Researches, among which the following ones: Regional Plan of Casentino Valley (about 800 sq.km); Buffer zone of the Casentinesi Forest National Park, (1996); preliminary study (1998-99) for The World Bank (Washington) for the Urban Retrofitting of the town of Saranda (Albania); National Resaerch Program "Urban Planning of Housing Developments with priority pedestrian mobility" financed by MIUR; European Research Program C27 "Sustainable Development Policies for Minor Deprived Urban Communities from 2004 to 2010"; Scientific and Research Center project at the University of Parma (2009-10), Reconstruction Plan of the quake-damaged historic center of Navelli (2011-13).

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