



REGIONE MARCHE



Economic analysis applied at a maritime state property territorial unit

Action 4.4 MSP Pilot project – Marche Region Final Report

20 November 2013

External Expert:



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1 Summary

Since many decades the coastal tourism represents for Italian regions one of the main resources for employment and revenues. In the same time the anthropic pressure on the shoreline has never been higher in terms of exploitation of natural resources (soil, water, fluvial). Since 70s, at European and global level, the main question is which direction we must undertake in order to ensure to the future generation a coastal sustainable development.

An economic model (replicable in other stretch of shoreline) taking into consideration the main issues of tourism sector and able to define an indicator ($\text{€}/\text{m}^2$ - the value for an m^2 beach on site x”), may represent something more than just an academic exercise. This model can be used in order to evaluate different *spatial* aspects, as anthropic pressure on a single beach, comparison for public coastal defense investments in a single site and entrepreneurial skills of tourist related economic actors.

In the collection of data that feeds the “replicable model” is underline the integration between coastal, land and maritime space. Some of the main themes of ICZM are interested by the economic analysis: coastal zone boundaries, protection and sustainable use of the coastal zone, economic activities, coastal ecosystems, landscapes & cultural heritage, environment, land policy, economic, financial & fiscal instruments, natural hazards & coastal erosion, cross-border co-operation. Each one of these issues interacts with the tourism and affects the indicator “ $\text{€}/\text{m}^2$ ” of a particular tourist site.

Considering the maritime space, the interactions with tourism are numerous and often generate conflicts among users: boating and its interaction with shoreline and sea environment; fishing, “slow food” and marine ecosystem; tank vessels and merchant ship’s traffic on the “Adriatic Sea highway” and the related coastal pollution risks due to possible shipping accidents (related to API oil refinery and platform in Falconara Site - Site of National Interest subjected to special laws on land/sea remediation).

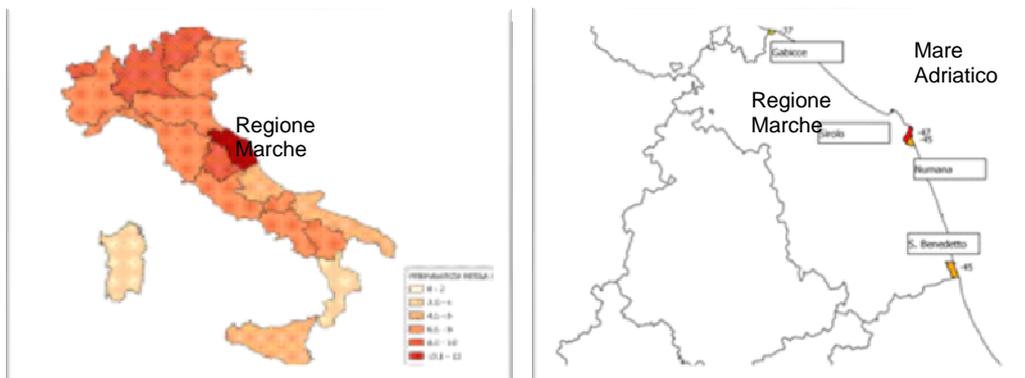


Figure 1-1 Marche Region.

The report shows a photograph of seaside tourism in four municipalities of Marche coastline: Gabicce Mare in the north – area of Regional Natural Park “San Bartolo” (www.parcosanbartolo.it) – Sirolo e Numana in the middle – area of Regional Natural Park “Monte Conero” (www.parcodelconero.com) and San Benedetto del Tronto in the south – area of Regional Natural Reserve “Sentina” (www.riservasentina.it). The document aims to estimate the instrumental value of the seaside in the same locations.

One of the tasks of the research line is to design a tool supporting public policies and public bodies for selecting actions to prevent coastal erosion in sites where the activities related to tourism are predominant.



Figure 1-2 from left to right Gabicce Mare – Parco San Bartolo, Sirolo - Parco del Conero, San Benedetto del Tronto.

The pilot project on four sample sites considers the following issues: tourist carrying capacity through seaside facilities interpretation via satellite imageries and updated data on tourism supply and demand. Chapter 3 of the pilot project evaluates the direct/indirect impact of tourist's related businesses on local economy using the indicator "*economic value of a beach square meter - €/m²*".

Great prominence has been given to the definition of a provisional model using the concept of "carrying capacity" in order to characterize an indicator on tourism evolution (dynamic) in a context of progressive reduction of the beaches. The match between the potential lack of touristic profitability and the expenses for coastal defense, provides some indications applicable to other coastal sites.

Therefore it's possible to consider that a deeper knowledge on tourism's factors (in the shoreline) and the dynamics that rules this knowledge, means to better understand the "*hinge*" that connects the land to maritime space and the Integrated Management of the Coastal Zone Management (ICZM) to Maritime Spatial Planning (MSP).

2 Project objectives

General aim of the pilot project is to design a technical instrument (a model) for calculating the return of coastal defence investments (public-local administration) in terms of tourism revenues shaping the economic value of the loss of a square meter of seaside. The model has been experimented and calibrated in three tourism districts of Marche (Northern, Middle, and Southern), and will be applicable to different sites, first of all the Adriatic coasts and Shape project partners.

In order to implement ICZM and MSP it's useful to conduct a deep research in tourism as a sector generating the higher revenues along the shoreline, involving millions of people in a year.

The anthropic pressure exercised by touristic factors represents, if not well planned and fully addressed with the participation of all stakeholders, one of the main conflicts among actions exercised along the shoreline and along the maritime space in front of the coast.

The environment is without any doubt the setting mainly involved by the tourism issue. The tourism seeks a safe (not polluted) and natural (without alteration of the landscape) environment, but in the same time (tourism) represents one of the main threats to environment quality, contributing to resources exploitation and waste production (healthy environment) and the demand for infrastructures and services (alteration of the landscape).

Manage this dichotomy, without continuously generate further conflicts, represents one of the main challenges for developed countries, but for developing countries or for those not yet contaminated by excessive tourism and anthropic pressure, it means being able to address the "energy potential" on the way of a sustainable development.

The pilot project is been addressed to design a replicable model of economic analysis implemented on a GIS platform and a spreadsheet (all material relating to the Geographical Information System is fully compatible with ESRI ARCMAP software and SHP or GEODATABASE).

3 Area of interest

The four sites in the Marche coast offer to tourists many services, from beach-services to others connected with cultural heritage, natural endowment, food and wine.

3.1 Gabicce Mare

Apart from being a renowned seaside destination, strictly related with the conterminous Romagna coast, Gabicce Mare is interesting for its supply to bike-tourism, with seven cycle-tracks that allow visiting the hinterland. Gabicce coastline, no longer than 1.000 meters, hosts 44 bathing places and roughly 4.500 beach umbrellas. Bathing places are really close each other and umbrellas leave a little room from the frontline to the sea. Free entrance beach areas are really small with respect to equipped ones.

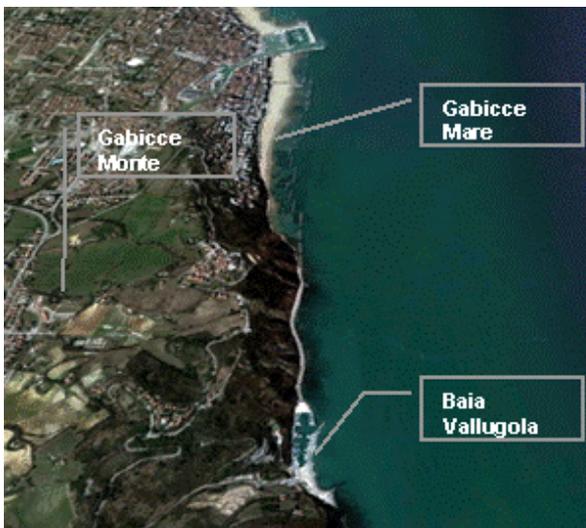


Figure 3-1 Gabicce, aerial view.

In the stretch of beach of Gabicce, area completely devoted to tourism, it has developed over the last decades an important habitat of *Poseidonia Oceanica*. The sea grass beds have found their ideal site just back to the emerged barrier reefs placed to protect the beach and in recent years has increased the surface of covered area. Due to the presence of “Capo San Bartolo Natural Park”, the protection of this site from the environmental point of view is therefore extremely important, the presence of *Poseidonia*, from the point of view of tourism, generates conflicts with bathers and bathing water (stranding of algae and consequent production of organic material, presence of algae in shallow water). Gabicce municipality hosts a huge number accommodation places, both hotels and other structures such as residence, B&B and apartments.

Table 3-1 Accommodations, total values.

Accommodations	No
Hotel****	11
Hotel***	47
Hotel**	26
TOTAL HOTELS	84
Residence	7
Vacation house	1
Camping	1
B&B	2
Rooms rental	2
Apartment	121
TOTAL NON-HOTEL	134

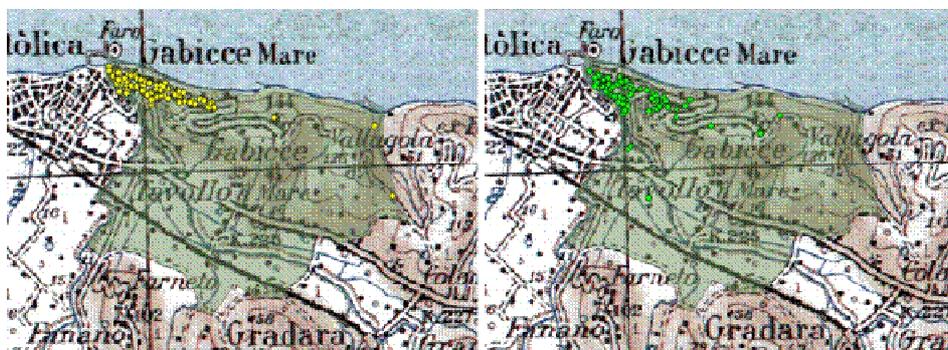


Figure 3-2 Hotels, geo-location.

Figure 3-3 No-hotel accommodations, geo-location.

Estimating property houses used for tourism, the percentage of houses taken by non-inhabitants at Census 2001 in Gabicce was 75% higher of the regional average. The house-tax data show that the payments for non-residential houses (i.e. tourist apartments, shops, and commercial spaces)/residential ratio in Gabicce are +45% with respect to the regional average, while tourists dwelling in private houses (property houses or rented) over the local population in 2011 have been 6.7 times the regional ratio.

Table 3-2 Private tourist houses, years 2001 and 2011, total values and indexes.

	Houses 2001	House-tax payments 2011	Tourist arrivals 2011
Total value	1.021	7.668	2.576
Municipality/Region ratio	1,75	1,45	6,7

3.1.1 Sirolo and Numana

Due to the territorial characteristics and thanks to the promotion of Riviera del Conero Consortium, the tourism supply in Sirolo and Numana is quite diversified. Seaside tourism is coupled by trekking and environmental tourism supply addressed to the Conero regional natural park.

Sirolo

Sirolo seaside is made of little bays and coves at the border of Mount Conero, a distinguishing feature throughout the whole regional coastline and very rare in the whole Italian Adriatic coast, usually made of large sand shores smoothly downgrading to the sea. In Sirolo there are just two beaches equipped with fixed umbrellas (Urbani e San Michele), and free entrance beaches (Sassi Neri, Due Sorelle e Gabbiani), mostly approachable uniquely from the sea

In Sirolo there's a well-organized supply of sailing, wind- and kitesurf, canoe, boat and little watercraft. A sea-shuttle service to Due Sorelle beach is available. A very important local attraction is given by the seabed, attracting scuba-diving and snorkelling fans from Northern and Central Italy.



Figure 3-4 Sirolo, aerial view.

Accommodation supply is articulated, with hotels, country houses, camping, and B&B.

Table 3-3 Accommodations, total values.

Accommodations	No
Hotel****	2
Hotel***	8
Hotel**	3
TOTAL HOTEL	13
Residence	-
Country house	10
Camping	4
B&B	14
Rooms rental	26
Apartment	5
TOTAL NON-HOTEL	59

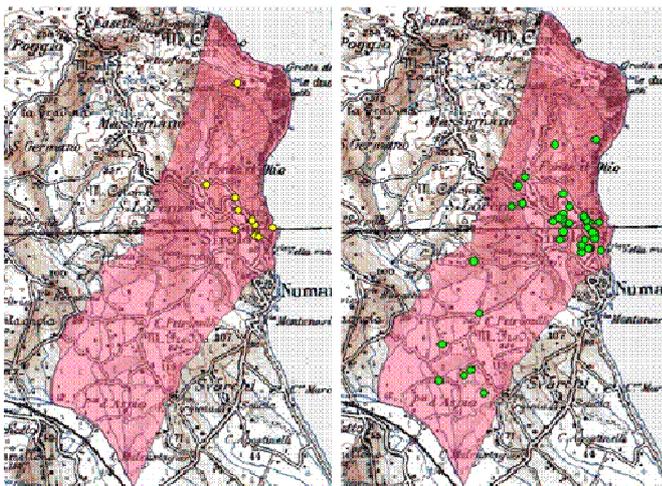


Figure 3-5 Hotels, geo-location; Figure 3-6 No-hotel accommodations, geo-location.

The non-inhabitants/inhabitants ratio at Census 2001 in Sirolo was +70% with respect to regional average, while tourist arrivals in private houses over the total population in summer 2011 have been 12 times the regional value.

Table 3-4 Private tourist houses, years 2001 and 2011, total values and indexes.

	Houses 2001	House-tax payments 2011	Tourist arrivals 2011
Total value	629	4.833	2.989
Municipality/Region ratio	1,71	1,10	11,95

Numana

With respect to the nearby Sirolo, Numana shows wider and easier-attainable beaches, with a long sand shore particularly appreciated by families.

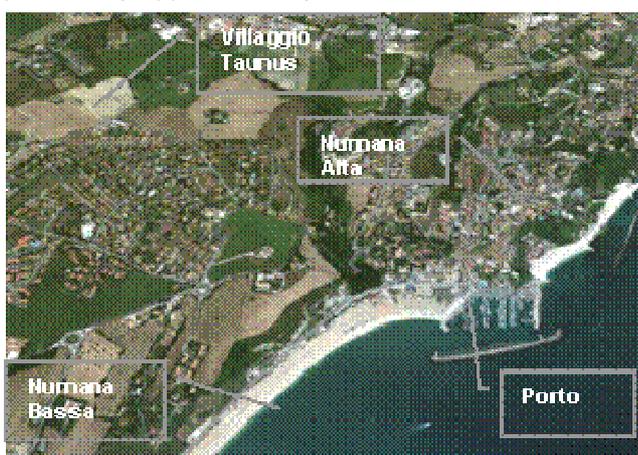


Figure 3-7 Numana, aerial view.

Along the seaside of Numana, more than 4.700 meters long, we count 47 bathing places distributed in Higher Numana (2), Lower Numana (17), and Marcelli (28), and 7.750 beach-umbrellas; moreover, 65.000 square meters of free entrance beaches are available (25% of the whole Numana seashore).

Table 3-5 Accommodations, total values.

Accommodations	No
Hotel****	1
Hotel***	18
Hotel**	2
TOTAL HOTEL	22
Residence	8
Resort	2
Camping	2
B&B	13
Rooms rental	18
Apartment	12
Country house	4
TOTAL NON-HOTEL	59

Even in Numana the accommodation supply is well differentiated, with hotels (mainly three-starred category), residences, B&B and rental rooms. In Numana there exist two camping and two resorts with bungalow.

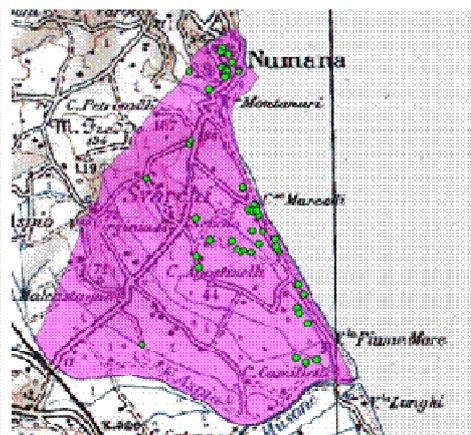
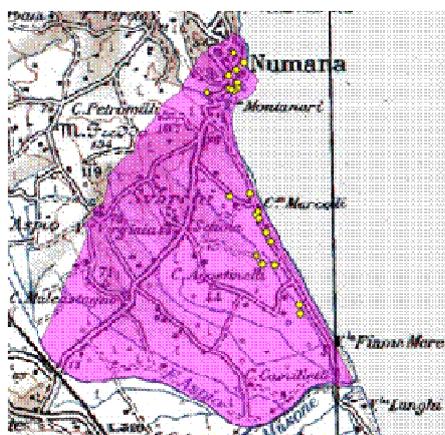


Figure 3-8 Hotels, geo-location.

Figure 3-9 No-hotel accommodations, geo-location.

Private houses indexes for Numana show the higher values of the whole regional coastline: the non-inhabitants/inhabitants ratio at Census 2001 in Numana was four times the regional average; in 2011, the quota of tourists addressed to rented private houses in Numana was 64 times the corresponding regional value.

Table 3-6 Private tourist houses, years 2001 and 2011, total values and indexes.

	Houses 2001	House-tax payments 2011	Tourist arrivals 2011
Total value	4.697	16.635	15.924
Municipality/Region ratio	4,06	3,80	63,84

Numana has a nautical port with 800 berths, hosting both a nautical and a yacht club. Quite huge is the supply of restaurants and pizzerias, with more than 60 units in the seafront and the downtown. Young visitors can find two discos, and many pubs and night events.

The two sites of Numana and Sirolo are located within the “Regional Natural Park of Monte Conero”, which includes in its territory Sites of Community Interest (SIC) and Special Areas of Protection (ZPS) protected by European legislation.

The main conflicts developed by the high environmental value of the area are due to the constant requests by operators bathing for the construction of coastal defense works that, due to the protection of areas, are obstacles by Entities in their implementation.

3.1.2 San Benedetto del Tronto

San Benedetto del Tronto is one of the most famous sea towns of the Italian Adriatic coastline. The huge and very long beach, joint with the shallow seabed, is very attractive for anybody looking for relax and calm. The seaside is characterized by a long and easy cycle-track that follows the coastline for almost 15 kilometres.

In the more than 7.000 meters long seaside are hosted 92 bathing places and 13.700 umbrellas. Free entrance beaches are 94.000 square meters, 30% of the whole seashore. Many bathing places offers beach sports such as volley, indoor-football and basket, and organize lessons for swimming, canoe, boat sailing, wind- and kitesurf, and activities like spinning, rowing, and water gym. Other activities such diving are supplied both by bathing places and local associations.

The accommodation endowment is relevant, with almost 170 structures divided in Hotels, B&B, rental rooms, vacation houses, country houses, residences and apartments. Non-hotel accommodations prevail (96 versus 70), with a prevalence of B&B (49). The presence of camping is modest, with just one unit.



Figure 3-10 San Benedetto del Tronto, aerial view.

Table 3-7 Accommodations, total values.

Accommodations	No
Hotel****	4
Hotel***	48
Hotel**	18
TOTALE ALBERGHI	70
Residence	19
Country house	2
Vacation house	12
Camping	1
B&B	49
Hostel	1
Rooms rental	8
Apartment	3
Historical house	1
TOTALE ESERCIZI COMPLEMENTARI	96

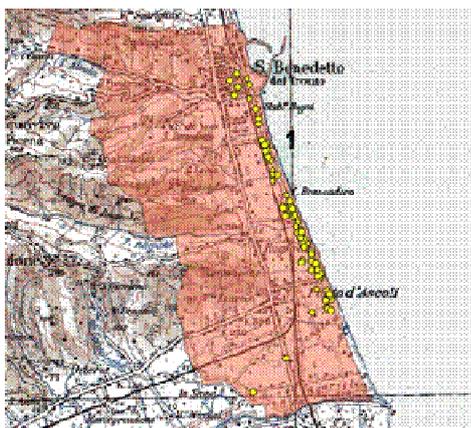


Figure 3-11 Hotels, geo-location

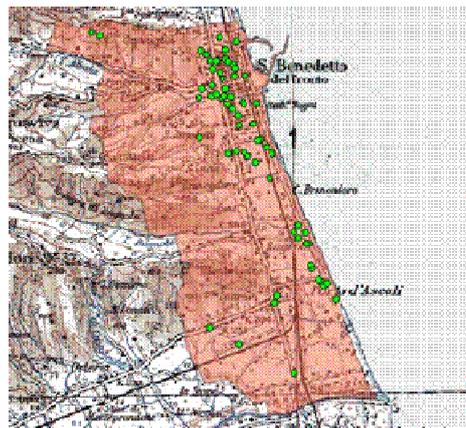


Figure 3-12 No-hotel accommodations, geo-location.

With respect to previous municipalities, San Benedetto shows a lower weight of tourist private houses, even if still higher than the regional average.

Table 3-8 Private tourist houses, years 2001 and 2011, total values and indexes.

	Houses 2001	House-tax payments 2011	Tourist arrivals 2011
Total value	6.281	46.226	8.739
Municipality/Region ratio	1,47	1,10	2,81

Being a town with more than 48.000 inhabitants, San Benedetto has a huge number of restaurants and food and beverage locals (180). The main part of them is placed close to the seaside, with many restaurants run directly from the bathing managers.

4 Project activities

Tourism demand in the four municipalities is almost totally concentrated in summer, from May to September, but efforts are made to reinforce the supply and enlarge the season. Tourists are mainly from Italy, even though in last years foreign arrivals have increased. Lombardy, Veneto, and Emilia Romagna are the three regions where most of the national tourist flows come from; as for the rest of the Marche, the higher quota of foreign tourists proceeds from Germany. Substantial is even the current incoming from Austria, The Netherlands, and Czech Republic, while it's increasing from Eastern (Poland, Russia), and Northern Europe (Sweden and Norway).

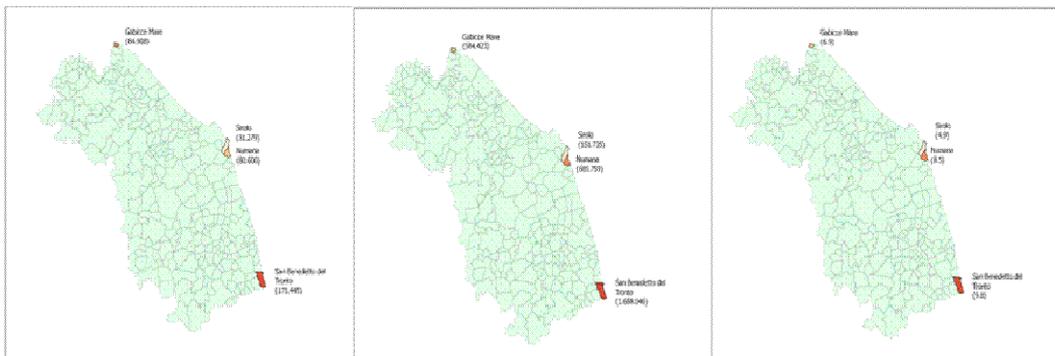


Figure 4-1 Tourist arrivals, attendance, and average permanency, year 2011.

4.1.1 Gabicce Mare

Tourists' movement in Gabicce has shortly decreased in last three years, with a slight curtailment of the average permanency. Both arrivals and attendance have lowered from 2009 al 2011 (-2,91% arrivals, -3,95% attendance).

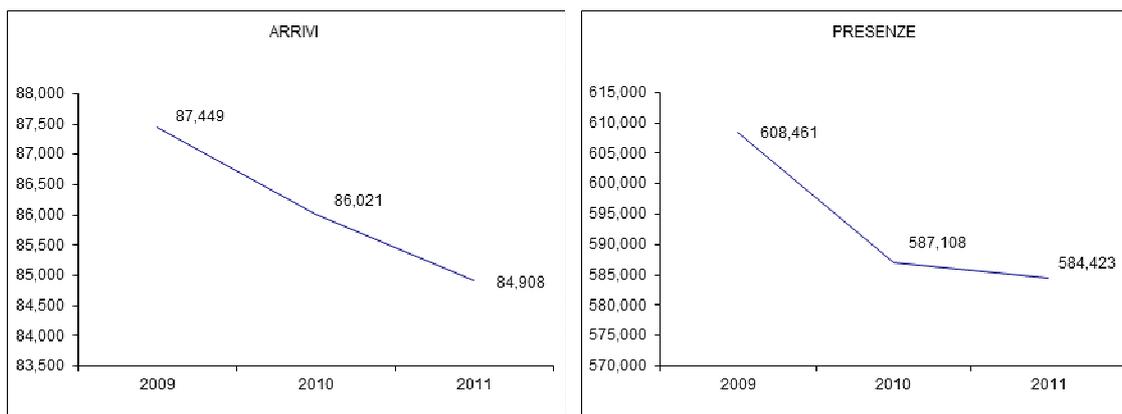


Figure 4-2 Tourists arrivals and attendance, May-September 2009-2011, total values.

The majority of tourists in Gabicce are from Italy, with the main part of arrivals from the nearby Emilia Romagna, followed by Lombardy and Veneto. Relevant are even the incoming from other areas of Marche, but in this last case with an average permanency shorter than for tourists from outside (4,4 days against 6,6).

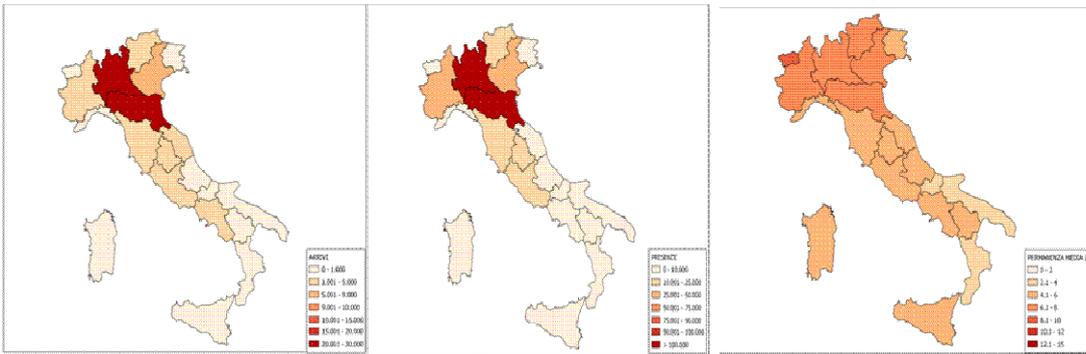


Figure 4-3 Tourist arrivals, attendance, and average permanency, May-September 2011, total values.

Watching at arrivals from abroad, the majority of tourists comes from Germany and Switzerland. Generally speaking, foreign tourists' trends in last three years have been satisfying, even if arrivals slightly dropped in 2011.

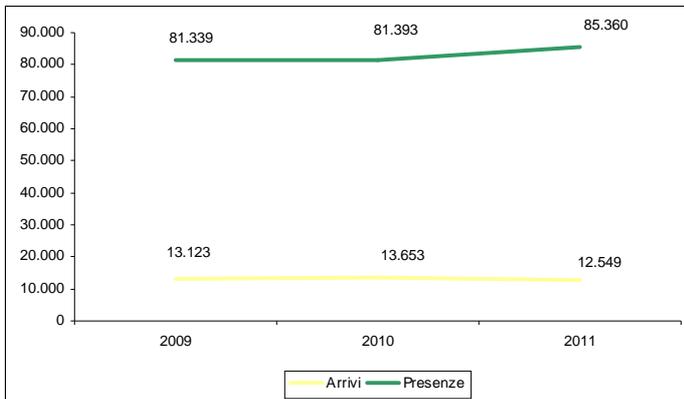


Figure 4-4 Foreign tourists arrivals and attendance, May-September 2009-2011, total values.

The increase of both arrivals and attendance from Sweden is surprising (respectively from 63 to 670, and from 365 to 1.922 units). German and Swiss tourism have grown, while English one decreased. Hard to interpret the Rumanian data (-8% in arrivals, +72% in attendance), maybe due to a mis-registration (tourism presence where it was not).

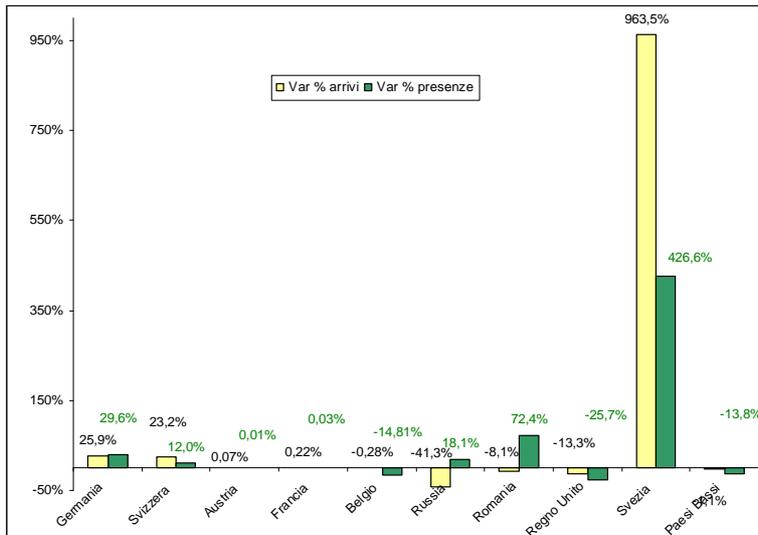


Figure 4-5 Foreign tourists arrivals and attendance variation, years 2009-2011, percentages.

Hotels are the kind of accommodation preferred by foreign tourists in Gabicce: more than 90% of attendance is addressed to them, while Italians still chose non-hotel structures.

4.1.2 Sirolo and Numana

In spite of their closeness and of being both included in the Natural Park of Mount Conero, Sirolo and Numana are very different for landscape characters, kind of seashore, and beach services. As a consequence, even tourists attracted are different

Sirolo is mostly attended by young couples interested in a hit-and-run tourism and short stays, while Numana fits better with families and more sedentary visitors. Anyway, in both locations tourists prefers no-hotel accommodation, and Italians flows comes from Emilia-Romagna, Lombardy and Veneto. Foreign tourists are mainly from Germany, The Netherlands, Austria, and Czech Republic from outside.

Sirolo

Tourism trends in Sirolo show a continuous improvement in arrivals and attendance, with a remarkable growth in last two years. On the other hand, average presence in Sirolo is lower than in the other three locations. It's worth noticing the 2010 difference between arrivals (+ 22%) and attendance (+0,7%), while the opposite happened in 2011 (+3% in arrivals and +17% in attendance). The overall trend 2009-2011 is positive for both the indicators, registering a +26% and a +18% respectively.

As mentioned, Italian tourism comes principally from Emilia Romagna and Lombardy, followed by Veneto and Piedmont. Quite high is even the quota of tourists from inside the Marche. Not surprisingly, there's a direct correlation between distance from the origin and permanency.

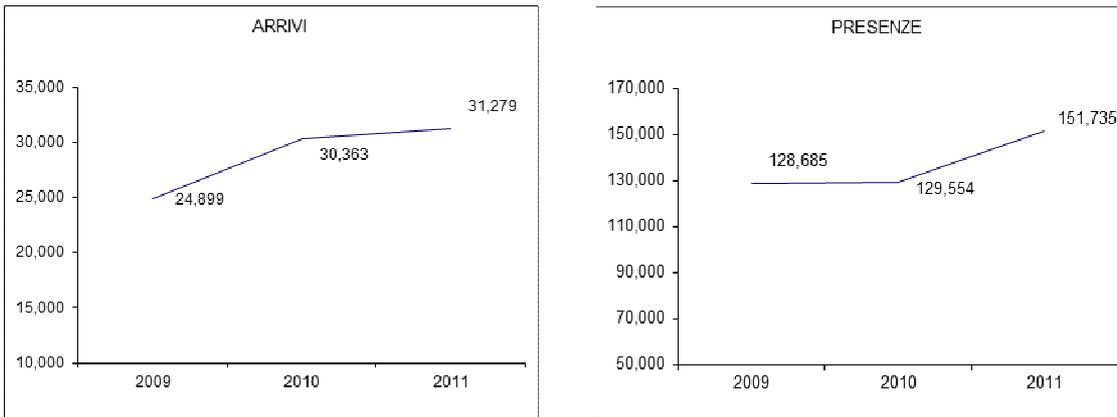


Figure 4-6 Tourists arrivals and attendance, May-September 2009-2011, total values.

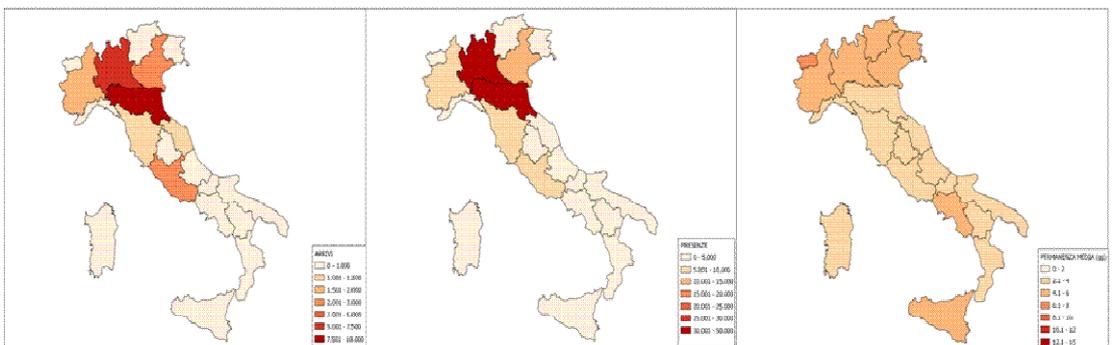


Figure 4-7 Tourist arrivals, attendance, and average permanency, May-September 2011, total values.

Main international proveniences are from Germany, The Netherlands, and Austria, followed by France, United Kingdom, and Switzerland. Last three years trends from abroad show an increase in arrivals (+26,2% from 2009 to 2011), and a little weaker growth in attendance (+21,9% in the same span of time).

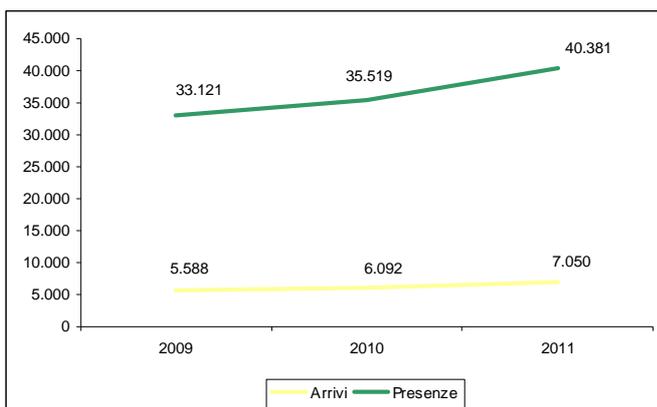


Figure 4-8 Foreign tourists arrivals and attendance, May-September 2009-2011, total values.

Focusing on origins it's interesting the evolution of tourism from Poland (+156,7% in arrivals and +223,6% in attendance), while Belgian and Danish dropped. Czech Republic registers a sound reduction in attendance (-6,4%), even if with a strong increasing in arrivals (+72,9%).

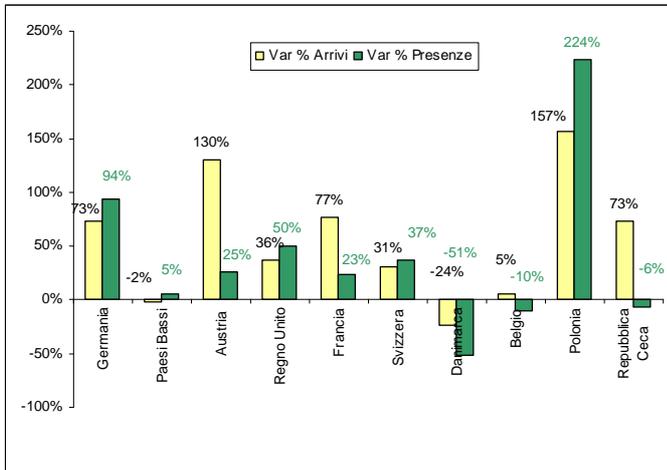


Figure 4-9 Foreign tourists arrivals and attendance variation, years 2009-2011, percentages.

Tourists living in Sirolo are mainly addressed to non-hotel accommodation (country houses, B&Bs, rented apartments), even because of the attraction of Conero Natural Park, with many internal country houses.

Numana

Different from Sirolo, Numana tourism has known in last three years a swinging proceeding: after a strong reduction in 2010 of both arrivals (-14,1%) and attendance (-7,7%), 2011 registered a tangible reprise (+24% and +11,8% respectively) that overcame even the 2009 values.

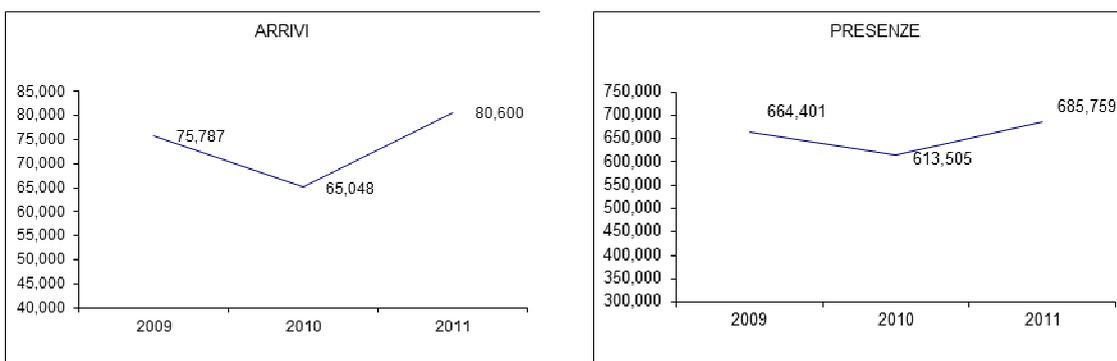


Figure 4-10 Tourists arrivals and attendance, May-September 2009-2011, total values.

Likewise Sirolo, Italian arrivals are mainly from Lombardy, Emilia-Romagna and Veneto, but with a strong difference in attendance, fluctuating from six days (Lazio) to 9 (Umbria). Completely different is the attitude of people from Marche, that stays in Sirolo just for one or two days and linger in Numana with an average of 14 days.

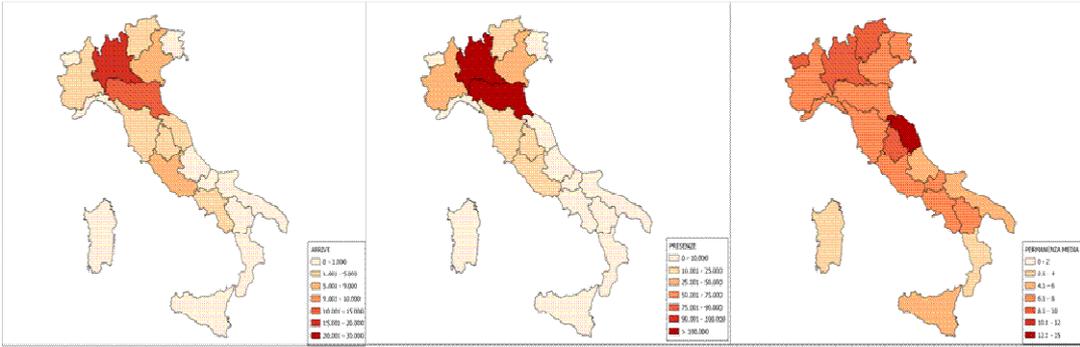


Figure 4-11 Tourist arrivals, attendance, and average permanency, May-September 2011, total values.

Foreign arrivals and attendance are increasing throughout the period, with an impressive growth of 96% in arrivals and of 137% in attendance with respect to 2009.

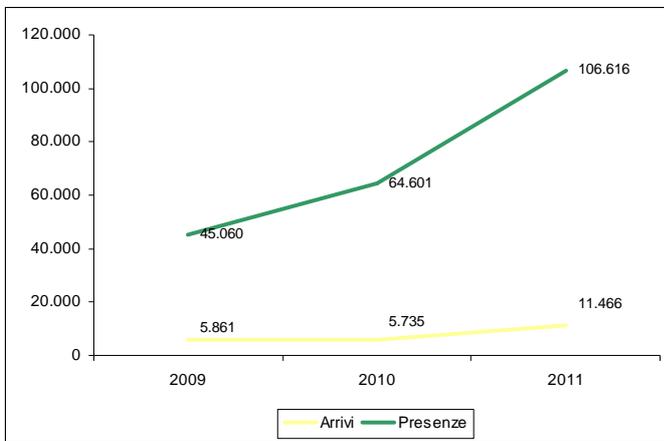


Figure 4-12 Foreign tourists arrivals and attendance, May-September 2009-2011, total values.

They come especially from Germany, The Netherlands, Switzerland and Czech Republic, while Russians, Polish and Norwegian are strongly increasing in last years.

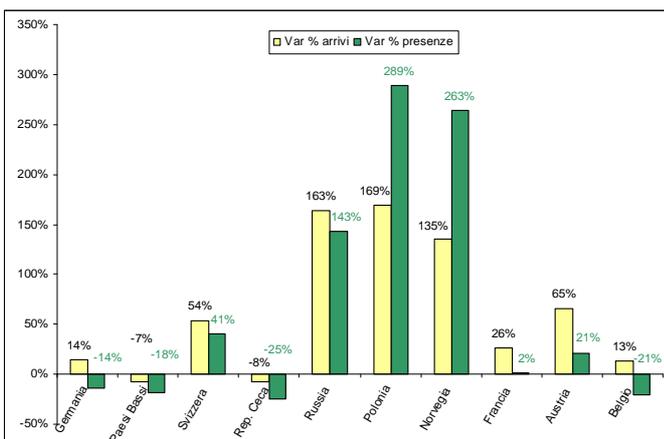


Figure 4-13 Foreign tourists arrivals and attendance variation, years 2009-2011, percentages.

Again, in Numana the non-hotel accommodation is the preferred one. Hotel sector regained 1% in 2011, after losing attendance in previous years.

4.1.3 San Benedetto del Tronto

In last year tourist trends in San Benedetto del Tronto seem to be substantially stable both in arrivals and in attendance. The majority of Italian tourists in San Benedetto comes from Lombardy, Lazio, and Emilia-Romagna, strictly followed by Umbria, Veneto, and Campania. Again, we observe a direct linkage between origin and length of the holiday, with people from Lombardy, Piedmont and Veneto staying over the general average of five days.

Very differently from other municipality we considered in previous pages, foreign attendance here increased consistently in 2010 (+13,6%) to drop in 2011 below the 2009 levels (-14%). At the same time, arrivals increased monotonically. They come principally from Germany, Russia (the higher increasing both in arrivals and attendance), Czech Republic, and Slovakia. Last two are the ones who stay longer, respectively nine and 10 days on average.

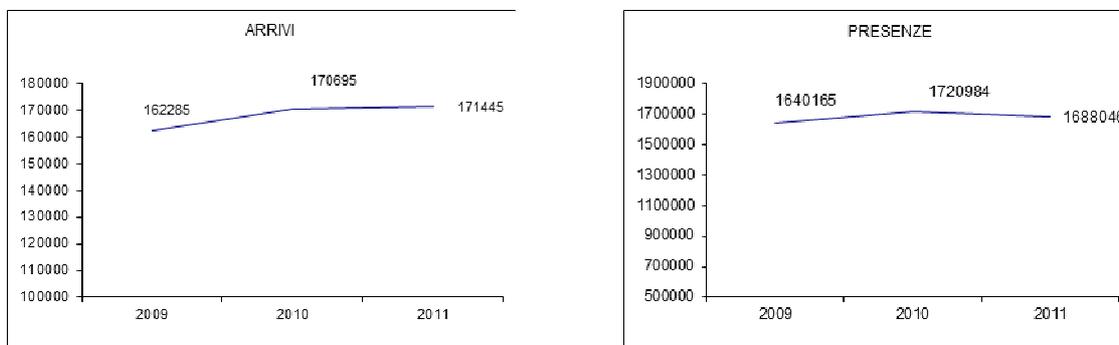


Figure 4-14 Tourists arrivals and attendance, May-September 2009-2011, total values.

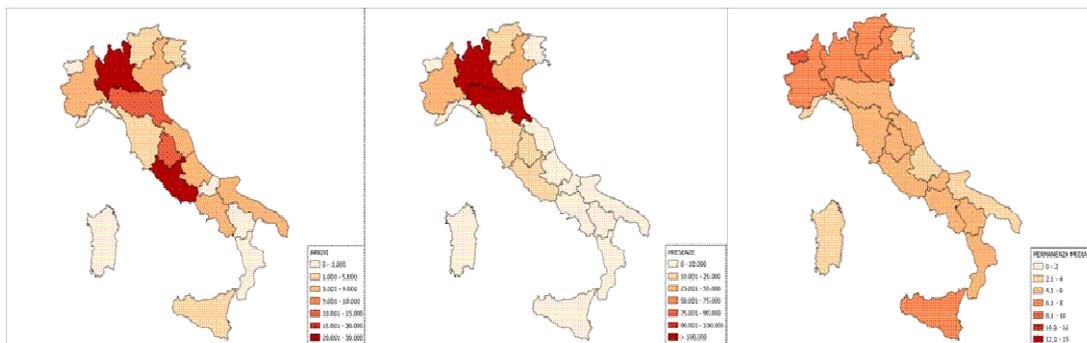


Figure 4-15 Tourist arrivals, attendance, and average permanency, May-September 2011, total values.

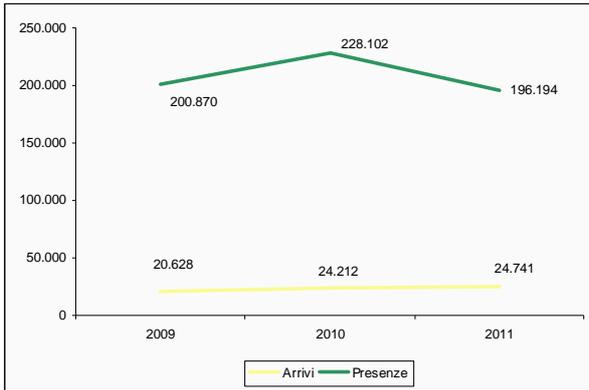


Figure 4-16 Foreign tourists arrivals and attendance, May-September 2009-2011, total values.

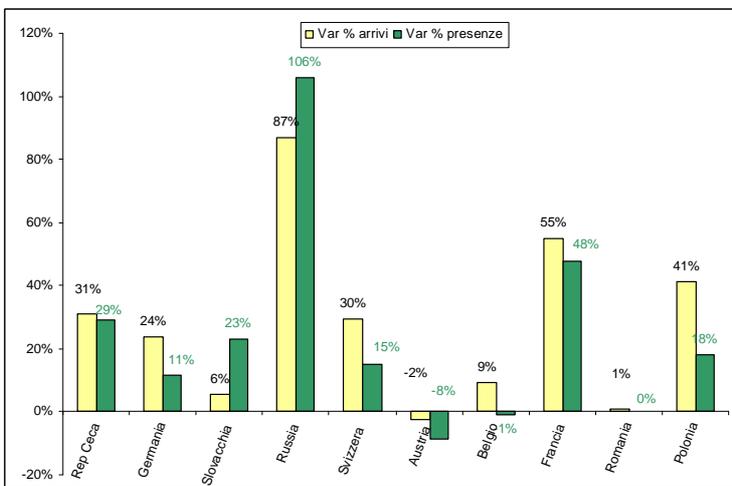


Figure 4-17 Foreign tourists arrivals and attendance variation, years 2009-2011, percentages.

Again, the preference is for non-hotel accommodations, albeit hotels cover a distinguished 40% of the total demand.

5 Project results

5.1 The tourism income assessment

Quantifying the total economic impact of tourism in the four municipalities of Gabicce Mare, Sirolo, Numana and San Benedetto del Tronto has meant to estimate at first the direct tourists expenditure, and then - to capture the consequences on the satellite activities of the tourism sector - the multiplicative effects of it. All values in next pages are related to year 2011, the last one with a complete series of data.

5.1.1 The direct impact

Calculation methodology

The starting point of the itinerary that will take to the estimation of the squared meter of beach value is the attendance of tourists in the summer season. Due to the fact that the prices of supplied services are different according to a "high" (July and August) and a "low" (June and September) season, maintaining the distinction even in the attendance is useful. Because of its signalling power on the capability/willingness to pay of the single tourist (paying a night in a four starred hotel is more expensive than a night in a camping), a second helpful classification to be kept is on the kind of accommodation chosen by the tourists.

To have a complete photograph of the tourism in any municipality we must add to tourist attendance two more categories of users: "Commuters" (i.e. people converging on the seaside place from the neighbourhood area, but they don't sleep in it), and "Inhabitants" (i.e. people living in the same municipality and enjoy the beach services). The size of both categories have been estimated in a parametric way: for commuters, identifying a gravitational area, assuming that a percentage in-between 5% and 10% moves to the seaside place for 12 days per month on average (40% of the total available period), and adding to them from 0,5%-1% of the total population of the Province (net of inhabitants of the same municipality and of commuters just calculated from the gravitational area). Inhabitants have been estimated assigning a 20% parameter to the total population (i.e. one inhabitant out of five goes to the seaside) for the same period of 12 days per month. Used formulas are as follows:

$$\text{Inhabitants: } T_r = (N_r \times P_r) \times 48$$

$$\text{Commuters: } T_p = (N_g \times P_g + N_{pr-} \times P_{pr-}) \times 48$$

Where N is the units for each category (g = inhabitants in the gravitational area net of the considered municipality; $pr-$ = Province inhabitants net of the considered municipality and of the gravitational area, r = inhabitants in the considered municipality), P is the chosen parameter for each category, 48 are the days of exerted tourism activity.

A second cohort of data we need to assess the economic impact of tourism regards different expenditure items for tourists. To deal with this topic, the following categories of services have been considered, each of them expressed in terms of single tourist expenditure per single day of holiday.

Table 5-1 Expenditure items.

Items	Description
Accommodation	Daily expenditure for room and board per chosen kind of accommodation
Beach umbrella	Daily expenditure for beach-umbrella+beach chair
Food expenditure	Daily expenditure to purchase supermarket goods (food, domestic goods, ...)
Other expenditures	
extra- room and board meals	Daily average expenditure restaurant meals (not considering meals of the room and board regime)
Bar/Cafeteria	Daily average expenditure for sodas/ice creams/sandwiches/bottled water
Beach services extra-umbrella	Daily average expenditure for beach services (windsurf lessons, boat rental, ...)
Shopping	Daily average expenditure in purchasing gadgets, souvenirs, apparel

A final series of needed data are the seashore features data: total extension, percentage of both equipped and free entrance areas, number of fixed beach-umbrellas in each seaside place.

The number of umbrellas provided in the equipped beaches has been multiplied by the number of available days per summer month, assuming a using time of three weeks in June, four weeks both in July and August, and two weeks in September. Since not all registered tourists rent an umbrella once they go to the beach (besides of people choosing free entrance areas, even in an equipped beach you can just bring on your beach towel and lay down on it), different monthly occupancy ratio have been applied to the total available number of umbrellas. The final formula is:

$$\text{Monthly taken umbrellas: } O_m = \bar{O} \times g \times t$$

With \bar{O} = total number of counted umbrellas in the place, g = ratio days of actual availability of umbrellas/total of days in a month, t = monthly occupancy ratio.

Available data and estimation model parameters

All parameters and values considered in each municipality descend from original official data for season 2011, in many cases calculated as an average of some other values.

From data (see Annex) arise some interesting outcomes: in a general context quite homogeneous (dealing with places belonging to the same coastal line, at a maximum distance of roughly 160 kilometres, and addressed to the same kind of tourists), we see consistent differences with respect to seashore areas, tourists density and room available per beach user. Gabicce and Sirolo are able to host a greater number of visitors per square meter of beach with respect to San Benedetto. Gabicce is even the seaside where the percentage of equipped beach is higher (76%); on the contrary, in Sirolo the same quota is just 15%.

Watching at the price of services, Numana and San Benedetto come out as the most expensive, followed by Sirolo and – very far – Gabicce. But the cheaper condition of Gabicce is compensated by a deeper resort to higher level of accommodation structures (three and four starred hotels) and by a widespread organization of beach services, in the nearby Emilia-Romagna seaside district style.

Table 5-2 A comparison among meaningful values in the four municipalities, Average, percentage and total values, Year 2011.

Municipality	Users density	Squared meters per user	Seashore size (sqm)	% organized beach
Gabicce Mare	0,071	14,03	84.028	76%
Sirolo	0,129	7,73	41.552	15%
Numana	0,037	27,12	262.096	33%
San Benedetto del Tronto	0,044	22,76	313.336	49%

Table 5-3 A comparison among meaningful values in the four municipalities, Index values (Upper value =100), Year 2011.

Comune	Densità fruitori	Metri quadrati per fruitore	Superficie spiaggia	% Spiaggia attrezzata
Gabicce Mare	55	52	27	100
Sirolo	100	28	13	19
Numana	28	100	84	44
San Benedetto del Tronto	34	84	100	64

The results

Once data have been collected and processed through the application of mathematic formulas, we get estimation of total tourism revenues and of the consequent value assigned to a single squared meter of beach in any place. The formulas we used are the following:

$$\text{Tourism income: } R = \sum_{i=1}^{10} \sum_{\mu=1}^4 N_i^{\mu} \times S_i^{\mu}$$

Where N_i^{μ} is the attendance for each users category i (divided according to the elicited accommodation) each month μ , and S_i^{μ} is the related daily expenditure.

$$\text{Umbrellas income: } RO = \sum_{\mu=1}^4 O_m^{\mu} \times SO_m^{\mu}$$

Where O_m^{μ} is the number of beach umbrellas used each month μ , and SO_m^{μ} is the related daily price per person

The squared meters value is an index of capability in generating revenues of each local tourism district. In its straighter form, it's given by:

$$\text{Squared meter value: } V = \frac{R + RO}{m^2}$$

Where $R+RO$ is the total tourism revenue (Tourism income+ Umbrellas income) as previously calculated, and m^2 is the total size of the seashore. Results goes from € 224,8 for Numana to € 812,4 for Gabicce.

A similar measurement is easily understandable, but has a problem of comparability when a huge difference in seashores' size is introduced. For this reason, a standardized measurement is useful, where to neutralize the two dimensional effects incorporated in the V formula: the extension of the seashore and the size of the gravitational area for the tourists' categories of commuters and inhabitants. So, first of all it has been considered only the revenues from the other eight categories of tourists:

Standardized squared meter value:

$$VS = \frac{\sum_{i=1}^8 \sum_{\mu=1}^4 N_i^{\mu} \times S_i^{\mu} + \left(\sum_{\mu=1}^4 O_m^{\mu} \times SO_m^{\mu} \right) \times \frac{\sum_{i=1}^8 \sum_{\mu=1}^4 N_i^{\mu} \times S_i^{\mu}}{R}}{\sum_{i=1}^8 \sum_{\mu=1}^4 N_i^{\mu} \times 3,7}$$

Numerator represent the total expenditure of accommodated tourists; the first double summation is the daily expenditure of each of the eight considered categories; the second term of the addition is their estimated expenditure for beach-umbrellas assigned to those eight classes of tourists. Numerator value is divided by the total number of accommodated tourists (the double summation at Denominator), getting in this way the daily individual expenditure for these categories of tourists in the municipality.

The previous calculation allows neutralizing the gravitational area's size effect, but not the seashore extension one yet. To deal with it, we imagine that each beach user is interested uniquely in getting the right to occupy a space of 2,7 square meters on the seashore, equal roughly to the room to put down a beach towel with an opportune buffer zone. At the end of the standardization, the value of the squared meter changes perceptibly, going from € 17,4 of Sirolo to € 33,5 of San Benedetto.

5.1.2 The indirect impact

Tourism expenditure in a seaside place generates multiplying effects on local revenues. To calculate the dimension of this indirect effect we use the formula of tourism multiplier, that hinges upon a set of parameters extractable from official National accounts:

$$\text{Multiplied tourism income: } Y = \frac{1}{1 - (c - h - t_1) + m} [C_0 + (1 - g - t_2)G]$$

From this formula it's easily educible the indirect impact of tourism expenditure on total income generated by tourism or, put in another way, the multiplier effect of a euro spent by a tourist in the considered place:

$$\text{Tourism multiplier: } \frac{\partial Y}{\partial G} = \frac{1 - g - t_2}{1 - (c - h - t_1) + m}$$

Where the variation of total revenue induced by tourism (Y) because of the tourism expenditure (G) is given by the value of the fraction, with c = consumption propensity of local community, h = propensity of inhabitants to spend the holiday abroad, m = import propensity of local community; g = tourists' foreign goods purchasing propensity, i. e. the quota of tourists' expenditure covered by goods and services from outside the municipality; t_1 and t_2 are the average tax-rates respectively of direct and indirect taxes. All parameters are included in-between 0 and 1.

Whenever Tourism multiplier is higher than one (i. e. whenever Numerator is higher than Denominator), tourism in the considered area is a development driver; otherwise, it's parasitic. Being National accounts parameters, their values have been elicited from ISTAT official data.

Table 5-4 Parameters and Tourism multiplier values, year 2011.

Municipality	m (export prop.)	h (holiday abroad prop.)	c (consumption prop)	g (tourists' foreign goods purchasing prop)	t1 (average direct tax rate)	t2 (average indirect tax rate)	Tourism multiplier
Gabicce Mare	0,0002	0,0200	0,8403	0,3200	0,2419	0,2000	1,1380
Sirolo	0,0005	0,0200	0,8448	0,1100	0,2431	0,2000	1,6473
Numana	0,0005	0,0200	0,8448	0,1500	0,2431	0,2000	1,5518
San Benedetto del Tronto	0,0010	0,0200	0,8350	0,0800	0,2411	0,2000	1,6857

5.1.3 A recapitulation of main results

The comparison among data and values estimated in the four municipalities allows highlighting some tendencies and trends: San Benedetto and Gabicce seem to be the places with the higher capability in producing tourism revenue, both in absolute terms and according to the standard value of squared meter of beach. Nonetheless, Sirolo gains positions when we consider the multiplier effects.

Gabicce shares many features with the conterminous Romagna seaside: thanks to a low cost strategy and an effort in providing beach services, it is able to attract many tourists, even though it's probable that a part of the tourists expenditure goes out of the local district to be spent in Romagna (discos, restaurants, nightclubs, etc...).

Finally, Numana shows more than a contradiction: on one hand, it has a high tourism revenue with respect to the taxable income ascribed to its (few) inhabitants; on the other hand, because of a huge extension of its seashore, the value of the beach squared meter for it is low, even when multiplied or standardized. Anyway, this conclusion tends to fade when we consider it not individually, but conjoined with Sirolo in a unique "Conero" seaside place.

Table 5-5 Recapitulation of main results.

Municipality	Total tourism revenue (€)	Weekly individual expenditure (€)	Tourism multiplier	Beach squared meter direct value (€)	Beach squared meter multiplied value (€)	Beach squared meter standardized value (€)	Beach squared meter standardized and multiplied value (€)
Gabicce Mare	68.265.572	812	1,14	812,4	924,5	31,5	35,9
Sirolo	24.243.636	446	1,65	583,5	961,1	17,4	28,6
Numana	58.908.415	501	1,55	224,8	348,8	19,7	30,5
San Benedetto del Tronto	122.220.980	851	1,69	390,1	657,5	33,5	56,5

5.2 The economic impact of coastal erosion

Once estimated the total tourism revenue, we must understand the tourism dynamics in the four municipalities with the assumption of a seashore reduction.

Accordingly to the specific features arisen in the previous pages, in this Chapter we set up a model to forecast the reaction of visitors to different waves of coastal erosion, estimating the related income fall. The model is based upon the availability of room for any beach user and is strictly connected to carrying capacity and sustainability notions.

5.2.1 Carrying capacity and sustainable development

Carrying capacity notion originates in natural science. It depicts the capability of a given habitat to support a particular population, providing the necessary conditions to its survival. Ulterior interpretations of this notion led to accept even for carrying capacity a multidimensional meaning, different from the strictly physical or “ecological” one: a “social” carrying capacity, identified by the greatest attendance a site could bear without congestion or reciprocal disturbance among visitors; and an “economic” carrying capacity, given by the greatest for-profit activities that could be introduced in a place before saturation, income fall, and economic crisis arise. For each of these three aspects – ecological, social, and economic – a threshold beyond which the site is over-used can be identified, triggering a decline trajectory instead of a development one.

Carrying capacity shares this multidimensional approach with another bordering among disciplines notion: the sustainability concept. Definitions sustainable development are copious. This is probably due both to the complexity of the concept, and to its inconsistency, since it try to keep together different and contradictory elements: development, denoting change and progression, and sustainability, that recall conservation and status quo protection. From the beginning, for example from the definition proposed by the Brundtland Report, it's well accepted that sustainable development entails an economic dimension; a deeper interpretation allows to identify in it even an ecological and a social dimension, and to get a potential conflict among this three dimensions. As a matter of fact, sustainable development implies to give up the maximization of each sectorial objective, for a compromise equilibrium aimed at recomposing the conflict among economy, ecology and social subject.

The interaction among the different elements of sustainable development and among the different carrying capacity thresholds are the basis of the forecasting model set up to estimate the relation between tourism income and coastal erosion.

5.2.2 The potential cost of erosion

How would react tourists of the four considered places to a seashore reduction? Answering to this research question means to design a function that links the number of tourists with the available room on the beach for each of them.

The model set up

The beach demand follows a twofold dynamics: on one hand any tourist needs a “living space”, a minimal quantity of squared meters on the beach below which the outdoor experience is unsatisfactory; on the other, when on holiday the visitor needs socialite moments, so that an exaggerated room availability, is equally un-

satisfactory, being an indicator of boredom and dullness. A general formalization of this attitude could be the following:

$$\text{beach demand: } N = G(x-s) \left(1 - \frac{x}{e}\right)$$

Where N is the dependant variable, namely the number of attracted tourists; the independent variable x is the available squared meters for each beach user (the “lining space”); s and e are respectively the minimal and maximal threshold below and beyond which representative tourist’s individual demand drops to nil (the tourist leave the place because of excess of congestion or because excess of isolation). G is a multiplier, incorporating all the other variables not considered by the model.

The previous formula can be assumed as a social sustainability function, with s and e as (social) carrying capacity thresholds. From a graphic point of view, in a Cartesian plan $N = f(x)$ is a parabola with downward concavity and intersection with abscissa in s and e (N drops to nil for both $x \leq s$ and $x \geq e$).

To run the model we need a second function, aimed at identify the physical seashore availability. This can be draw as follows:

$$\text{beach supply: } N = \frac{D}{x}$$

Where D is the seashore extension, and the other variables are the same of the beach demand/social sustainability function. Beach supply function, that might be written more correctly in the form $x = D/n$, states that does exist an inverse relation between the number of tourists that can be hosted on a shore, and the room destined to each of them. Graphically, it’s the downsloped hyperbola branch. This supply function is nothing but an ecological sustainability function, with an upper right point that identifies the physical carrying capacity of the beach.

Assuming fixed prices, economic sustainability can be expressed as the minimal attendance under which the tourism activity is any longer profitable. This threshold is set at the capability to occupy at least 30% of the total beds endowments. From a mathematical point of view it is a linear function, depicting a straight line parallel to the abscissa and a constant equal to the threshold:

$$\text{Economic sustainability: } \bar{N} = 0,3 \times PL$$

Where PL is the number of the total beds of all kind of accommodations in the municipality, multiplied for the number of days of the summer season. Drawn in a Cartesian plan, the three functions give the following graph:

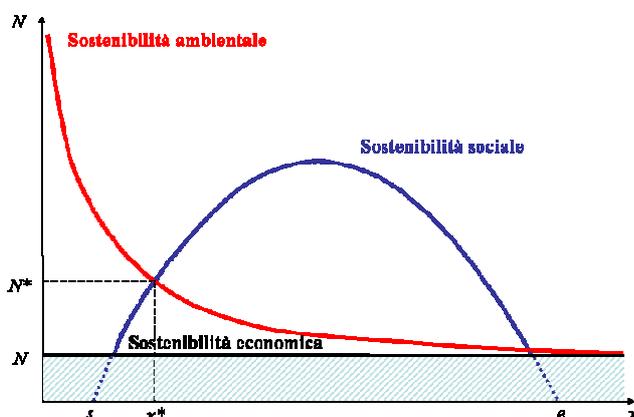


Figure 5-1 Equilibrium and sustainability in a coastal place with seaside subject to summer tourism.

The intersection between supply (ecological sustainability) and demand (social sustainability) curves identifies the “equilibrium”, i. e. the number of tourists hosted by the place and the average space available for each of them. Whenever the equilibrium is at an N^* lower than \bar{N} , it is unsustainable from an economic point of view (being inside the dashed area), and supply-side operators leave the market.

Form and position of the parabola reflects characteristics of the representative tourist in each municipality: a moved to the right curve means users more interested to exclusivity; on the contrary, the more it is near to the ordinate axis, the more tourists are concerned with sociality. At the same time, a curve with s and e put closer (i. e. a thinner parabola) identifies a less resilient community of tourists, that can more easily leave the place because of a reduction in the individual beach room.

How does the equilibrium changes when the beach availability varies? A downward shift of the supply/ecological sustainability curve (reflecting a lower availability of beach, for example because of erosion) locates a brand new spot at the new intersection with the demand/social sustainability curve, that doesn't move. The seasonal character of the tourism experience makes it likely that the system will undergo a shock: initially (from 0 to 1), visitors will not perceive the seashore reduction, and the same N_0^* tourists will continue to attend the beach. But in the brand new situation the usable room for each of them has dropped from x_0^* to x_1 , and when they become aware of it demand collapse to N_1 . This is not a stable position, yet, since the seashore supply is once more different from the perceived one from users. N_1 visitors have a higher individual room than x_1 , and this attracts new tourists until the point (x_F^*, N_F^*) , where the two curves meet again.

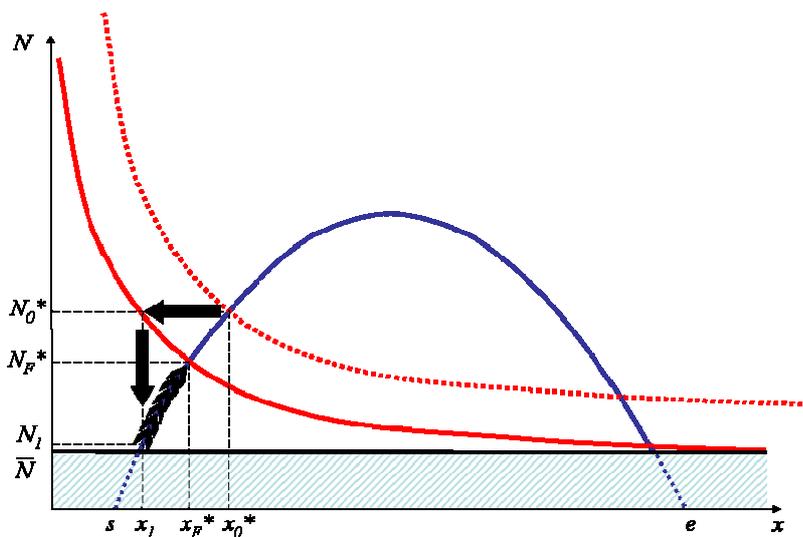


Figure 5-2 New equilibrium dynamics.

In this dynamics, it's evident a problem related with the initial shock: the risk that the decrease of tourists is irreversible, due to the fact that temporary N_1 would end inside the economic non-sustainability area. As we saw, in this case supply operators leave the market and the tourism system crumbles, so that the comeback to N_F^* doesn't happen. This means that the decline could spring even for a seashore reduction actually compatible with tourism exploitation and a satisfactory income.

Applying the model to Marche coastal line

The theoretical model set up and described in previous paragraph is used to illustrate the current and the potential tourism dynamics in the four examined places of Marche region. The original demand/social sustainability function is modified in a twofold way to fit better with idiosyncratic characteristics of any place: 1. both social

carrying capacity threshold are now multiplied by a parameter to express the attitude to sociality or to exclusivity of tourism in each municipality; 2. a new parenthesis is added on the right hand of the equation, expressing the attendance of the place by private house owners tourists:

$$\text{beach demand: } N = G \left(x - \frac{s}{c} \right) \left(1 - \frac{x}{el} \right) + H \left(x - \frac{s}{h} \right) \left(1 - \frac{x}{eh} \right)$$

The new parameters are c = ratio between the percentage of camping tourists in the considered municipality and the same percentage in the whole Marche region; it's assumed as a proxy of the higher propensity to sociality (low cost, younger tourism, higher frugality); l = ratio between the percentage of four starred hotels tourists in the considered municipality and the same percentage in the whole Marche region; its assumed as a proxy of exclusivity (higher cost, more mature tourism, more refined services); h = ratio between the percentage of property house tourists in the considered municipality and the same percentage in the whole Marche region; finally, H is a multiplier, working in the same way of G , but related exclusively to private house owners tourists.

Watching at the “mechanics” of the model, c and l modify the thickness of the parabola (the higher their values, smoother is the parabola, and vice versa). Adding a second product allows to take care of the kind of tourism more resilient to coastal erosion (who bought a house for vacation *in loco*, most likely will be more reluctant to leave the place for another destination); from the mathematical perspective, it doesn't change the functional form of the equation, just shifting it outward, so that its maximum point is higher and the “base” of the parabola is wider.

Beach supply is identified exclusively by parameter D , expressing the usable surface of the seashore (organized + free entrance) multiplied by the 120 days of the summer season. Similarly, the only needed parameter to identify the economic sustainability function is the number of beds PL times the 120 days of the summer season.

Returning to beach demand function, once defined the form we know three point of it: where demand drops to nil, in correspondence with the two social thresholds, and where it crosses the supply function. These points are fundamental to identify the value of G and H in each local area, while parameters c , l and h are inferable from statistical official data. So, the only parameters that need exogenous assumptions to be determined are the social thresholds, set respectively at 3,7 and 100 square meters. Resulting values are:

Table 5-6 Value of the set of parameters for the four municipalities.

Parameter	Description	Gabicce	Sirolo	Numana	San Benedetto
G	Total constant effect	49.603	16.245	23.853	26.804
s	Lower bound social sustainability threshold	3,7	3,7	3,7	3,7
c	Low cost tourism indicator	0,81	156,1	121,6	3,4
e	Upper bound social sustainability threshold	100	100	100	100
l	High cost tourism indicator	160,3	27,5	12,9	134
H	Property tourism constant effect	3.561	75	675	681
h	Property tourism houses indicator	130,5	6,0	38,7	35,2
D	Seaside dimension	8.358.464	4.067.236	18.616.041	30.105.818
PL	Seasonal beds	926.000	460.000	1.240.000	1.600.000

From all these values of the parameters a group of quite different demand and supply curves arise, with more than a surprise with respect to collected data: Gabicce seems to be the more “exclusivist” locality, while Numana is the more addressed to low cost tourism.

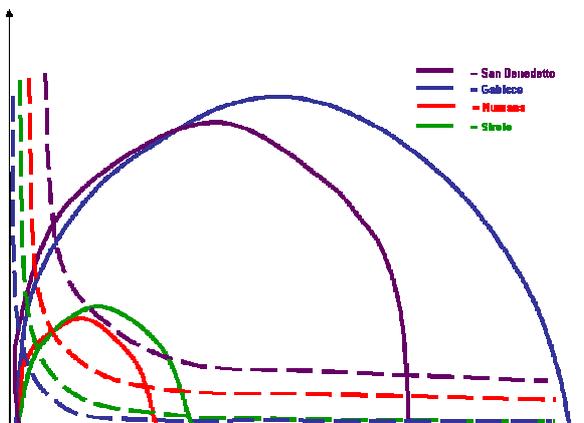


Figure 5-3 Estimated social and environmental sustainability curves in the four municipalities.

Running the model allows to verify the changing of total tourism revenue as a consequence of shore reduction, and to spot the “point of no return” (i. e. when economic non-sustainability comes in) for each seaside place. Results follow:

Table 5-7 Forecasted tourism attendance for different levels of coastal erosion, total values and percentages.

	Current attendance	Attendance w/ -10% seashore	Attendance w/ -20% seashore	Attendance w/ -30% seashore	Attendance w/ -40% seashore	No return ero- sion
Gabicce	562.371	528.699	493.159	455.401	-	-37%
Sirolo	256.668	243.523	229.620	214.812	198.898	-47%
Numana	668.160	634.207	598.266	559.952	518.733	-45%
San Benedetto	893.818	847.264	798.037	745.618	689.293	-45%

Table 5-8 Forecasted tourism revenues for different levels of coastal erosion, total values.

	Current revenues	Revenues w/ -10% seashore	Revenues w/ -20% seashore	Revenues w/ -30% seashore	Revenues w/ -40% seashore	No return ero- sion revenues
Gabicce	65.072.003	3.905.109	8.026.835	12.405.783	-	33.864.106
Sirolo	16.351.835	837.016	1.722.264	2.665.091	3.678.387	7.670.008
Numana	47.971.110	2.432.093	5.006.534	7.750.968	10.703.445	21.306.695
San Benedetto	108.652.652	5.661.509	11.648.043	18.022.819	24.872.576	50.455.269

The tourist place more in danger proves to be Gabicce, the only one where economic sustainability would be unsatisfied before to lose 40% of the seashore. Other places react almost in the same way (economic non-sustainability triggering at a loss of 45-47%), even if with very different outcomes in terms of total revenues. In any case, the estimated loss of revenues rate is around half the seashore loss rate, even though the two rates tend to converge at no return point.

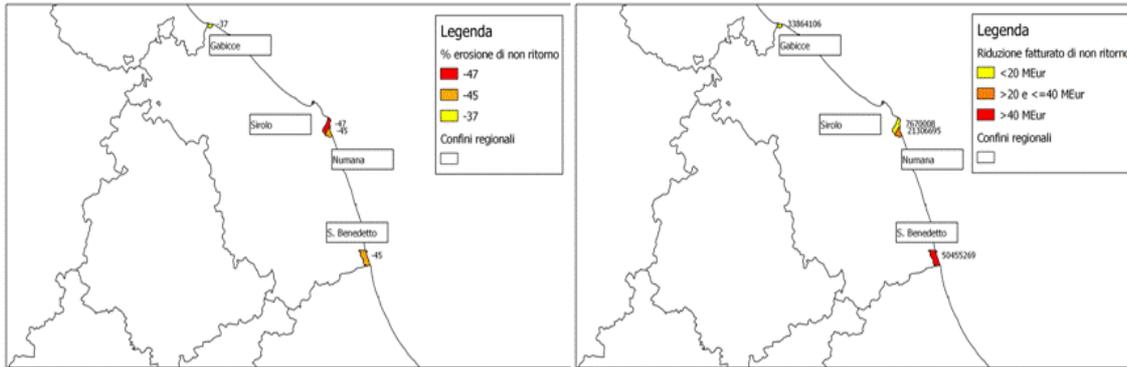


Figure 5-4 Attendance and total revenue reduction as a consequence of seashore loss, total values and percentages.

5.2.3 Coastal protection expenditures

Once estimated the benefits and the potential loss of them, we can compare these figures with the annual expenditure in coastal protection works. We distinguish two kinds of investments: hard works (artificial cliffs and riffs) and soft (nourishments both with sand and gravel).

Hard works annual costs are estimated € 139,22 per linear meter of seaside, a total value resulting from the sum of € 125 (the average investment cost divided by 20 years of alleged duration of the work) with € 14,92 of annual ordinary maintenance cost.

Soft works costs have been estimated in a range between € 1.006,25 (gravel) and € 1.506,25 (sand) perlinear meter each year, with a depreciation time of four years.

Because of these values, a hypothetical intervention to protect the whole coastal line of the four municipalities will induce the following total costs, different according to the chosen option.

Table 5-9 Complete coastal line defense estimated expenditures, absolute values.

	Length (m)	Hard works (€)	Soft works-gravel (€)	Sof works-sand (€)
Gabicce	1.750	243.635	1.760.938	2.635.938
Sirolo	3.750	522.075	3.773.438	5.648.438
Numana	4.750	661.295	4.779.688	7.154.688
San Benedetto	7.000	974.540	7.043.750	10.543.750

5.2.4 Coastal protection: a public good or a club good?

Whatever the chosen technique, besides of the fundamental safety service for population it plays coastal protection is favourable even from an economic-finance point of view: annual investment to protect from erosion goes from 0,4% (hard works in the sea of Gabicce) to almost 35% (sand nourishment in Sirolo, where gravel anyway would fit better) of the total 2011 tourism revenue.

Table 5-10 Coastal protection expenditures-tourism revenues ratio.

	Total revenue (€)	Hard works/Revenue	Soft works-gravel/Revenue	Soft works-sand/Revenue
Gabicce	65.072.003	0,4%	2,7%	4,1%
Sirolo	16.351.835	3,2%	23,1%	34,5%
Numana	47.971.110	1,4%	10,0%	14,9%
San Benedetto	108.652.652	0,9%	6,5%	9,7%

The picture changes notably if we compare investments with estimated revenue loss.

Table 5-11 Coastal protection expenditures-tourism revenues loss ratio.

	Revenues w/ -10% seashore	Hard works/Loss	Soft works-gravel/Loss	Soft works-sand/Loss
Gabicce	3.905.109	6%	45%	67%
Sirolo	837.016	62%	451%	675%
Numana	2.432.093	27%	197%	294%
San Benedetto	5.661.509	17%	124%	186%

From a strictly financial perspective, investment is justified just for hard-works (in all places) and for Gabicce (whatever the protection technique). In all other cases the presumed effort in coastal protection is always higher than the economic loss suffered by the local tourism system with a 10% erosion.

Local tourism system depends on non-negligible public investments. In this sense, they can be assimilated much better to club (or collective) goods, rather than to public goods.

Club goods satisfy place-based needs, and they generate benefits specifically to local communities or social groups. To be provided, club goods ask for a strong investment in coordination. Before to start the collective action to produce them, involved agents have to select priorities, goods to be produced, technical and project alternatives, and so on. Public entities plays a relevant role in their provision, mobilising and using different kinds of resources, but they are intermediate (or place-based) institutions the fundamental actor.

If coastal protection – or a main part of it – is a club good, its provision needs a reshaping: the local tourism system takes advantage from the related conspicuous investments; for this reason, on one hand its representatives must be truly involved in decisions on this activity, on the other hand they must participate directly in financing coastal protection.

6 Implication for MSP and ICZM

6.1 Implications for MSP

Tourism is one of the 11 “human activities” considered in the planning of maritime space contributing to the increasing pressure on the marine habitat. The *European Parliament Directive (COM(2013) 133 final - 2013/0074 (COD))* at point 1 enunciates that “...the high and rapidly increasing demand for maritime space for different purposes, such as renewable energy installations, maritime shipping and fishing activities, ecosystem conservation and tourism and aquaculture installations, as well as the multiple pressures on coastal resources require an integrated planning and management approach”.

All across Europe the tourist numbers in the shoreline represents one of the main revenues in terms of gross domestic product and is combined with terms such as "economic growth" and "sustainable development.". As example, revenues deriving from tourism related activities in the shoreline amount to a total of 3% of the GDP of Marche Region.

Regarding this point the *European Parliament Directive (COM(2013) 133 final - 2013/0074 (COD))* clearly recommends the way for draw up maritime spatial plans (14): “..due regard should be given to these various pressures in the establishment of maritime spatial plans and integrated coastal management strategies. Moreover, healthy coastal and marine ecosystems and their multiple services, if integrated in planning decisions, can deliver substantial benefits in terms of food production, recreation and tourism, climate change mitigation and adaptation, shoreline dynamics control and disaster prevention”. At Art. 3 the directive defines the integrated maritime policy as “to foster coordinated and coherent decision-making to maximize the sustainable development, economic growth and social cohesion of Member States, in particular with regard to coastal, insular and outermost regions in the Union, as well as maritime sectors, through coherent maritime-related policies and relevant international cooperation” as well as the Commission's multiannual strategic objectives of the proposal/initiative, Annex I, section 1.4.1, states “To support sustainable economic growth in the marine waters and coastal zones of the EU”

In this contest the trinomial “tourism – economic growth - sustainable development”, represents an indivisible concept towards maritime spatial planning and the resolution of the conflicts addressed by MSP has fundamentals impacts on it.

Therefore, deal with the tourism carrying capacity of a particular stretch of coastline, is undoubtedly useful information for maritime spatial planning. Also determine the “direct value of an m/sq. of a beach” represents a useful parameter/indicator both for matching different shoreline (example: any economic loss in the event of stranding of hydrocarbons as a result of accidents in off-shore platforms and/or tankers in transit) and as a pressure/exploitation index of the sample shoreline.

6.2 Implication for ICZM

As in most of Italy and Mediterranean countries' coastal regions, tourism in Marche Region is one of the activities that generates the highest economic revenues along the coast, involving millions of people in a limited period of the year.

The anthropic pressure of tourists can represents, if not well planned and directed through the participation of the local stakeholders, one of the main reason of conflicts among activities in the shoreline. Adequate choices

have to be made by the local administrations staying in continuous contact with private and citizens. The local administrators have to be in contact with the technical/scientific sphere that through an accurate monitoring of the territory, of the shoreline and of the sea, addresses the target among the protection of the marine and coastal ecosystem.

The main issues related to tourism and ICZM that Marche Region is currently addressing are:

- a) Beach's concessions in areas at risk (meteorological-marine medium and high intensity flooding events - on going verification by Marche Region Floods Directive);
- b) Public infrastructure such as roads, bike trails, viewpoints, in areas at risk - meteorological-marine medium and high intensity flooding events;
- c) Private camping (on private land) in areas at risk - meteorological-marine medium and high intensity flooding events;
- d) Requests by private individuals for building docks for recreational boating (future requests for dredging to maintain the functionality of the dock with the difficulty of placement of dredged material);
- e) Requests for deeper foundations by Ancona Port Authority (cruise ships and cargo ships of increasing tonnage and the related issue of dredged materials).

Some of this ICZM and tourism related issues will be addressing in the updated Coastal Plan on Integrated Coastal Management of Marche Region in 2014 – 2016.

Issues a), b) and c) are related to long term planning and policies of Marche Region (soil defense). Just think about the issue of natural nourishment that should be reactivated along the "comb" river courses of the entire region through proper maintenance of waterways (cleaning of river beds), transport on the coast of the material accumulated behind over sedimentation the reins and crosses bridges and hydroelectric derivations.

An alternative solution to "natural nourishment" could be coastal defense works both rigid and soft (artificial beach nourishment). This solution involves at least three problems that currently does not seem to overcome:

- a) Financial resources;
- b) Retrieval of large quantities of materials (beach nourishment material - non-renewable resource);
- c) Failure target adjustment to climate change.

Since several years the Marche Region is trying to address Issues d) and e).

Particularly the issue related to sediment dredging is one of the matters which at the moment is still not solved for the following causes:

1. In the main port of Marche Region (the port of Ancona) is actually on going the construction (end work scheduled to end in February 2014) of the depositing site (180,000 cubic yards of average contaminated sediment);
2. Sea areas dedicated to discharge of sediment cannot be used for beach nourishment (high presence of silt and clay).

The concept of "sustainable development" does imply choices related to decreasing the pollution of sediments within the docks (ports) The depositing site often represents new works (hard) placed along the wing coast with all the problems related and do not seem to be the ideal solution, especially in times of crisis (unused yards built in the proximity of the depositing site in the port of Livorno - Tuscany).

6.3 Innovative aspects of the project

Innovative aspect of the project is related to the replicability of the economic analysis's model on any other coastal sites simple using a spreadsheet and a GIS platform, even for non-expertise in economic matters.

7 Conclusions

In the previous pages has been built a model aimed on one side to estimate the impact on the current economic ("static") of tourism factors in four samples sites of Marche Region, on the other hand aimed to provide the evolution ("dynamic") of this impact in the case of reduction of the coastline (result of erosion events). The model is based on a simple set of equations and parameters, easily manageable with a normal spreadsheet and the results of which are well-returnable through a GIS system.

The model is updated by a series of official data related to tourism indicator, with a direct correlation between the precision of the collected data (completeness, continuity, temporal dimension of minimum aggregations) and the rate of refund. Furthermore the model is enough flexible to operate through estimated values and hypothesis.

In the pilot project the output summarized in the indicator "*tourist value of the square meter of beach*" reveals how San Benedetto del Tronto and Gabicce produce more revenues of Riviera del Conero. Gabicce features are favourable to young tourists with minor spending capacity, but records the values in line with a more exclusive use. This feature is also reflected in the fact that Gabicce appears more receptive to an eventual reduction of the beach (lost revenue and rapid decline).

Last issue addressed was the comparison between the reduction of tourism revenues as a result of potential erosion events and coastal defense estimated costs. The comparison shows that the cost incurred by the public body for nourishment is less than the potential loss of tourist revenue only in the case the levels of erosion exceeds 20% of the total beach (75%), while the intervention is financially justified as regards solid defences (parallel or perpendicular breakwaters).

Whatever technique used, there is a correlation between revenue of the local tourism system and investment in hard-structures, so as to be able to say that they represent a "*common good*". This consideration may be the starting point for a discussion on the most proper model for financing these infrastructures, a model that requires even the private economic system that recognizes and consequently granted to its institutions a representative participation in decisions process.

It is emphasized that "*common goods*" (otherwise known as "*selective common goods*" or "*club goods*") are particular goods, generating external economies only for specific target groups. In this sense, "*common goods*" are exclusive because those who are "*in the club*" (a specific group) enjoy it, but those who are "outside the club" (not deriving benefit from the asset itself) haven't any interest in joining the club. The "*common goods*", finally, satisfy specific localized requirements and generate benefits for entire communities or social groups. In this case the most important issue is the capacity to produce these goods through investments in coordination policies.

This means that, before launching collective action, public entities must decide which requirement satisfy, which infrastructure realize and with which technical and planning alternative.

Conclusive findings of the whole pilot project are summarised in **Errore. L'origine riferimento non è stata trovata.** according to the 4-pillars matrix common to all pilot projects. The matrix intends to highlights: (i) main outcome and deliverables of the project, (ii) improved skills, (iii) possible future uses of the project outcome, (iv) future opportunities and conflicts related to the evolution of pilot project contents in an MSP perspective.

Figure 7-1 Conclusive findings of the pilot project.

		Output			
Capitalization	<p>What we have done</p> <p><i>A replicable economic analysis aimed at define the indicator "economic value of a beach square meter - €/m²".</i></p> <p><i>Analysis of satellite imagery estimating the use of a beach from the point of view of tourism</i></p> <p><i>Comparison between public investment in coastal protection and benefits for the community</i></p>	<p>How can we use output in the future?</p> <p><i>Replicate the model of economic analysis in other tourist sites</i></p> <p><i>Creating a GIS model - tourism data collection</i></p> <p><i>Ratings on public investment in terms of coastal defense and return in terms of benefits for the community</i></p>	Looking Forward		
	<p>What we have learned/Skills improved</p> <p><i>An indicator (economic value of a beach square meter - €/m²) for feedback on tourism, profitability and pressure from tourism</i></p> <p><i>The importance for coastal defense of the involvement and participation of the private actors (economic operators) being (often) the beneficiary of public investment</i></p>	<p>Opportunities</p> <p><i>Involvement of private actors in decision-making</i></p> <p>Criticalities</p> <p><i>Private interests and economic aspects of tourism in a limited area such as the coastal one; subsequent lack of planning in favour of the short-term actions</i></p>			
		Skills			

8 References

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