Abandoning the Apennines? The Anthropo-systemic value of the Italian inner areas within the 2016-17 seismic crater

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Abstract

This paper aims at contributing to the academic and political debate about the future of inner areas, which swings between the request for public policies designed to reverse their socioeconomic marginalisation on the one hand, and the request for their abandonment on the other hand. After having discussed the rationale underpinning these opposite views, we propose to contextualise the notion of territorial capital to inner areas. This theoretical approach, labelled as Anthropo-systemic approach, results into an empirical methodology aimed at quantifying, when possible, the monetary value of the territorial assets included in the Italian inner areas of the 2016-17 seismic crater. Results suggest that the abandoning option is a mistaken strategy, even when the sole public budget is considered, and call for a new generation of policies where human presence is a factor of identification, regeneration, and activation of local capital.

Keywords: Territorial capital, Anthropo-systemic value, Inner areas, Territorial policy, Evaluation of local assets

JEL codes: R1, R5, R11, R58.

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1 Introduction

Population shrinkage of large areas is one of the major challenges of the twenty-first century (Gross, 2008). It affects many developed countries (Reher, 2007; Elshof et al., 2014) but it is particularly intense in inner peripheries, covering 80% of rural areas in Europe (De Toni et al., 2021), where it has become a key social and economic issue. The recent European elections, the referendum on Brexit, and the US election revealed the existence of a widespread social discontent related to the peripherality gradient, arising from the so-called 'places that don't matter' (Rodriguez – Pose, 2018) or the ‘left-behind places’ (Wuthnow, 2019). Marginalisation, which in the past has mainly affected contexts that were not able to undertake sustained patterns of industrialization, now involves new areas of economic and social distress caused by globalisation (Wood, 2019).

Population decline is always considered an intrinsic consequence of the modernization process marked by migration flows towards urban environments, which provide more and better job opportunities, a comfortable lifestyle, easy access to private and public services, and a wide range of social connections (Elshof et al., 2014; Collantes, 2009). Many peripheral settings, on the contrary, fall into a downward spiral (Pike et al., 2010) in which demographic contraction leads to a loss of economic functions (Leetmaa et al., 2015), population aging (Reynaud & Miccoli, 2019) and further depopulation caused by an unbalanced age structure (Bucher & May, 2005). This ‘demographic malaise’ (Golini & Lo Prete, 2019) has been further accelerated by exogenous shocks, such as the 2007-2008 Great Crisis (Reynaud & Miccoli, 2019) and recurrent natural disasters (Coronese et al., 2019). These events, unfortunately, can be considered structural in many mountain areas that are already affected by a prolonged economic and social decline, also known as ‘slow burn’ (Pendall et al., 2010).

The inertia of the demographic phenomena may jeopardise the future of many places: population decline is a self-reinforcing process (Elshof et al. 2014) that, below a given threshold, becomes irreversible. Massive settlements and farmlands abandonment raises great concern about their economic and social impact (Wang, 2019), the survival of cultural heritage, traditional folklore and biodiversity (Rey Benayas et al., 2007; Basile & Cavallo, 2020). Currently many places are close to such a turning point, which implies entering the uncharted and worrying scenario of definitive abandonment (Reher, 2007). The related political and academic debate swings from two opposite choices: inner areas must be the target of place- and people-based policies aimed at reversing this process, or, on the contrary, they must be abandoned since market forces will inexorably continue polarising the socioeconomic potential within urban areas. This dialectic follows the dilemma of European policies (Amcoff, 2007) aimed at finding out a balance between territorial competitiveness and cohesion (Fratesi & Perucca 2020; Maly, 2018).

As of today, the importance of inner areas has been often neglected in the academic debate (Sørensen, 2018) and largely underestimated by a certain kind of statistical analysis based on an urban-centric perspective (Basile & Cavallo, 2020). Although the scarcity of sub-regional data has encouraged ideographic and qualitative accounts, inner areas also need large-scale quantitative studies to grasp the complexities of rural settings (Milbourne, 2007) and to achieve a holistic view of rural decline.

To fill this gap, the aim of our paper is to describe the multifaced value of peripheral areas, providing an assessment of the monetary and non-monetary costs and savings inherent in the abandoning-not abandoning dilemma, and to eventually support the related decision process. To this purpose we propose exploring peripheral areas through an original perspective based on two interlinked pillars:

a) the notion of territorial capital (Camagni, 2008; 2009), defined as the amount of material and immaterial resources which are embedded at the local level and result from a long lasting co-evolutionary process between local societies and territory. Specifically, Camagni and Capello (2013) propose a classification of the different factors that form the territorial capital, based on a 3x3 dimensions-matrix: their degree of rivalry (high, medium, and low) and their degree of materiality (tangible, mixed, and intangible goods). This notion, however, must be extended and adapted to the peculiarities of peripheral contexts (Bristow & Healy, 2014), since territorial capital was originally introduced to explain the different performance in regional competitiveness.

b) an Anthropo-systemic approach. By assuming that the value of the territorial capital is intrinsically related to human presence, we agree that the surfacing of the latent components of territorial capital is a necessary but not sufficient condition for local development. Inner areas, in fact, are often characterised by semi-natural landscapes which result from the combined action of a secular local human activity and its natural elements (García-Ruiz et al., 2020), as shown by peculiar forms of agricultural, forest, and pastoral activities. In this view, some scholars claim for the need of an anthropo-biocentric approach (Magnaghi, 2010) or an anthropo-systemic assessment (Marceau, 2016) to explore territorial complexity, arising from the interdependence between spaces, communities, and individuals. We address this relatively under-explored issue by introducing the concept of Anthropo-systemic value, intended as the positive externalities arising from the human-nature relationship, a concept particularly suited to the polycentric and dense networks of small-sized villages of the Italian Apennines constituting our case-study.

The remainder of the article is as follows. After having discussed the issue of inner areas and contextualised the notion of territorial capital, we consider the rationale underpinning both the abandoning and the remaining options. An empirical section aimed at attempting to assess costs and benefits of keeping human presence within peripheral context follows. Its results will be subsequently discussed, eventually leading to some policy suggestions.

2 Inner areas and territorial capital

The intense industrialisation phase experienced by southern Europe in the second half of the 20th century caused rural depopulation, broadening territorial divides. Demographic fall, in fact, reinforces economic decay, reduces accessibility to public services, hinders occupational and consumption opportunities, and undermines social cohesion (Li et al., 2019) as well as the quality of life in several peripheral contexts.

Since the turn of the 21st century, this vicious circle has further been accentuated by the spread of the so-called Knowledge Economy (KE), an economic paradigm based on knowledge-based activities and innovation. KE is characterized by a two-way cause and effect relationship with urban contexts, where the highest level of knowledge and innovation potential is available (Jacobs, 1969). The presence of wage-enhancing opportunities, consumer-oriented services, and urban amenities (Berry & Glaeser, 2005), as well as the quality of life (Florida, 2002), attract highly educated, and skilled workers. Cities, in brief, allow 'the selective geographical matching of productive resources, skills and institutions of coordination' (Storper & Scott, 2009), giving rise to a polarizing circular cumulative causation *à la* Myrdal. At the same time, inner areas have been increasingly characterized by an opposite process which has led to an even lower demographic density and sparser population. This trend has further worsened their character of remoteness, which have become an unsustainable constraint in a globalized and interconnected world. In the last decade, even many industrial districts which were grown in the urbanised countryside far from large cities, are struggling facing global competition (Compagnucci, 2012).

Even though these causality effects are well-known, most of the current related literature misses a comprehensive assessment of the costs of an irreversible desertification related to the ongoing slow-burn process (Pike et al. 2010), regarding 'geographically remote, economically marginal, politically powerless and socially inhomogeneous' (Blowers & Leroy, 1994, 203) settings, characterized by scarce endowment in infrastructures (Gormar & Lang, 2019), social capital (Leibert & Golinski, 2017), and effective institutions (Tödtling & Trippl, 2005). In spite of the importance of these criticalities, several scholars claim that the endowment of inner areas is still underestimated because of the hegemonic role played by approaches 'placing higher value on metropolitan or economically growing regions' (Gormar & Lang, 2019, 488). This calls for a careful reflection on the role of contextualised factors and path-dependent processes in the local development trajectories (Webber, Healy, & Bristow, 2018), especially in the globalised world, where the importance of factors embedded at the local level has re-emerged.

With this as the premise, the first task to be accomplished to assess the value of the inner settlement is the identification of local assets, which represent markers of local identity. In order to achieve this

objective, we use the notion of territorial capital, which refers to the stock of space-specific resources available to the inhabitants of a territory, labelled as 'common goods for a local community' (Ventura et al., 2008, 160). This definition introduces a comprehensive and holistic view since it considers the whole set of resources that are generated and embedded in each place (Camagni, 2008). In this perspective, territorial capital originates in the combination of a wide list of local assets investigated by different disciplines and comprehensive of 'all the relevant engines of growth described by the mainstream literature on development' (Perucca, 2014, 738). All these elements have been generally considered individually, in terms of human, physical, social, and public capital. In addition, considering the private, public, or mixed nature of rivalry (Camagni, 2008), allows to assess also latent, non-market goods that directly affect residents' wellbeing (Waltert & Schläpfer, 2010).

Recently, scholars have emphasized the key role played by territorial capital in shaping both regional performance (Perucca, 2013; Camagni & Capello, 2013), sustainable development strategies (Ruiz Pulpon & Canizares Ruiz, 2020), and the construction of local identity (Capello, 2019). These assumptions suggest that the issue of the empirical assessment of territorial capital can no longer be postponed. Even though some efforts have already been carried out (Castelnovo et al., 2020), its quantification remains a quite challenging task. Major obstacles arise from the shortage of appropriate proxies, as well as from the amount of heterogeneous assets each of which requires specific measures, and the lack, or scarce availability, of data at the local level.

This quantification is even more difficult within inner areas, where a substantial part of the constituents of territorial capital involves non-market goods and services. Territorial capital, as mentioned before, was originally conceived to assess regional competitiveness affected by the hypermobility of labour and capital (Bristow, 2010) caused by the globalisation process. Unlike neoclassical regional growth models had provided for, the mobility of the factors of production was lower than expected and held back by fixed costs, specific regulations, physical constraints, individual needs, and polarisation effects. In other words, space matters, and therefore territorial capital should be contextualized (Bristow, 2010), especially when focusing on inner areas, and re-scaled at the municipal level (Benassi et al., 2020). Missing this contextualisation risks enabling a poor level of sensitivity to local contingencies, which can feed biased expectations, ill-suited policies' (Markey et al., 2008, 342), and prevents local capital from being considered in local planning despite its potential role in promoting endogenous development in peripheral areas (Sørensen, 2018).

Each territory has its own specific form of capital (Toth, 2015), arising from the continuous interplay of the anthropic and natural systems that can hardly be assessed through narrow, and single-sector views (Dezio, 2020). The concept of Anthropo-systemic value suggests that a profitable exploitation of this hybrid capital (economic, historical, social, aesthetic, anthropological, cultural, environmental,

and artistic) only occurs in a systemic way, when activated by human presence: ancient houses, which represent an architectural, cultural and historical value, need dwellers; cultural and artistic heritage require both visitors and custodians; fields require farmers, herdsmen and livestock breeders.

Making a detailed list of local assets is a necessary but not a sufficient condition for counteracting multiple challenges (environmental fragility, population shrinkage, and socio-economic marginalization) faced by slow-burning inner areas: they may positively influence economic resilience (Fratesi & Perucca, 2019) or stimulate endogenous development, but only in so far as the presence of residents is provided.

3 Inner areas and natural disasters: should we stay, or should we go?

The depopulation of the mountain areas, which started in the second half of the 20th century, has nowadays reached a critical crossroad. Globalization and ICT progress have increased the polarisation of factors and exacerbated the vulnerabilities of settings poor in market-related territorial capital (although rich in non-market assets). Besides, recently, the slow-burn affecting inner areas has been emphasized by exogenous shocks, such as the 2007-2008 Great Crisis and the subsequent recession it caused, the 2009 and 2016-17 earthquakes which hit respectively L'Aquila and the inner areas of Central Italy, the 2020, and still ongoing, Covid-19 pandemic. In particular, the 2016-2017 earthquakes have substantially worsened the declining trend of the affected ares: the material destruction of several mountain villages and settlements, the related temporary population displacement in the coastal areas which, in some cases, has become permanent, and the magnitude of the reconstruction costs, have raised many concerns about the future of these areas. The situation, in some cases, is so impaired that it has given rise to a political and academic dilemma: should we (as a society) abandon or, on the contrary, invest in these areas, being aware that reaching the goal of reversing depopulation is quite an uncertainty task (Pezzi & Urso, 2017)?

The first option is supported by those who believe that mountain settlements represent an unproductive social cost, endowed with a kind of human and natural capital that is difficult to preserve and hardly generate profits. Most of these studies focus on the public expenditure issue, arguing that a sort of 'organised depopulation' should be pursued in human settlements where an insufficient demographic size impairs the economic viability of service providing, be they public or private (Orcao & Cornago, 2007). In addition, conservationist literature is mainly focused on the negative impact of human activities on fragile environments (Navarro & Pereira, 2015; García-Ruiz et al., 2020). The final exodus from marginal and peripheral areas would bring positive effects, such as the progressive balance between population and available resources as well as the reduction of pollution

and soil erosion, and, thus, the recovery of the natural eco-systems (Gross, 2008; Navarro & Pereira, 2015; García-Ruiz et al., 2020; Schnitzler, 2014; van der Zanden et al., 2017).

Rewilding strategy, however, is controversial if applied to 'cultural landscape' (García-Ruiz et al., 2020), which are historically shaped by the interaction between man and nature. This approach underestimates the rising costs and the loss of benefits, also in terms of wider positive externalities, related to the creation of a large, uninhabited 'green desert' in the heart of Italy. Woody plant encroachment, bushy pastures and/or arable lands, paths infested with invasive vegetation produce soil erosion, contributing to undermine water resources, landscape and cultural heritage, and causing landscape homogenization, greater fire risk, and streamflow declines (Rey Benayas et al., 2007; García-Ruiz et al., 2020). Pathologic upland abandonment generates huge damages and consequent expenses related to the lack of maintenance, that can even affect downstream towns and cities.

The second option, on the contrary, contends that, in order to enhance biodiversity and to safeguard the heterogeneity of cultural landscapes, the management of local environment is essential (García-Ruiz et al., 2020). In the Apennines' context, ecosystem services also depend upon the positive externalities provided by certain types of human activities, such as the forestry. In this view, the woods can be considered as a collective good (unlike the forest, where wilderness rules) requiring community rules so that its resources can be used effectively, without dissipation. The Vaya tempest which severely hit Northern Italy on 29th October 2018 causing the felling of 42 million trees over an area of 41,000 hectares (Motta et al., 2018), is a clear example of the importance of this relationship. The storm affected more severely the forests which had been left to the regrowing process, with no human intervention. Forestry management, consisting for instance in providing sufficient space among the trees, would have limited such heavy damages, and allowed to keep providing ecosystem services (Tymstra et al., 2020). The same applies when residents are employed in low-impact activities, like small and sustainable touristic business or even extensive livestock, that may fulfil an ecological restoration strategy aimed at maintaining the functionality of these complex environments (Schnitzler, 2014; García-Ruiz et al., 2020) and improving the provision of eco-systemic services. On the contrary, if this second option was only, or mainly, based on tourism flows of affluent and self-sufficient people temporary living in these areas, the risk of gentrification connected to an unsustainable consumption model for fragile contexts, would likely increase (Barca et al., 2014).

In this view, public interventions targeted to inner areas should be primarily aimed at preventing the deconstruction of local communities from becoming an irreversible process: this action can no longer be postponed, bearing in mind that no action is action as well (Gross, 2008).

4 The case study: data, methodology, and main results

In this paragraph we attempt to provide empirical evidence to the considerations discussed in the theoretical section through a two-step approach: a) The spatial identification of municipalities at risk of abandonment (MRA), and b) the assessment of the Anthropo-systemic value of MRA. Both the selection of MRA and the methods to assess their Anthropo-systemic value have been inspired by a conservative approach, aimed at minimising both the extension of the concerned area and the value of its territorial assets. Data, when possible, have been collected for the year 2015, thus before the 2016-17 seismic events.

4.1 – Municipalities at risk of abandonment (MRA)

MRA have been sought within the 2016-17 seismic crater area, which is located in three Central regions (Lazio, Marche, and Umbria) and a Southern one (Abruzzo) of Italy, latitudinally crossed by the central Apennines Mountains (Fig. 1). It covers an area of approximately 8,000 km^2 inhabited by about 600,000 people living in 140 municipalities, most of which are located in the Marche region (60 % of the population of the crater).

[Figure 1 about here]

This is a prevalently mountain area: while only 18.1% of municipalities are considered non-mountainous, 75.4% are classified as totally mountainous and the remaining 6.5% as partially mountainous. Although the crater hosts the provincial capital of Teramo, Macerata, Ascoli Piceno and Rieti, its settlements' fabric is markedly polycentric and dominated by small-sized municipalities: those with less than 2,000 inhabitants account for 68% of the total population (Compagnucci & Morettini, 2020).

What is the rationale in focusing on this area? In addition to data availability constraints, which, at this stage of the research would have prevented a comprehensive analysis of all the Italian inner areas, the choice depends on the fact that the seismic crater can be considered the quintessential of remote rural and mountain areas, with few flat, fertile soils, scarce accessibility, a harsh climate and rugged orography. Population shrinkage reaches here a particular intensity, as well as the level the risk of agricultural abandonment (van der Zanden et al., 2017). Furthermore, this is one of the most seismic areas in Europe (Zullo et al., 2018), where endogenous and exogenous shocks both add up in causing decline and potentially driving to a definitive settlement abandonment, the last step in the process of village hollowing (Di Figlia 2016; Wong, 2020; Mc Leman 2011). Lastly, the area of the study case hosted a homogeneous and original civilization, organised according a polycentric settlement model

based on villages which date back to the 12th-13th centuries (Wickham, 1988; Di Méo, 1991), which left for posterity a huge cultural, architectonical and historical heritage.

MRA were identified and selected according to the following criteria:

1) They must be included within the category of inner areas, characterised by low accessibility to basic services, such a health, education, and transport (Barca et al., 2014);

2) Their resident population must be lower than 1,334 inhabitants, this latter being the average population of the municipalities within inner areas with less than 5,000 inhabitants, thus considered as small-sized municipalities;

3) They must have experienced a population loss between 1951 and 2011 higher than 47,7%, this latter being the average population loss of the municipalities within inner areas with less than 5,000 inhabitants. This criterium indicates a chronic loss of population in a territory that it could be affected by "slow burn" (Pike et al., 2010).

[Figure 2 about here]

Based on this algorithm, 42 MRA have been identified (See Figure 2 and Table A in Statistical Appendix), representing the part of the seismic crater at higher risk of abandonment (and desertification). By providing an estimation of the territorial capital based on the notion of anthropo-systemic value on a relatively large sample of villages at risk of desertification, we fill a gap in current literature, which rarely investigates the municipal level.

4.2 The Anthropo-systemic value of MRA

The second step of the empirical analysis consists in estimating costs and benefits related to the existence of MRA. Table 1 summarizes the variables used to proxy the savings in terms of public expenditure related to the abandonment of MRA as well as their Anthropo-systemic value. Specifically, we consider those local economic activities and territorial capital assets which are intrinsically related to the human presence: agricultural, livestock and touristic activities, the real estate stock, the ecosystem service, the architectonical, historical, and cultural heritage.

With respect to the territorial capital taxonomy proposed by Camagni and Capello (2013), we mainly focus on the tangible goods dimension according to different degrees of rivalry, such as the buildings stock, belonging to the category "private fixed-stock capital" (high rivalry), cultural heritage, belonging to the category "impure public goods" (medium rivalry), and natural resources, belonging to the category "impure public goods" (low rivalry). This choice is consistent with the acknowledgment that tangible goods are the pillar of inner areas' territorial capital, where, on the

contrary, relational density and agglomeration externalities play a minor role (mixed goods, in the Camagni and Capello matrix), as well as the intangible goods (human, relational, and social capital in the Camagni and Capello matrix), weakened by decades of socioeconomic marginalisation. However, a potential research development regards exactly the intangible goods, such as the common exploitation of some natural production factor (Di Méo, 1991), which contribute to the substantial systemic character of the mountain settings. Various forms of ownership coexist and complement each other: families have their own assets but, at the same time, they can use common land for pastures and woods. This territorial organization represents a form of social capital which enhances local development, reduces transaction costs, opens access to knowledge, promotes economic spillovers (Westlund, 2006) and thus ensures social, economic, demographic, and environmental equilibrium. Community relations are not constraints to freedom but conditions for a development based on reciprocity, on 'another way of owning' and therefore difficult to estimate when compared to the market relationships. Nonetheless, they eventually result in wellbeing outcomes.

Table 1: about here

1. Direct public expenditure savings (DPES). Costs referred to the functioning of local public administration between 2010 and 2014 have been derived from "Open bilanci" (Open Municipal Budgets[1]). Each budget item is reported in Euro (current prices) and has been split into two different categories (Table B in Statistical Appendix):

a) costs which cannot be eliminated (FC), even in case of abandonment of MRA, such as those related to the presence of cemeteries, as well as those which are incurred by municipalities as part of a 'system' or 'network' (road systems, water infrastructures) and that will probably be covered by a different public administration. These expenses have been arbitrary considered at the 10% of their average value between 2010 and 2014, always to respond to the need of a conservative approach;

b) costs which can be eliminated or minimum expenditures (ME) which regard all the other services provided at the municipal level. According to the following formula:

$$DPES = \mathrm{ME} - 0{,}1 * \mathrm{FC} \qquad [1]$$

Data show that the public transfer for the functioning of local public administration of MRA amounts to about 13 million Euro, equal to 502 Euro per capita, of which 3 million Euro minimum expenditures (Table b in Statistical Appendix).

[1] Source: https://openbilanci.it

2. Local economic activities (except for agriculture). Data provided by the Chamber of Commerce show that, in 2015, MRA's local firms amount to 183, employing 1,048 people and generating a turnover of 136 million Euro, whereas total individual income subject to taxation amounts to 253 million Euro (of which 43,3% are old-age pensions), equal to 14,316 per capita[2].

3. Agricultural activities. Albeit an important and ongoing contraction, they represent an important economic engine of inner areas. Although they provide a substantial contribution in terms of safeguard of landscape and land quality (Battaglia et al., 2019), we only focus here on market production. To assess its value (AAV), which is closely interlinked with the work of local farmers and which would cease in the absence of inhabitants (since farming, and especially animal production, requires a continuous human presence), we first consider the average agricultural land value (ALV) in Euro in 2015 per hectare and per each type of crop (*j*) at the municipal level (*i*), provided by the Italian Revenue Agency. Farm value is thus given by the sum of the products of the monetary values of the different type of crop[3] and the utilised agricultural area (UGA) per municipality:

$$AAV = \sum i \sum j \, (\mathrm{ALV}_j * UGA_j) \qquad [2]$$

In 2015 it amounts to 438,7 million Euro[4] (Table c in Statistical Appendix).

4. Animal production. Like agricultural activities, animal production (AP) plays an important economic role within inner areas. Its assessment is based on the definition of Standard Output (SO), which, according to Eurostat[5], results from the average monetary value in Euro of the agricultural output at farm-gate price, per hectare or per head and type of livestock (*j*). Animal production value is thus given by the sum of the products of SO, provided by CRA-INEA for the Marche region in 2015, and the number of livestock (NL) per type and per municipality:

$$AAV = \sum i \sum j \, (NL_J * SO_J) \qquad [3]$$

The estimate of animal production amounts to 49 million Euro (Table d in Statistical Appendix)

5. Real estate assets. It is assumed that municipalities' abandoning will result in the progressive ruin of the dwelling stock (coupled with the abandonment of public spaces) and subsequent loss of value of the residential buildings (VRB). Drawing from the 2011 Census of the Italian population, we

[2] Ministry of Economy and Finance.

[3] Istat, Census of Agriculture, 2010.

[4] An informal interview with an official of the Department of Agriculture, rural development and fisheries of the March Region has highlighted that this value has grown since 2011, due to the increasing importance of grasslands and of public transfers.

[5] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Standard_output_(SO).

considered the total area in square metres of dwellings occupied by residents (AREA_OCC) in different kind of localities (central, peripheral, scattered), and the minimum monetary value of residential buildings in 2015 (MMV, Euro/m2 by locality) provided by the OMI dataset[6].

$$VRB = \text{AREA\_OCC} * \text{MMV} \qquad [4]$$

The resulting VRB amounts to 648 million Euro, reflecting potential monetary loss caused by the abandonment of the real estate stock (Table e in Statistical Appendix). In case of abandonment, we expect a rapid slump of VRB. It is worth noting that this value is referred to the sole 34,5% of the total building stock, whose majority consists of not occupied dwellings. Furthermore, these latter are usually second homes, which, in terms of public budget, pay a higher municipal tax on immovable property than primary residential property.

6. Core tourism activities. It is assumed that the desertification of MRA will also lead to the loss of the local tourism industry. If this assumption is quite strong, it is nevertheless true that the decision to abandon MRA will result in the cut of water, energy, and gas supply[7], making it particularly challenging the provision of standard touristic services. To estimate their economic value, we considered accommodation and food service activities. Regarding the value of accommodation service (VAS), we use the information regarding: a) presence (NPRES) and arrivals of Italian (ita) and foreign (for) tourists[8], and b) the different kinds of expenses (travel, accommodation- ACC) and extra-expenses - EXP) of Italian and foreign tourists[9]. We then multiply solely accommodation and extra costs by the presence:

$$VAS = NPRES_{ita} * (ACC_{ita} + EXP_{ita}) + NPRES_{for} * \left(ACC_{for} + EXP_{for}\right) \qquad [5]$$

Based on this formula, accommodation generates a monetary value of 13,4 million Euro (Table f in Statistical Appendix). As for the value of food service (VFS), we considered the number of its employees at the municipal level (EMP) in 2015[10], and the amount of the regional turnover in food service activities (RTFS) per employee for Abruzzo, Umbria, Lazio and Marche region[11] in 2015.

[6] The Italian Revenue Agency.

[7] As previously mentioned, one of the reasons at the basis of the willingness to abandon MRA is the fact that the provision of basic services in these areas is uneconomic.

[8] Istat, Capacity of tourist accommodation establishments by type of accommodation and municipality - 2015

[9] Marche Region tourist observatory

[10] Istat, ASIA database.

[11] Istat, Enterprises economic indicators – regional level.

We finally selected the Abruzzo's turnover (the lowest value, equal to 44,000 Euro/employee) to be multiplied by the number of employees (Table g in Statistical Appendix).

$$VSF = EMP * RTFS \quad [6]$$

Food service activities generate a monetary value of 131 million Euro.

7. Ecosystem service. Land management improves the provision of services, both in terms of quality and quantity. According with the availability of data at the municipal level, a (very partial) measure for the monetary value of ecosystem service (MVES) can be provided by the carbon sequestration capacity. Following Matthews & Lave (2000), who apply the method of external costs avoided, this value can be calculated by multiplying different PM10 sequestration coefficients[12] (PMc) by the extension of woods managed by agricultural farms[13] (EWAF) and by the average cost per each ton of PM10 emissions (ACPM), which was equal to 4,828. Euro in 2007 (Table h in Statistical Appendix). Always responding to a conservative approach, we used the lowest sequestration coefficient (broadleaves forests) for all the MRA.

$$MVES = PMc * EWAF * \text{ACPM} \quad [7]$$

The final monetary contribution amounts to about 36,9 million Euro in terms of costs avoided.

8. Lastly, we consider all the benefits related to the presence of cultural capital, which is defined as 'an asset which embodies, stores or gives rise to cultural value in addition to whatever economic value it may possess' (Throsby, 1999). It often includes public or common goods, physical (buildings, monuments) or intangible assets (folklore, traditional practices) that do not necessarily provide monetary revenues, including both indirect benefits to society as a whole and an existence value disengaged from its use and shaping collective identity and local landscape. The Superintendence for Architectural Heritage and Landscape has identified in the selected area 15 artistic excellences (certified with the Italian Touring Club - TCI - stars'), 25 museum, 9 libraries but even 1.852 protected assets encompassing 692 houses, 479 churches, 171 palaces, 46 towers, 22 mills, 20 city walls, 19 bell towers, 17 sacred aediculas, 15 convents, 14 cemeteries, 13 villas, 12 castles and other types of assets. We therefore provide quantitative evidence of a historical legacy always neglected, or at most

[12] According to Matthews & Lave (2000) the different PM10 sequestration coefficients are equal to 160 kg ha/year in the case of broadleaves forests, 490 kg ha/year in the case of coniferous forests, 325 kg ha/ year in the case of mixed forests.
[13] Istat, Census of Agriculture 2010

restricted to few artistic masterpieces. The adoption of different metrics is the only way to include cultural heritage in the computation of territorial capital, overcoming the difficulties in monetary assessment of the non-use value, which represents a major contribute of the heritage capital of inner areas (Sagger, Philips & Haque, 2021).

4.3 Discussion of the results

Based on the results of the empirical analysis and using a purely accountancy-based approach, the abandoning option might appear to be an effective strategy. It would allow public savings for 13 million Euro, which, however, being reported gross of the expenditures to be incurred anyway, equal to about 2,6 million Euro, would generate a net saving of about 10,4 million Euro. In addition, we shall consider the advantages arising from the relocation of people, employees, and firms elsewhere. Individual income would be taxed in a different municipality, where a more effective provision of essential services would be possible due to the presence of agglomeration economies, which, in addition, could also positively affect firms' turnover. In conclusion, the abandon option could result in reduction of public transfer, higher level of private and public investment where the 'territorial interest rate' is higher, and a better exploitation of human capital currently underused. However, this is only a part of the whole story, which must be discussed in the light of several potential losses.

Assuming a) a low level of factor mobility in the agriculture and tourism sectors (the abandonment option will immediately devalue their fixed capital, possibly lowering their investment capacity); and b) a very conservative flat tax rate equal to 1% for agriculture (whose value amounts to about 488 million Euro – AAV+AP) and to 20% for the tourist sector (whose turnover is about 144 million eURO– VAS+VSF), it follows that the 10 million Euro savings for public budgets will be lower than the tax revenues losses, amounting at least to 33,6 million Euro. This result itself questions the economic effectiveness of the "should we go" option, without considering the 36,9 million Euro of cost avoided related to the carbon sequestration, a service provision for which mountain and inner areas should be paid, the losses in the cultural and historical heritage, and the immediate depreciation of the local building stock, whose value is about 650 million Euro.

From a theoretical perspective, our analysis shows that inner areas are neither empty nor devoid of meaning places; rather, they possess a specific territorial capital based on peculiar pillars. 'Territory is a natural and cultural product, individual and collective at the same time' (Dezio, 2020), especially the Apennines, which can be considered 'in-between' places' – neither densely populated human settlements nor pure wilderness areas (Bryant et al., 2011) – that incorporates the centuries-old efforts of its inhabitants.

These considerations have been tested in a fieldwork focused on the villages of Biselli and Cortigno in the Umbria region. Biselli is a village located in the Corno valley, near the busy road to Norcia. The village was abandoned in the ’80s of the last century and the extemporary attempts to renew some houses were wrecked among the brambles, the rubble, and the absence of social relations induced by an irreversible desertification process. About 500 meters higher, there is the village of Cortigno, an eagle's nest on the top of the mountain overlooking Biselli. Despite its remote position (it is accessible only by a winding, shabby and exposed road of 22 kilometres), Cortigno is still inhabited by some staunch residents, whose presence gives both economic and cultural value to buildings, lands, churches, and historical vestiges. Biselli and Cortigno confirm that space acquires most of its meanings through the life it hosts.

5 Policy and future perspectives

The paper provides an original descriptive and interpretative approach to inner and mountain areas supporting the idea that investing in these places is not only a moral duty but is likely able to generate benefits for the future of local and national societies. The next steps related to this research project regard its two main limitations: the limited territorial dimension of the case study and the selected assets of territorial capital. We aim to expand the analysis at the country level focusing also on the intangible goods dimension, as, for instance, the exploitation of common lands by local communities. Facing the issue of inner areas requires estimating the irreversible cost of abandonment in monetary, relational, cultural, and environmental terms. Unfortunately, the identification of a systemic and holistic set of indicators has not received the attention it deserved: inner and mountain areas are penalized by interpretative models conceived for other contexts, which induce stereotyped and distorted reflections on territories where time is perceived as immobile (anachronism) and space is empty (anatopism).

We need interpretative models with temporal depth, able to understand development paths, persistence and discontinuities embedded both in the landscape and in residents’ memory, to identify the potential of places. In this perspective, the concept of territorial capital helps us to consider the issue of preservation of the local assets. The term capital indicates something temporary in nature, which may be accumulated or devalued. It therefore requires maintenance to avoid the deterioration induced by exogenous and/or endogenous factors (Toth, 2014). This involves a territorial planning based on regeneration of endogenous (material and immaterial) resources because all that does not regenerate, degenerate (Morin, 2001).

Anatopism, on the other hand, is linked to the vertical character of inhabited areas, which lies at the root of the mountain heterotopia (Dematteis, 2016). The peculiar connections shaping mountain

spaces undermine consolidated metrics, break, and tangle the territorial syntax. In 1931 Serpieri warned that 'above all we must be careful not to bring here, in this substantially different world, the same criteria that can apply elsewhere. What is progress elsewhere can be regress here' (A.A.V.V., 1932). Inner areas swing between a stereotypical, romantic view, that emphasizes the benefits of rural idyll or traditional landscape, and statistical representations of these settings as devaluing and costly for the public finance.

To solve this contradiction, we should better consider the role played by quantitative indicators in enhancing the processes of territorial marginalization. Behind an apparently neutral objective, statistics convey highly contestable rationality by extending market principles to the assessment of common goods or cultural heritage. The incapacity to give value to collective assets of inner areas is a clear example of the distortions arising from this approach regards, which resulted in the implementation of strict environmental constraints that have deprived the forest of its productive function and created hostility towards conservation policies within local communities. This approach ultimately stigmatizes inner areas and serve to justify status quo or legitimate interventions (i.e., financial cuts) that intensify territorial gaps (Sisson, 2021). However, stigmatizing statistics could be contested through a critical understanding of what gets counted and how it is assessed.

The concept of Anthropo-systemic value gives dignity to inner areas, identifying assets and specificities often seen as worthless. Local development trajectories are determined by the capacity to identify, measure, regenerate and exploit less mobile assets of a certain place (Pezzi & Urso, 2017). According to this idea, economic backwardness and population shrinkage in peripheral settings arise from the underuse (or no use at all) of territorial capital. The Anthropo-systemic value allows decision makers to monitor and evaluate losses and gains in territorial capital over time, provide a common framework to bring together multidisciplinary evidence, reduce the risk of ignoring the value of territorial capital, and enable a comprehensive cost-benefit analysis aimed to find effective policy solution.

Such perspective crosses the long-term cohesion and competitiveness issues, since the protection of natural, semi-natural and cultural local assets is considered a key-asset for competitiveness in the next years (Bristow, 2010). Although several theories[14] predict an ineluctable destiny for places without the necessary critical mass or networks, (Rodríguez-Pose & Fitjar, 2013), other scholars suggest that the future is not predestined (Kühn, 2015) and 'peripheralization can be challenged, rejected or even reversed on the long run' (Gormar & Lang, 2019, 488). The rediscovery of natural amenities, such as the presence of pure water and air, of different kinds of property rights and land management (such as the commonalities), of peculiar cognitive cultural local goods, can promote sustainable

[14] Such as, for instance, the endogenous growth theory and the new economic geography.

development and make territory appealing for a place- and communities-oriented type of businesses (Delbosc & Currie, 2011), tourists and, most importantly, new residents (Battaglia et al., 2019) which, as we experienced during the Covid-19 pandemic, may benefit from safer places thanks to smart-working modalities.

The increase in the number of permanent residents can be achieved through the provision of basic services, job opportunities, compensation payments for the positive externalities produced (a sort of "lighthouse keeper", i.e., the CO^2 credits in the carbon commodities market). Focusing on the capacity of inner area to keep and to increase the number of their residents implies implementing a strategy founded on the "*civitas*", namely the set of social ties, functions and services (including the enhancement of the connectivity and digitalization) providing the benefits of civil life (Dematteis, 2016). The concept of Anthropo-systemic value can support achieving this goal, by identifying 'place consciousness' (Magnaghi, 2010) used to solve the abandonment dilemma.

The future of inner areas also concerns the design and development of tools to identify targeted solutions for specific local needs to achieve a sustainable development (Battaglia et al., 2019). A future marked by a new humanism, in which man is not an element of disturbance of the environment but a factor of identification, regeneration and activation of local capital. In the awareness that countering the abandonment of inner areas is an economic and ethical need for the whole of Italy, called upon to preserve collective heritage and identity, even if localized.

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List of tables and figures

Table 1. Proxies considered to assess the Anthropo-systemic value of MRA

Num	Proxy	Source	Year
1	Cost related to public budgets	Open bilanci - Open Municipal Budgets	2010-2014
1	Firms turnover	Chamber of commerce	2015
1	Residents' individual income subject to taxation	Ministry of Economy and Finance	2015
2	Agricultural activities	Istat, Census of Agriculture 2010; Italian Revenue Agency 2015	2010, 2015
3	Animal production	CRA-INEA, 2015; Istat, Census of Agriculture, 2010	2010, 2015
4	Building stock	Istat, Census of Population, 2011; Italian Revenue Agency, 2015	2011
5	Tourism activities: accommodation and food	Istat, database ASIA - employess and firms, 2015; Istat, Capacity of collective accommodation establishments by type of accomodation and municipality, 2015; Marche Region tourist observatory; Enterprises economic indicators - regional level	2015
6	Ecosystem service	Matthews & Lave (2000); Census of Agriculture 2010	2010
7	Historical and cultural heritage	Italian touring Club (TCI); Archive of goods of great historical interest of the Superintendence for Architectural Heritage and Landscape	2012

Fig. 1: the crater area in the national and regional contexts

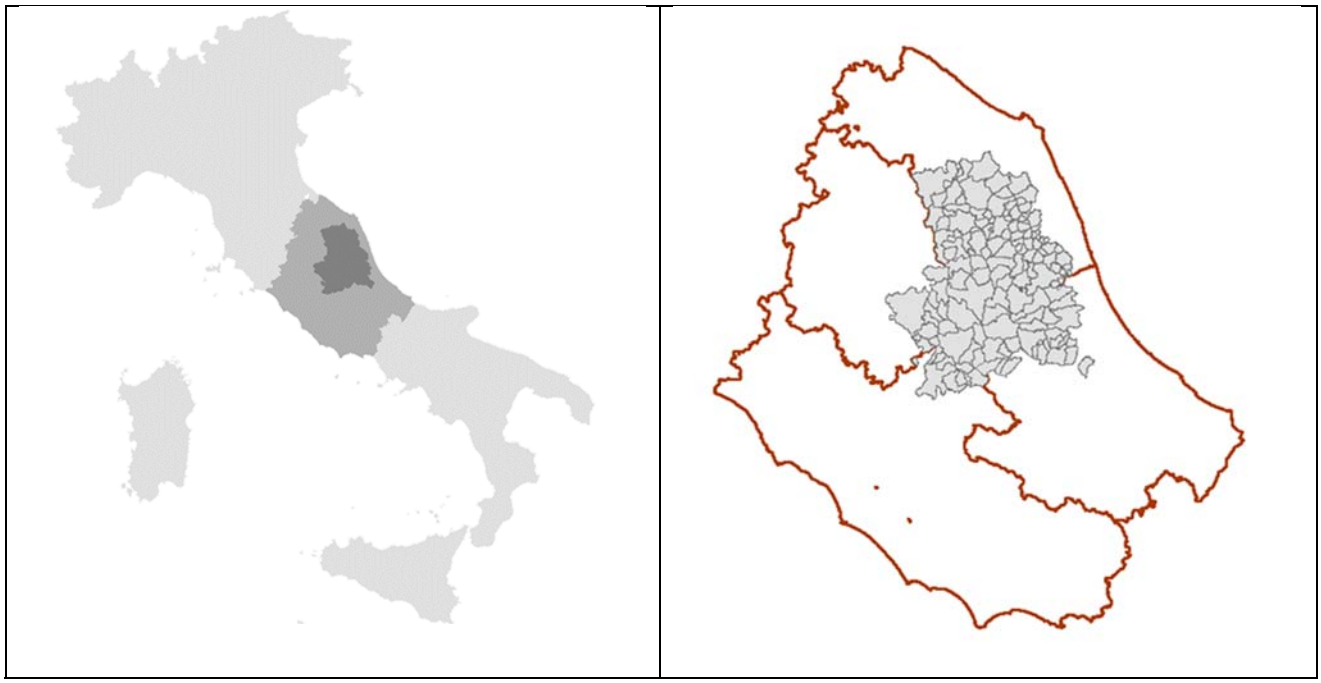
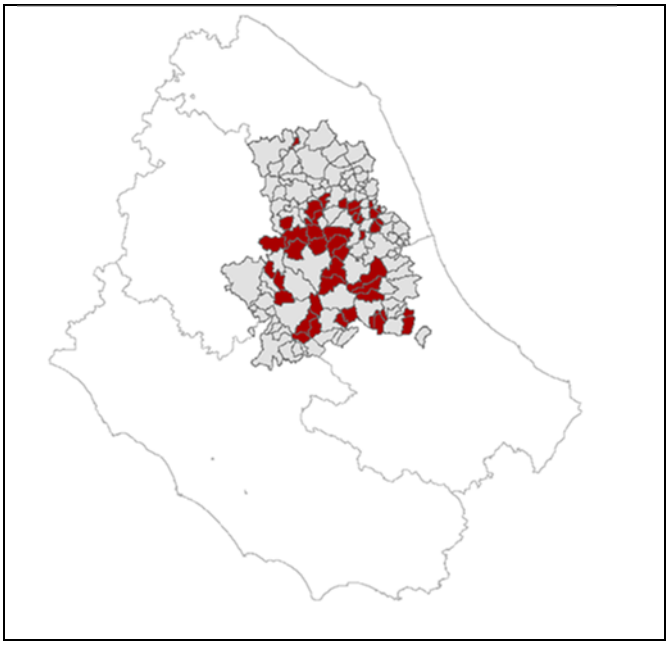


Fig. 2: Municipalities at Risk of Abandonment – MRA (in red)



Statistical Appendix

Table a: List of the Municipalities at Risk of Abandonment – MRA

Code Istat	Municipality	Name region	Code Istat	Municipality	Name region
43001	Acquacanina	Marche	109021	Monte Rinaldo	Marche
43010	Castelsantangelo sul Nera	Marche	109039	Smerillo	Marche
43011	Cessapalombo	Marche	54031	Monteleone di Spoleto	Umbria
43017	Fiastra	Marche	54042	Poggiodomo	Umbria
43021	Gualdo	Marche	54043	Preci	Umbria
43027	Monte Cavallo	Marche	54048	Sellano	Umbria
43032	Monte San Martino	Marche	54058	Vallo di Nera	Umbria
43035	Penna San Giovanni	Marche	57001	Accumoli	Lazio
43040	Poggio San Vicino	Marche	57006	Borbona	Lazio
43056	Ussita	Marche	57017	Cittareale	Lazio
43057	Visso	Marche	57037	Micigliano	Lazio
44006	Arquata del Tronto	Marche	57057	Posta	Lazio
44034	Montedinove	Marche	66016	Campotosto	Abruzzo
44038	Montegallo	Marche	66021	Capitignano	Abruzzo
44044	Montemonaco	Marche	67010	Castel Castagna	Abruzzo
44056	Palmiano	Marche	67012	Castelli	Abruzzo
44065	Rotella	Marche	67022	Cortino	Abruzzo
109014	Montefalcone Appennino	Marche	67024	Fano Adriano	Abruzzo
109015	Montefortino	Marche	67034	Pietracamela	Abruzzo
109019	Monteleone di Fermo	Marche	67036	Rocca Santa Maria	Abruzzo
109020	Montelparo	Marche	67046	Valle Castellana	Abruzzo

Table b: Public expenditure and wealth generated in the MRA

Year	Heading		Euro
2010-14	Revenues		83,038,612
2010-14	Public contributions		13,014,669
2010-14	Expenditure		81,171,463
		Cemeteries	1,027,756
		Water	2,562,887
		Road system	6,773,670
2010-14	Expenditure to be incurred anyway (10%)		1,036,431
2010-14	Public contributions pro capite		502
2015	Firms' turnover		136,000,000
2015	Individual income		253,461,569
2015	Income pro capite		14,316
2015	Number of firms		183
2015	Number of employees		1,048

Table c: Monetary value of the agricultural products in the MRA

Agricultural products	Total monetary value of agricultural products - Euro
Coppice woodland	91,368,762
Tall trees woodland	45,895,293
Mixed woodland	8,353,546
Chestnut trees	3,350,707
Orchard	15,660,965
Fallow	10,988,260
Garden	4,514,256
Irrigated garden	1,379,153
Grazing land containing tree	45,326,480
Shrubby grazing land	21,395,182
Grassland	90,112,813
Arable crops	79,303,017
Olive plantation	9,393,359
Vineyards	11,665,880
Total	**438,707,671**

Table d: Monetary value of the animal production in the MRA

Type of livestock	Number of livestock	Monetary Value of livestock - Euro per unit	Total monetary value of livestock - Total Euro
Bovines > 1 year-old	2,397	1,265	3,031,982
Bovines 1-2 year-old, female	341	740	252,595
Bovines 1-2 year-old, male	915	593	542,759
Bovines > 2 year-old, male	119	692	82,093
Bovines > 2 year-old, dairy heifers	1,476	558	823,650
Bovines > 2 year-old, heifers for slaught	159	558	88,527
Bovines > 2 year-old, dairy cows	1,616	558	901,686
Bovines > 2 year-old, cows for slaughter	2,861	1,844	5,276,185
Equine population	2,000	649	1,298,000
Ssheeps	63,880	293	18,716,983
All other ovine	6,765	113	764,481
Goats	2,613	306	799,604
All other caprine	367	57	20,925
Pigs > 20 kg	339	299	101,450
Pigs 20-50 kg	242	575	139,207
Pigs > 50	15,857	575	9,117,506
Boars	11	575	6,325
Sows	183	1,670	305,729
Other sows	0	1,670	0
Broilers	120,290	2,016	2,425,051
Laying hens	87,574	2,786	2,439,811
Turkeys	3,213	5,761	185,104
Guinea fowl	70	1,101	771
Geese	140	1,678	2,349
Other poultry	61	1,101	669
Rabbits	31,845	56	1,783,320
Apiculture	1,586	44	69,784
Total	312,891	-	49,176,547

Table e: Value of the occupied dwellings in the MRA

code_istat	Municipality	Total occupied dwellings	Total dwellings	% occupied dwellings	Total area (m²) of dwellings occupied by residents	Total monetary value of occupied dwellings in Euro
43001	Acquacanina	53	305	17.4	4,903	2,461,850
43010	Castelsantangelo sul Nera	169	927	18.2	16,127	8,085,420
43011	Cessapalombo	225	365	61.6	24,988	14,072,070
43017	Fiastra	275	973	28.3	26,895	14,569,890
43021	Gualdo	344	1340	25.7	41,760	22,602,500
43027	Monte Cavallo	71	188	37.8	7,417	3,679,750
43032	Monte San Martino	274	424	64.6	31,189	15,055,050
43035	Penna San Giovanni	477	891	53.5	59,862	32,638,200
43040	Poggio San Vicino	117	198	59.1	11,972	7,065,200
43056	Ussita	234	2404	9.7	20,397	10,978,630
43057	Visso	528	1429	36.9	54,950	33,904,020
44006	Arquata del Tronto	622	1684	36.9	54,803	30,509,250
44034	Montedinove	208	371	56.1	26,447	13,294,110
44038	Montegallo	334	1189	28.1	28,409	15,063,470
44044	Montemonaco	278	653	42.6	27,139	13,692,910
44056	Palmiano	83	299	27.8	8,730	4,575,820
44065	Rotella	361	568	63.6	38,147	19,436,720
54031	Monteleone di Spoleto	279	927	30.1	24,928	16,303,390
54042	Poggiodomo	76	437	17.4	7,608	4,464,930
54043	Preci	379	1405	27.0	37,538	20,586,100
54048	Sellano	520	1062	49.0	53,025	29,685,410
54058	Vallo di Nera	189	415	45.5	17,015	9,244,590
57001	Accumoli	323	1123	28.8	31,751	25,083,290
57006	Borbona	348	1269	27.4	30,312	20,915,280
57017	Cittareale	251	827	30.4	23,919	18,896,010
57037	Micigliano	88	429	20.5	5,503	4,347,370
57057	Posta	344	1500	22.9	31,135	24,596,650
66016	Campotosto	313	866	36.1	23,055	12,197,330
66021	Capitignano	313	919	34.1	32,688	15,991,630
67010	Castel Castagna	179	247	72.5	16,379	7,080,250
67012	Castelli	550	854	64.4	54,260	24,057,560
67022	Cortino	326	761	42.8	32,213	11,531,800
67024	Fano Adriano	200	676	29.6	16,088	9,445,520
67034	Pietracamela	161	691	23.3	12,208	8,930,360
67036	Rocca Santa Maria	258	635	40.6	28,148	10,696,240
67046	Valle Castellana	506	1499	33.8	47,627	22,873,030
109014	Montefalcone Appennino	201	432	46.5	24,700	12,381,070
109015	Montefortino	527	1711	30.8	56,217	28,448,700
109019	Monteleone di Fermo	182	236	77.1	20,369	10,503,370
109020	Montelparo	342	597	57.3	40,005	19,963,790
109021	Monte Rinaldo	150	204	73.5	19,153	9,693,870
109039	Smerillo	159	311	51.1	18,299	8,989,320
	MRA	**11817**	**34241**	**34.5**	**1,188,278**	**648,591,720**

Table f: Accommodation and extra-expenses of Italian and foreign tourists in the MRA

Tourists	Presence	Accomodation expences per tourist in Euro	Accomodation expences - Total Euro	Extra-expences -per tourist in Euro	Extra-expences - Total Euro	Total Euro
Italians	128,902	37	4,769,374	31	3,995,962	8,765,336
Not italians	54,545	38.5	2,072,710	47	2,563,615	4,636,325
Total	**183,447**		**6,842,084**		**6,559,577**	**13,401,661**

Table g: Turnover generated by food service activities in the MRA (in thousands)

	Turnover by employee - Euro (thousands)	Employees in the food service sector	Estimated total turnover - Euro (thousands)
MRA	44.0	2,978	131,032

Table h: Cost avoided by woods managed by agricultural farms in the MRA

Municipality	Woods managed by agricultural farms - hectars	Sequestration coefficients PM10 broadleaf	Carbon sequestration in TON	Costs avoided
Accumoli	1605.9	160	256.9	1,240,605
Acquacanina	964.6	160	154.3	745,184
Arquata del Tronto	1223.0	160	195.7	944,802
Borbona	82.0	160	13.1	63,331
Campotosto	664.6	160	106.3	513,390
Capitignano	871.2	160	139.4	673,015
Castel Castagna	233.0	160	37.3	179,973
Castelli	812.5	160	130.0	627,653
Castelsantangelo sul Nera	2044.2	160	327.1	1,579,160
Cessapalombo	299.8	160	48.0	231,577
Cittareale	1297.8	160	207.6	1,002,563
Cortino	2067.1	160	330.7	1,596,882
Fano Adriano	1193.6	160	191.0	922,066
Fiastra	779.2	160	124.7	601,921
Gualdo	278.2	160	44.5	214,883
Micigliano	255.4	160	40.9	197,293
Monte Cavallo	48.9	160	7.8	37,768
Monte Rinaldo	23.1	160	3.7	17,845
Monte San Martino	201.9	160	32.3	155,955
Montedinove	144.5	160	23.1	111,636
Montefalcone Appennino	131.2	160	21.0	101,377
Montefortino	999.4	160	159.9	772,059
Montegallo	219.2	160	35.1	169,320
Monteleone di Fermo	59.9	160	9.6	46,250
Monteleone di Spoleto	784.1	160	125.5	605,752
Montelparo	262.0	160	41.9	202,430
Montemonaco	1136.0	160	181.8	877,554
Palmiano	174.7	160	28.0	134,966
Penna San Giovanni	335.8	160	53.7	259,426
Pietracamela	1536.6	160	245.8	1,187,008
Poggio San Vicino	658.7	160	105.4	508,840
Poggiodomo	1541.6	160	246.7	1,190,909
Posta	2382.8	160	381.2	1,840,726
Preci	2386.7	160	381.9	1,843,739
Rocca Santa Maria	1637.5	160	262.0	1,264,994
Rotella	373.0	160	59.7	288,171
Sellano	3169.0	160	507.0	2,448,070
Smerillo	138.9	160	22.2	107,279
Ussita	1142.3	160	182.8	882,460
Valle Castellana	8137.8	160	1302.1	6,286,590
Vallo di Nera	1902.8	160	304.4	1,469,919
Visso	3587.4	160	574.0	2,771,282
Total			**7646.0**	**36,916,624**