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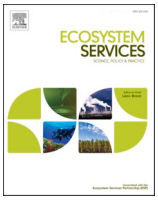

Perceived benefits from reclaimed rural landscapes: Evidence from the lowlands of the Po River Delta, Italy

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ABSTRACT

The attention towards residents' perceptions of ecosystem services for an efficient management of rural landscapes is gaining momentum. One noteworthy aspect is the identification of links between perceived supply and societal demand of ecosystem services, as they can disclose leverages to improve rural policies. The objectives of this study are: i) to assess residents' perceptions of ecosystem services attributed to typical landscape elements; and ii) to characterise the perception of different groups of residents. We present the results from a residents' survey based on a phone-questionnaire carried out in a reclaimed coastal area, where vulnerabilities such as anthropic impact legacies and natural hazards are exacerbated. The aim of the questionnaire concerns the collection of information regarding people perception of benefits attached to a set of rural landscape elements and demand for services. The results show that awareness of regulating functions, the presence of disservices and the link with local food production relate with residents' perception of benefits from landscapes. Furthermore, we note that local landscape and the meaning attributed to historical land reclamation initiatives has a lasting influence on the perception of ecosystem services and that of such perceptions are significant for the design of land use policies.

1. Introduction

Landscapes are shaped by the dynamic interaction between natural and socio-cultural forces and –according to how people perceive them- represent assets that contribute to social wellbeing (Antrop, 2005; Council of Europe, 2000). One central background for the assessment of the contribution of landscapes to societal wellbeing is represented by ecosystem services (ES), which frame the plurality of benefits that ecosystems provide to society (MEA, 2005). Several studies propose ES as an operational framework for environmental management. For instance, building on the ES cascade, Van Zanten et al. (2014a) developed a socio-ecological framework outlining the causal connections between landscape management, local economy, and the mechanisms influencing and driving agricultural landscapes. Similarly, Schaller et al., (2018) employed the ES framework to link landscape management with rural competitiveness. Nevertheless, tangible and non-tangible interactions between biophysical components and socio-economic systems hamper the analytical assessment of the relationships between landscape management and its impacts on ES provision to local society (de Groot et al., 2010). Indeed, landscapes may affect human welfare through a range of direct and indirect pathways including use and non-use, intrinsic and relational values (Swanwick, 2009; Chan et al., 2016). Moreover, ecosystems also generate disservices that result in negative impacts on society (McCauley, 2006; Shackleton et al., 2016). Perception of services and disservices is suggested as a relevant driver of human behaviour, but the assessment of the processes affecting such perceptions has been debated (Blanco et al., 2019; Shapiro and Bàldi, 2014). Several works focus for instance farmers' perceptions of disservices (Ango et al., 2014; Blanco et al., 2020; Herd-Hoare and Shackleton, 2020), but the influence of disservices on the wider society has not yet been targeted.

Besides biophysical assessments and monetary valuations, socio-cultural evaluation has been proposed as an approach fitting to a more inclusive assessment of service perceptions (Martín-López et al., 2012). The socio-cultural evaluation is hinged on the assessment of ES perceptions, which is a key process affecting the interaction between people and environment (Scholte et al., 2015). Landscape perception relates with several cognitive processes, individual experience and culturally modulated processes (Bell, 2001). Perception also concerns people's cognition of usefulness and contribution to wellbeing stemming from

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specific landscape elements (Lhoest et al., 2019). As the management of common pool resources often "*depends on the perceptions of the protagonists*" (Adams et al., 2003, p. 1915), the socio-cultural approach provides relevant insights into how people attribute values to specific ES and contributes to develop environmental policies that include the perspective of local stakeholders (Blayac et al., 2014; Campagne et al., 2018). Thus, assessing residents' perceptions of ES and disservices can support the design of more equitable policies and, in general, better land governance as residents are a relevant part of local actors (Bennett, 2016). For instance, insights into societal perceptions of landscapes are frequently considered to be a valid support for the design of the Common Agricultural Policy (CAP) to promote a balanced provision of private and public goods from rural areas (Howley et al., 2012).

Despite a longstanding theoretical background, assessing people's perceptions of ES associated to landscapes remains a difficult endeavour. That is tightly linked with the different conceptualization of landscapes, which translates into different values attached to the surrounding environment by different segments of society (Soini et al., 2010). Such differences are often explained by socio-economic attributes, such as age and education (Zube et al., 1983), environmental orientation (Kaltenborn and Bjerke, 2002), occupation and place of living (Brody et al., 2004), years of residency and childhood experience (Cantrill and Senecah, 2001), cultural background (Hein et al., 2006), social context (Cebrián-Piqueras et al., 2017), and correlated with different attitudes towards land-use changes, development, conservation, advocacy, protection, etc. (Smith and Sullivan, 2014). Often, the target of residents' perception of ES concerns the connection with use/interest of landscape such as recreational use or the perceived linkages between landscape and a wider set of land-use typologies (Campos et al., 2012; Aretano et al., 2013). Moreover, perception of ES should focus both demand and supply of ES as these are in effect interconnected (Carpenter et al., 2009; Geijzendorffer et al., 2015). In this context, one less studied issue concerns the assessment of residents' perceptions of reclaimed landscapes. Land reclamation involves large human interventions that usually aims at improving the productive functions of the landscape and that entails considerable ecological, aesthetic and social impacts (Svobodova et al., 2012). These interventions have exacerbate the role of management and the mismatch between human perceptions of ES and landscape functions may trigger unexpected impacts (van der Leeuw, 2012). An improved understanding of residents' perceptions of ES gains even more relevance for the design and implementation of land management options in coastal rural areas of the Mediterranean as these regions are often vulnerable and subject to competition and contrasts concerning different land-use options (Soy-Massoni et al., 2016).

The objective of this work is to assess residents' perceptions of benefits stemming from rural landscapes and to evaluate the relationship between individual perceptions and demand for ES. More specifically, the study seeks to identify groups of local residents according to their perceptions of benefits for different socio-economic sectors of the local society and obtain further insights into how these different perceptions are related to demand-side proxies linked to provisioning, regulating and cultural services (Wolff et al., 2015). The proxies related to ES demand are articulated as consumption of local agricultural products, knowledge/awareness of the local land reclamation authority, frequency of recreational activities and the opinion on which landscape elements are typical of the region.

The analysis builds on a statistically representative survey based on a questionnaire submitted to local residents (n = 295) in a case study area (CSA) characterised by huge wetland reclamation actions that have transformed the territory and by relevant cultural and naturalistic values attached to the region.

2. Material and methods

2.1. Case study area description

The CSA covers 957 km^2 and is located in the lowlands on the southern side of the Po River Delta (Ferrara Province, Emilia-Romagna Region, North Eastern Italy; Fig. 1). The area is part of the UNESCO site "Ferrara, City of the Renaissance, and its Po Delta" (http://whc.unesco.org/en/list/733). A significant part of the region is included in the Po Delta Natural Park (covering around 30% of the CSA) that was established in 1988 for the protection of the distinctive flora and fauna of the remnant wetlands. A peculiarity of the CSA is the huge impact of human activities in shaping the territory: the CSA occupies former natural wetlands that were reclaimed for the improvement of agricultural production and health conditions in the 15th Century by the Este Family and, in more recent years, during the 19th and 20th centuries. The latter reclamation initiative, in particular, focused on large portions of the region, including areas below sea level (current CSA elevation is comprised between −4 and + 19 m asl). Nowadays, the area is predominantly rural, characterised by intensive agricultural production in the hinterlands and growing urbanisation of the coastal strip, where Comacchio is the largest urban centre. Agriculture has traditionally played a significant role in the local economy but like in other European regions it is currently facing a transition towards a reduction in farm numbers and intensification (i.e. agricultural concentration; Piorr, 2003). Currently, more than 50% of the CSA is devoted to agriculture. Cereal production is the main agricultural system, mainly rice (covering 49% of the cereal production area). Industrial crops (17%) and vegetables (17%) are also noteworthy agricultural systems in the CSA (Agricultural Census, 2010). In recent decades, tourism development and demand for second homes on the seaside have resulted in an increase in population concentration on the coastal strip, whereas the hinterlands have experienced a slight decrease in population (on average + 2% increase between 2002–2010, National Institute of Statistics – ISTAT 2010).

2.2. Survey design

The survey was developed on the basis of a stakeholder-based consultation. A focus group with 15 representatives of relevant local stakeholder groups (agriculture and tourism associations, local government and land planning agencies, the Po Delta Natural Park, local experts, researchers, and the president of the Local Action Group) was held to discuss general socio-economic and environmental issues, the role of agriculture and agricultural landscapes on the regional economy and the main aspects that could be related to land-use conflicts. The stakeholders argued that a portion of the population had a negative perception of "swamp-related" elements. Different points of view were elicited to explain this view. For instance, swamp-related disservices (e.g. disservices linked to mosquitos) were deemed to be a significant aspect impacting perceptions of landscapes featuring still-waters. A further suggestion concerned the presence of conflicting views in relation to land reclamation that were summarised as: a) an attribution of negative views to the remaining wetlands such as 'unhealthy' and/or 'unproductive' and b) the perception of reclaimed lands and the related agricultural activities as not belonging to the territory.

A specific objective of the focus group concerned the identification of the main landscape elements characterising the rural landscape of the CSA. On the basis of the stakeholders' opinions, five elements were identified: "water channels and ponds", "waders and waterfowl", "wetlands", "rice paddy fields and related fauna" and "protected areas of the Po Delta Park". The stakeholders also proposed to aggregate the ten municipalities of the CSA into three homogeneous zones according to their specific landscape features: Comacchio (Comacchio municipality, 22,980 inhabitants) as the main urban and coastal area, rural hinterlands (municipalities of: Lagosanto, Jolanda di Savoia, Ostellato,

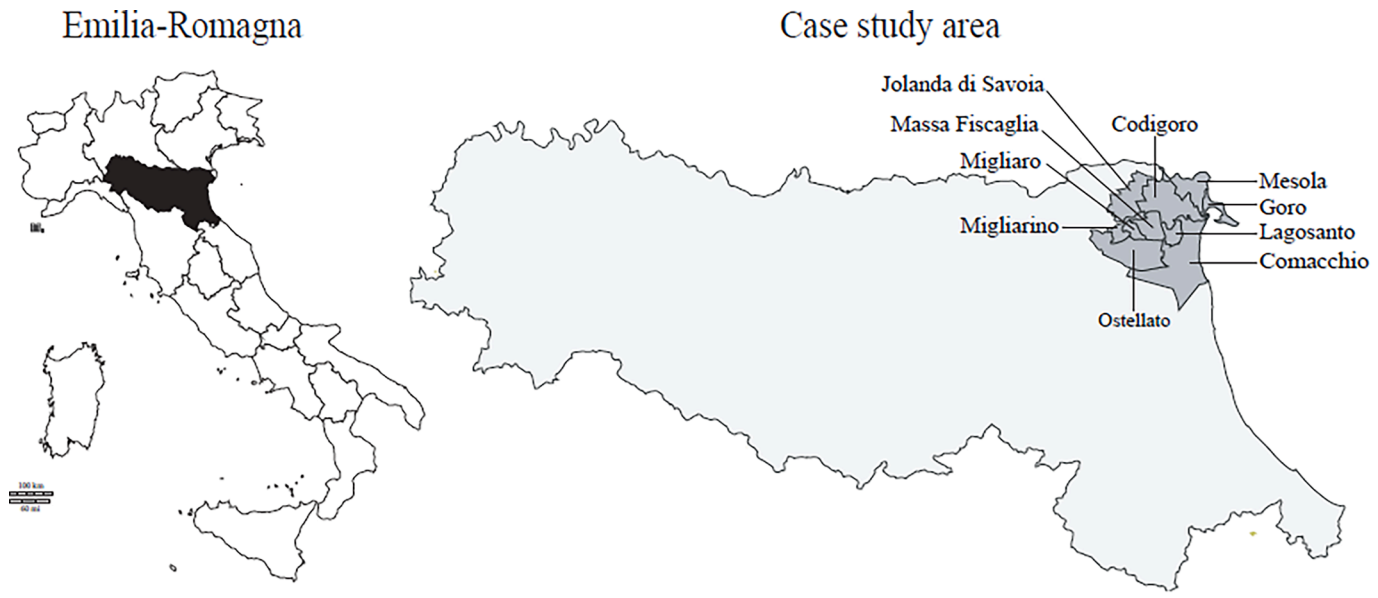

Fig. 1. Location of the case study area, highlighting the administrative borders of the ten municipalities included in the survey.

Migliarino, Migliaro, and Massa Fiscaglia municipalities, 23,943 inhab.) featuring important wetlands and agricultural areas, and the Po Delta (municipalities of: Codigoro, Goro, and Mesola municipalities, 23,387 inhab.) characterised by the River and its delta. The three zones were employed to perform a first statistical stratification of the survey. Gender and age classes were also considered in each homogeneous zone for stratification.

The survey was carried out in 2013 and consisted of 295 phone-questionnaires (0.44% of the total CSA population) targeting local residents between 18 and 70 years old (Appendix A). The selection of the variables included in the questionnaire was based on literature and on the issues that were considered to be of particular relevance for the CSA during the focus group (Appendix B). The questionnaire included different question blocks aimed at the collection of general socio-economic information for each respondent, the perceived benefits[1] attached to the set of five typical landscape elements and a range of questions aimed at estimating the demand of ES. In the questionnaire, the respondents were asked to express their opinion about the benefits stemming from the five typical landscape elements that were beforehand devised following the indications of the focus group. For each landscape element, the respondents were asked to state if, in their opinion, the element was a benefit, a disservice, or indifferent (i.e. neither of the two) respectively for agriculture, tourism and the local residents. The questionnaire included questions to characterise the respondents' place of living ('near water elements', 'urban area', 'rural area but not near water elements') and a range of socioeconomic data such as years of residency in the CSA, family composition, revenue, etc. The assessment of the individual demand of ES was articulated on the basis of different proxies according to "demand types" of ES (Wolff et al., 2015). Demand for provisioning services was assessed by seeking information on the frequency of consumption of local agricultural products (rice, eel, wine, and fruits and vegetables). Demand for regulating services was estimated through a self-assessment of knowledge/awareness of the local land reclamation authority (Consorzio di Bonifica della Pianura di Ferrara), appointed for the hydrologic control and maintenance. Proxies for the demand for cultural services included: a) recreational uses of landscape amenities, and b) non-use values concerning the idea of typical landscape. The former was assessed through a question-block about the frequency of different landscape-related activities (walking, bird watching, cycling, fishing & hunting, meals at farmhouse, visiting the Po Delta Natural Park). The latter was assessed by asking the interviewees to indicate up to three typical elements of the CSA landscape. That question was posed in an open-ended format at the beginning of the questionnaire, to avoid influencing the respondents, and to allow for the inclusion of a wide range of landscape elements that were considered typical even though beyond the objective of the survey (e.g. the seaside). The questionnaire was designed to differentiate between supply and demand of ES: In the questions related to the perception of benefit stemming from the five typical landscape elements, the respondents were asked to express their opinion about the benefits for the residents as a whole (i.e. not for the respondent in particular), agriculture and tourism sectors. On the contrary, in the questions related to service demand, frequencies of food purchase, recreation activities, identification of typical landscapes and awareness of regulating services, the respondents were explicitly asked for their individual behaviour and/or view.

2.3. Data analysis

The statistical analysis consisted of two steps: a) identification of groups of residents according to their perception of benefits stemming from the five landscape elements to local residents, agriculture and tourism; b) a subsequent description of the groups according to general socioeconomic attributes and the demand-related proxies linked to provisioning, regulating and cultural services.

The first step was based on a Multiple Correspondence Analysis (MCA) followed by a hierarchical cluster analysis (performed using R statistical software v. 3.6.1, functions MCA and HCPC; package FactoMineR; Husson et al., 2020) to classify the 295 cases in homogenous groups according to their perception of benefits from the five predefined landscape elements (Appendix C). The classification included 15 variables (five landscape elements × three socio-economic sectors) and each variable included three cases according to the questionnaire: overall perception of benefit, disservice or indifferent. The number of clusters was identified with the aid of an inertia analysis that suggests the subdivision level of the sample where a further cluster formation does not provide an advantage in terms of data description (i.e. inertia analysis indicates the classification in which the reduction of the within-cluster-sum-of-squares can be considered optimal).

[1] The term 'advantages' (in Italian '*vantaggi*') was preferred to translate benefits (in Italian '*benefici*') to use a less obsolete term and one that is closer to common usage.

The second analytical step sought to characterise and test the differences between the clusters by means of cross-tabulations and a Chi-square test. The profile of the respondents' groups identified through the MCA and the cluster analysis was therefore characterised on the basis of the background variables regarding socioeconomic attributes, place of living and the variables related to demand for services: frequency of purchase of local products, awareness of the land reclamation authority, frequency of landscape-related free time activities and perception of typical landscapes. Finally, the Cramer's V test was employed to crosscheck the background variables against any correlation effects.

3. Results

The majority of respondents acknowledged benefits from the landscape elements included in the questionnaire (Table 1): Except in the cases of paddy fields and waterfowls where the perception of benefits was lower, the other landscape elements were considered to be a benefit by a share of respondents between 59 and 92%. In particular, 40% and 31% of respondents considered paddy fields as a source of disservices for residents and tourism respectively. Water canals and ponds and protected areas of the Po Delta Park were the elements most commonly perceived as a source of benefits (on average 81% of respondents acknowledged benefits from these elements for the three socioeconomic sectors). Besides rice paddy fields and waterfowls, wetlands were perceived as not constituting a benefit by a good portion of the sample (on average, 26% acknowledged wetlands as not a benefit for the three socioeconomic sectors).

The cluster analysis performed on the first five axes of the MCA (38% of variance explained on aggregate by the five axes) identified four groups featuring different perceptions of benefits related to the landscape elements (online material Appendix C).

Cluster 1 included cases with an overall perception of benefits from all of the selected landscape elements for residents, agriculture and tourism (Fig. 2; further details on the cluster results are available in Appendix D). Similarly, cases in cluster 2 perceived benefits from the landscape elements included in the analysis but indicated a clear perception of disservices from paddy fields. The perception of benefits was more nuanced in cluster 2 in comparison to cluster 1, with more differences between the perceived benefits for residents, agriculture and tourism (Appendix D). For instance in cluster 2, 4% acknowledged benefits for residents and 51% for agriculture from paddy fields. Furthermore, a high share of cases in cluster 2 considered rice paddy fields a source of disservices for residents (82%) and tourism (72%). Cluster 3 was characterised by cases with a high perception of benefits from specific landscape elements such as water canals and protected areas, but differing from clusters 1 and 2, disservices linked to swamp-related landscapes (in particular wetlands and to a minor extent paddy fields and waterfowls) were particularly high: around 80% considered wetlands a source of disservices for residents, tourism and agriculture, whereas the perception of disservices from paddy fields was specifically linked to residents and tourism (68% and 59% respectively; Appendix D). Cluster 4 included cases with a lower perception of ES in particular from paddy fields and wetlands, but such perception was mostly referred to indifference and not to disservices as in cluster 3.

Table 1
Perception of benefits, disservices and indifference linked to the five landscape elements for the three socioeconomic sectors (agriculture, tourism and residents) as resulting from the residents' survey (n = 295).

		Benefit	Indifferent	Disservice	Don't know
Water canals and ponds (%)	Agriculture	92.9	3.1	2.7	1.3
	Tourism	76.3	6.8	9.5	7.4
	Residents	72.2	11.5	13.9	2.4
Herons, waders and other waterfowl (%)	Agriculture	50.5	16.3	16.9	16.3
	Tourism	88.1	4.1	3.1	4.7
	Residents	76.3	11.9	6.1	5.7
Wetlands (%)	Agriculture	58.6	13.6	18.0	9.8
	Tourism	78.0	5.8	12.5	3.7
	Residents	69.8	10.2	16.6	3.4
Rice paddies and related fauna (%)	Agriculture	64.4	10.5	15.6	9.5
	Tourism	43.7	15.6	30.8	9.9
	Residents	38.6	14.6	40.0	6.8
Protected areas of the Po Delta Park (%)	Agriculture	69.2	10.2	8.1	12.5
	Tourism	91.9	2.4	2.0	3.7
	Residents	81.7	6.4	5.4	6.5

Table 2 reports the average socio-economic and demographic features of the four clusters. The socioeconomic variables included in the questionnaire did not highlight significant differences (Chi-square test; p-value < 0.05) between the clusters. However, some trends can be noticed. For instance, cluster 1 included a slightly higher percentage of males and older people; cluster 2 a lower presence of cases working in the agrofood sector and living in the area for fewer years; cluster 3 a higher incidence of females and a lower frequency of tertiary level education; cluster 4 a higher frequency of long-standing residents and living in urban areas. On the contrary, the self-assessed knowledge of the local land reclamation authority highlighted significant differences between the clusters (p-value < 0.01) indicating the cases in cluster 1 being the most aware, on average, of the role of the authority in the regulation of water levels and hydrologic facilities in the region. On the contrary, cluster 2 and in particular cluster 3 recorded a low awareness of the local land reclamation authority.

The textual analysis performed on the open-ended question about typical landscapes made it possible to identify 8 main groups of landscape element categories. The typical landscape elements were classified as: agriculture-related elements (average frequency = 17%), green elements (20%), seaside (20%), the Po River (12%), wetland elements (12%), urban elements (6%) and cultural heritage elements (3%). In addition, landscape elements related to anthropic elements with a clear negative connotation (e.g. dirty roads, excessive urbanisation, lack of green areas, etc.) were recorded as being typical of the CSA with an average frequency of 10%. It should be noted that 43% of the sample included at least one of the pre-defined five landscape elements as typical (Appendix E).

Even though no significant difference was evidenced, the frequency of the eight landscape categories in the clusters were slightly different (p-value ≈ 0.1; Fig. 3) and in particular: Clusters 1 and 2 recorded a higher tendency to consider wetlands as typical, cluster 3 had a lower frequency of elements with a negative connotation and a higher frequency of agriculture-related (e.g. fields, farmsteads, etc.) elements and seaside, cluster 4 was more prone to cite elements related to cultural heritage.

Frequency of free-time activities such as "bird-watching", "cycling", "fishing & hunting" and "meals in farmhouse" were not significant across the four clusters (Table 3). Even though visits to the Po Delta Park structures were generally low (56% of interviewees stated no visits), that activity together with the frequency of walking showed some trends among the four clusters (p-value ≈ 0.05). Cluster 3 showed a slightly less frequent walking and the lowest frequency of visits to the Po Delta Park (100% stated 'rare or never' visits to the Po Delta Park). On the contrary, more than 40% of cases in clusters 1, 2 and 4 stated to visit the park centres rarely or often.

The frequency of purchase of local rice and fruits and vegetables were significant variables differentiating the four clusters (Fig. 4). Clusters 2 and 3 reported the lowest frequency of local rice purchases (37% and 44% stated never or rarely purchase of local rice; Appendix F). In particular, in clusters 2 and 3 only 16 and 11% of cases stated to always buy local rice, whereas around 50% of cases in clusters 1 and 4 stated to always or often buy local rice. Concerning local fruits and vegetables, more than 80% in clusters 1 and 2 reported a frequent purchase of local fruits and vegetables, whereas clusters 3 and 4 stated a slightly lower frequency of purchase. The other local products did not

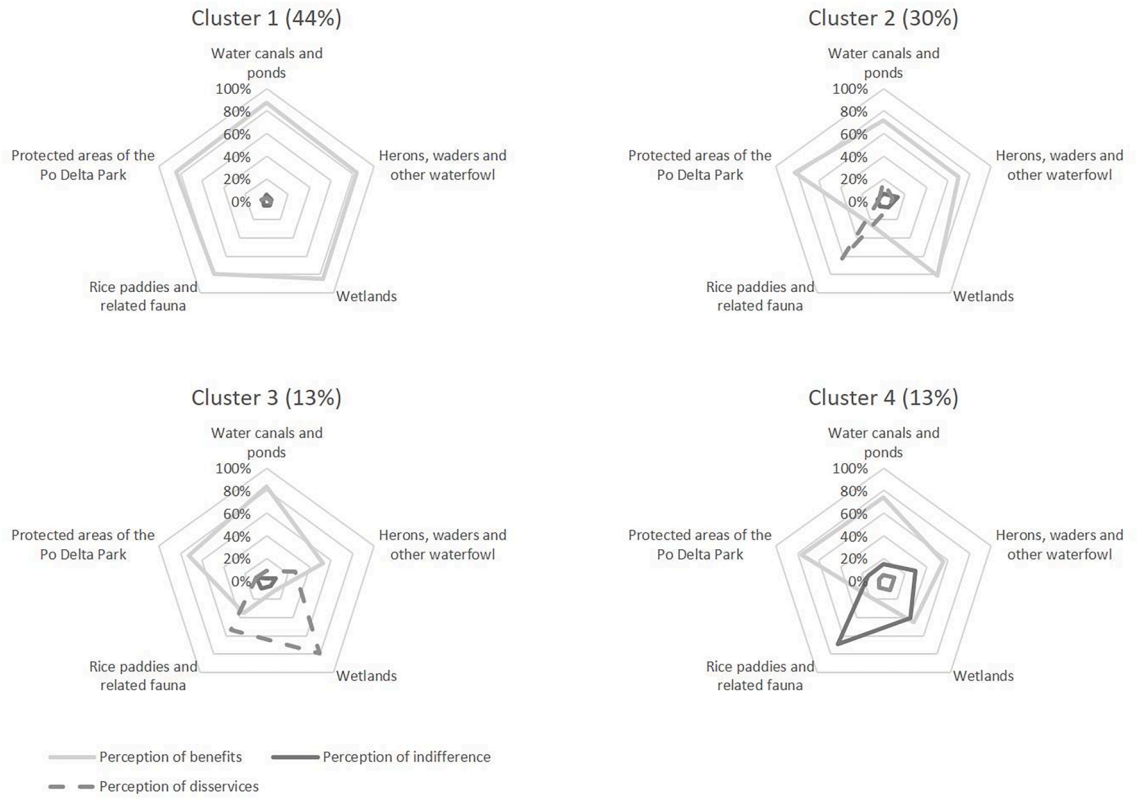

Fig. 2. Average perception of benefits, indifference and disservices in the four clusters stemming from "Water canals and ponds", "Herons, waders and other waterfowls", "Wetlands", "Rice paddies and related fauna", "Protected areas of the Po Delta Park". Percentages in brackets refer to the number of cases attributed to each cluster.

record noteworthy differences between the clusters. However, it should be noted that the consumption of eels was frequent in the sample (around 40% stated to buy eels often or always) even though clusters 3 and 4 recorded a less frequent trend of local eels consumption. The purchase of local wine was, on the contrary, less common (more than 50% stated to never or rarely buy local wine).

4. Discussion

Our results highlighted a generalised acknowledgement of benefits from the five landscape elements included in the survey. Namely, water canals and ponds and protected areas were the elements recording the highest rates of positive perceptions (rates above 80%), whereas more than 40% of the sample did not consider rice paddy fields as a benefit. The four groups of residents identified in the analysis were characterised by different perceptions, in particular of distinctive regional elements such as wetlands and rice paddy fields. The option for the respondents to differentiate the benefit perception for three categories (agriculture, tourism and residents), made it possible to highlight that a portion of the residents discerns benefit flows according to the different sectors of the local society. In particular, cluster 2, which included around one third of the sample, showed a positive perception of wetlands and a clear aversion to paddy fields, in particular concerning the perceived benefits for residents (68% of cases stated disservices for residents from paddy fields, Appendix D). On the other hand, respondents in cluster 3 (accounting for 13% of the sample) showed a neat aversion to landscape elements related to "swamps" (paddy fields, wetlands and waders). For instance in cluster 3, a clear perception of disservices for residents and the tourism sector was attached to the wetlands (86.5% of cases stated disservices for tourism and residents from local wetlands). The disservices linked to paddy fields and wetlands was a relevant feature characterising a portion of the sample in our CSA. That indicates how the consideration of negative aspects related to the environment may help to deliver more comprehensive analyses targeting the perception of ES.

In our analysis, the socioeconomic variables included in the survey did not highlight significant differences between the clusters. Some nuances like the slightly higher frequency of urban people in cluster 4 were apparent, but there were no significant differences linked to specific zone or proximity to a landscape element ("CSA zone" and "dwelling area type" variables). That contrasts with a range of studies highlighting how socioeconomic and spatial effects, such as gender, residency years and the distance from a landscape element, may affect people perceptions. For instance, in a case study area featuring subsistence farming, the spatial disconnection between ES supply and place of residence was reported as a factor inducing a more shallow knowledge of ES (Muhamad et al., 2014). In a study focusing on the difference between rural and urban dwellers carried out in the CSA, it was found that urban population had a more positive perception of landscape (Targetti et al., 2020). In this work, the results delineate a clear relation between perception of benefits and knowledge (or interest) regarding the most important regulating functions in the region (i.e. flood protection). In general, the clusters with a lower tendency to acknowledge benefits from wetlands and paddy fields (clusters 2 and 3) also recorded the lowest awareness of the activities and functions of the land reclamation authority. Curiously, primary roles of the authority are flood prevention and the management of water levels controlling the renaturalisation of wetlands in the region and eventually limiting the presence of those landscape elements in the CSA. This supports that the ways people understand the function of the elements in the territory plays a crucial role in driving their perceptions of the landscape. Moreover, the regulating services related to specific elements (e.g. flood regulation by wetlands and rice paddies) might influence considerably the perception of benefits from these areas.

The perception of benefits underscores some interesting relations

Table 2
Socio-economic and awareness of the local land reclamation authority's duties in the four clusters. Test of significance: Chi-square test with p-value ** = < 0.01; ns = no significant difference.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	p-Value	
Gender					0.1169	ns
F	44.3%	55.1%	64.9%	52.6%		
M	55.7%	44.9%	35.1%	47.4%		
Age class					0.4323	ns
Class1 (<30 years)	13.0%	15.7%	21.6%	18.4%		
Class2 (between 30 and 50 years)	28.2%	37.1%	37.8%	34.2%		
Class3 (between 50 and 70 years)	58.8%	47.2%	40.5%	47.4%		
Education					0.6718	ns
Primary level	38.2%	41.6%	43.2%	44.7%		
Secondary level	48.9%	48.3%	54.1%	42.1%		
Tertiary level	13.0%	10.1%	2.7%	13.2%		
Residency years					0.2314	ns
< 5 years	6.1%	13.5%	8.1%	10.5%		
>5; < 10 years	10.7%	14.6%	2.7%	7.9%		
>10; < 30 years	45.0%	40.4%	59.5%	36.8%		
> 30 years	38.2%	31.5%	29.7%	44.7%		
Income					0.6232	ns
Low (<14,000 €)	27.0%	36.1%	41.2%	28.6%		
Medium (between 14,000 and 42,000€)	60.8%	59.0%	52.9%	66.7%		
High (>42,000€)	12.2%	4.9%	5.9%	4.8%		
Job sector					0.6993	ns
Agro-food	9.2%	5.6%	10.8%	10.5%		
Tourism	2.3%	2.2%	5.4%	5.3%		
Retired	26.0%	22.5%	27.0%	13.2%		
Other	62.6%	69.7%	56.8%	71.1%		
Family composition					0.6645	ns
Single	4.6%	3.4%	2.7%	10.5%		
married without children	27.7%	21.3%	16.2%	26.3%		
With children	55.4%	62.9%	67.6%	52.6%		
Other	12.3%	12.4%	13.5%	10.5%		
CSA zone					0.6076	ns
Comacchio	32.1%	34.8%	32.4%	50.0%		
Rural hinterland	31.3%	28.1%	29.7%	23.7%		
Po Delta	36.6%	37.1%	37.8%	26.3%		
Dwelling area type					0.8342	ns
Urban	67.2%	65.2%	56.8%	63.2%		
Close to water elements	19.1%	16.9%	24.3%	15.8%		
Agricultural area (not close to water elements)	13.7%	18.0%	18.9%	21.1%		
Local Water Body Regulation Agency					0.0059	**
Declaring to not know the agency's duties	45.0%	62.9%	73.0%	57.9%		
Declaring awareness of duties of the agency	55.0%	37.1%	27.0%	42.1%		

with the perceptions of typical landscapes. Firstly, rice paddy fields were both the element cited with the lowest frequency in the open ended question (frequency = 3%; Appendix E) and the least positively perceived of the five pre-defined landscape elements. This supports the idea that the landscape elements that are not considered typical of the region are also associated with lower benefits. Yet, rice paddies are commonplace and the region has a Protected Geographical Indication rice product. Such a result seems to differ from a range of studies showing that the public holds a very positive view of traditional farming practices (van Zanten et al., 2014b). It is likely that the local population deemed rice paddies to not belong to the territory and rather that they are more connected to the land reclamation history than to the overall tradition of the area. In that view, the contribution of landscape elements to the sense of place is a factor of significant importance driving people's perceptions (Soini et al., 2012). In that respect, the relatively high percentage of respondents indicating negative aspects of the landscape (e.g. more than 10% in clusters 1, 2 and 3) confirms how negative perceptions or disservices are part of the relationship between people and landscape. A further consideration concerning the relationship between perception of ES and typical landscapes regards the lower frequency of "wetlands" cited as typical in clusters 3 and 4 and the higher frequency of sea-related elements considered as typical in cluster 3. That is consistent with the lower perception of benefits attached to the five elements of the rural landscape in those clusters.

Surprisingly, the results on free time activities unveiled a divide between the overall positive perception of benefit flows from the pre-defined landscape elements and a rather low interest in the recreational opportunities linked to water-related elements (79%, 85% and 56% stated never spending time "Birdwatching", "Fishing & hunting" and "Visits to the Po Delta Natural Park", respectively). A trend can be noticed towards a more frequent recreational "use" of the territory in the cluster denoting a more positive perception (cluster 1) in comparison to the others. Visits to the natural park and meals at local farmhouses are examples of that tendency. Nevertheless, the frequency of free time activities was rather similar in the clusters, underlining how recreational opportunities were not conclusive in affecting the different perceptions of benefits in the CSA.

The frequency of local product consumption showed how the clusters with less positive perceptions of rice paddies (clusters 2 and 3) were also the least inclined to buy local rice. Indeed, a relatively high share of cases (around 37 and 43%) in these clusters stated to never or rarely buy local rice. Moreover, cluster 3 showed a consistent less frequent tendency to consume eels, a notable local product. That same cluster was the one featuring a less positive perception of the rural landscape elements (especially wetlands and paddy fields) and a higher consideration of seaside as typical of the region. This suggests a connection between the perception of ES and the productive role of landscape. However, the results warn against naïve identifications of straight relations between perception of landscape benefits and provisioning services. For instance, the rather frequent consumption of rice in cluster 4 is at odds with the overall perception of indifference towards rice paddy fields. Furthermore, even though less frequent in comparison to the other clusters, cluster 2 highlighted a rather high consumption of rice in absolute terms (more than 30% of cases stated to consume always or often local rice). That evidence points to complex links between the perception of benefits and the individual view of landscape. It is likely that people's perception of ES is a cognitive process depending on a wide range of issues that the operational limitations of the survey (e.g. a partial coverage of the whole range of ES) was not able to disentangle completely.

The results of the study reflects the artificial features of the CSA landscape. However, in terms of local governance, the survey conveys four main considerations that can be useful in other coastal rural areas in the Mediterranean as these regions are influenced by important land management legacies and present similar dynamics of growing anthropic pressure (Debolini et al., 2018). Firstly, the study confirms how people's judgement of their territory may be based on limited knowledge of functional aspects (Ruiz-Frau et al., 2018). In the CSA, that perception regarded elements of the landscape covering sizable parts of the territory (i.e. wetlands and rice paddy fields). Improving the understanding of the problems related to the management of the territory and involving a wide-as-possible range of sectors and stakeholders in the land management decision process is, therefore, necessary to reduce potential conflicts regarding land policies (Adams et al., 2003). In an "artificial" landscape like the CSA, which is partly below the sea level, regulating services deserve far more attention, as the territory is particularly susceptible to environmental risks such as floods, water pollution and sea-storms. In that respect, more participative approaches

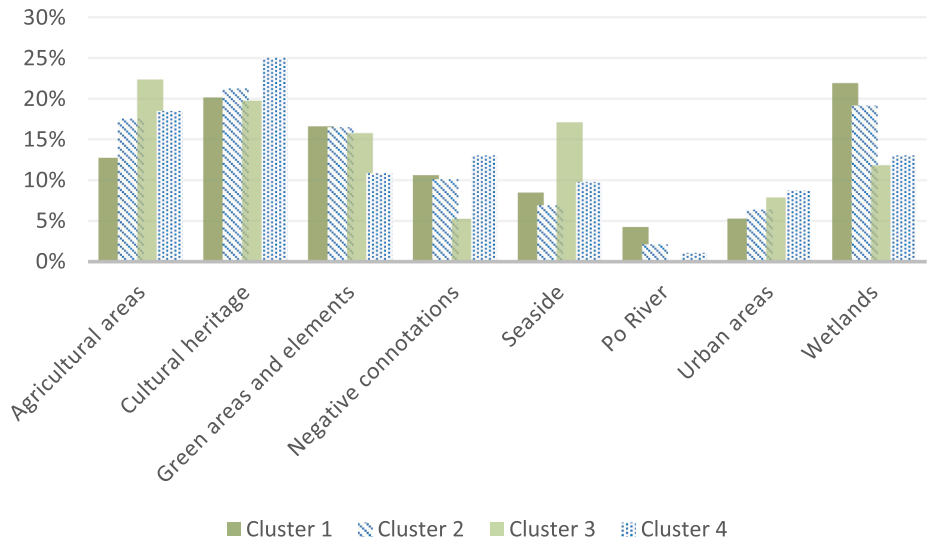

Fig. 3. Frequency of typical landscape categories cited by the cases in the four clusters. Chi-square test: p-value = 0.1334.

Table 3
Frequency of free-time activities connected to landscapes in the four clusters. Test of significance: Chi-square test with p-value *= < 0.05; ns = no significant difference.

	Cluster 1			Cluster 2			Cluster 3			Cluster 4				
	never	rarely	Often	never	Rarely	often	never	rarely	often	never	rarely	often	p-Value	
Walking (%)	18.3	7.6	74.0	15.7	16.9	67.4	18.9	21.6	59.5	26.3	5.3	68.4	0.094	≈*
Bird-watching (%)	76.3	9.9	13.7	79.8	13.5	6.7	86.5	2.7	10.8	84.2	10.5	5.3	0.313	ns
Cycling (%)	15.3	7.6	77.1	19.1	5.6	75.3	27.0	10.8	62.2	15.8	7.9	76.3	0.641	ns
Fishing & hunting (%)	83.7	6.2	10.1	88.6	3.4	8.0	81.1	5.4	13.5	81.6	0.0	18.4	0.411	ns
Meals in farmhouse (%)	37.7	36.2	26.2	38.6	40.9	20.5	45.9	35.1	18.9	52.6	28.9	18.4	0.615	ns
Visits to the Po Delta Natural Park (%)	53.4	32.8	13.7	56.3	36.8	6.9	75.0	25.0	0.0	50.0	42.1	7.9	0.079	≈*

should allow for the inclusion of different perspectives and consider how part of the population may be less interested in- or aware of- some aspects, such as regulating services.

The survey suggests that the "meaning" attached to land management decisions has a lasting impact on conveying information about the services provided by landscapes (Antrop, 2005; Magnusson, 2004). The general view of land reclamation in the CSA, which was essentially seen as a top-down governmental decision, offers a key for interpretation. For instance, in an opposite decision-making context (bottom-up reclamation initiatives of the first European settlers in the Bay of Fundy, Canada), Sherren et al., (2016) described the rather positive perceptions of residents towards the local land-reclamation facilities. These different historical contexts may play an important role on awareness, identity and sense of place and are, therefore, relevant aspects affecting the appropriation of landscapes, their management and the perception of ES.

The results regarding the consumption of local rice were consistent with the perception of benefits. This supports the pertinence of the promotion of local food and/or short supply chains as a tool for enhancing the bidirectional links between people and landscapes. At the same time, the survey highlighted that people's perception of ES depends on several interrelated aspects that are complex to disentangle. For instance, the lower appreciation of wetland benefits in cluster 3 is related to a lower interest in local foods, a stronger perception of disservices and a lower awareness of the role of the land reclamation authority. In this respect, land use policies and initiatives for the promotion of the territory should not focus on single ES with a sectorial approach. With specific reference to policies like the Common Agricultural Policy, the design of agri-environmental measures should consider their impact on a wide range of ES and follow a more "horizontal" approach involving a wider range of local economic sectors and institutions (e.g. the land reclamation authority) in all of the design processes (Hodge, 2001).

5. Conclusions

The residents' perceptions of ES are increasingly a subject of analyses, as their assessment sheds light on the links between perceived ES supply and societal demand, and ultimately disclose leverages to improve rural policies. Despite the large body of literature concerned with landscape perception, assessing people's perceptions of ES associated to landscapes is still in its infancy. In this paper, we present the results of a survey carried out in a reclaimed landscape in the North of Italy. The objectives of the study are i) the assessment of residents' perceptions of ES attributed to a set of typical landscape elements; and ii) the characterisation of the relationship between individual perceptions and demand for ES.

The survey confirms the existence of an articulated relationship between people and the landscape in which they live, but at the same time supports that different segments of society are characterised by different perceptions of benefits and disservices flowing from landscapes to the different sectors of the local society. Such perceptions are characterised by a wide range of interconnected factors. For instance, the historical context likely has a relevant influence on the consideration of different landscape elements as a source of ES or disservices.

The results support a significant relationship between perception of benefits and knowledge of relevant regulating services. In an "artificial" landscape like the CSA, which is partly below the sea level, regulating services deserve far more attention as the territory is particularly susceptible to environmental risks.

The perception of benefits is consistent with the consumption of local food. In particular, the clusters with a lower perception of benefits from

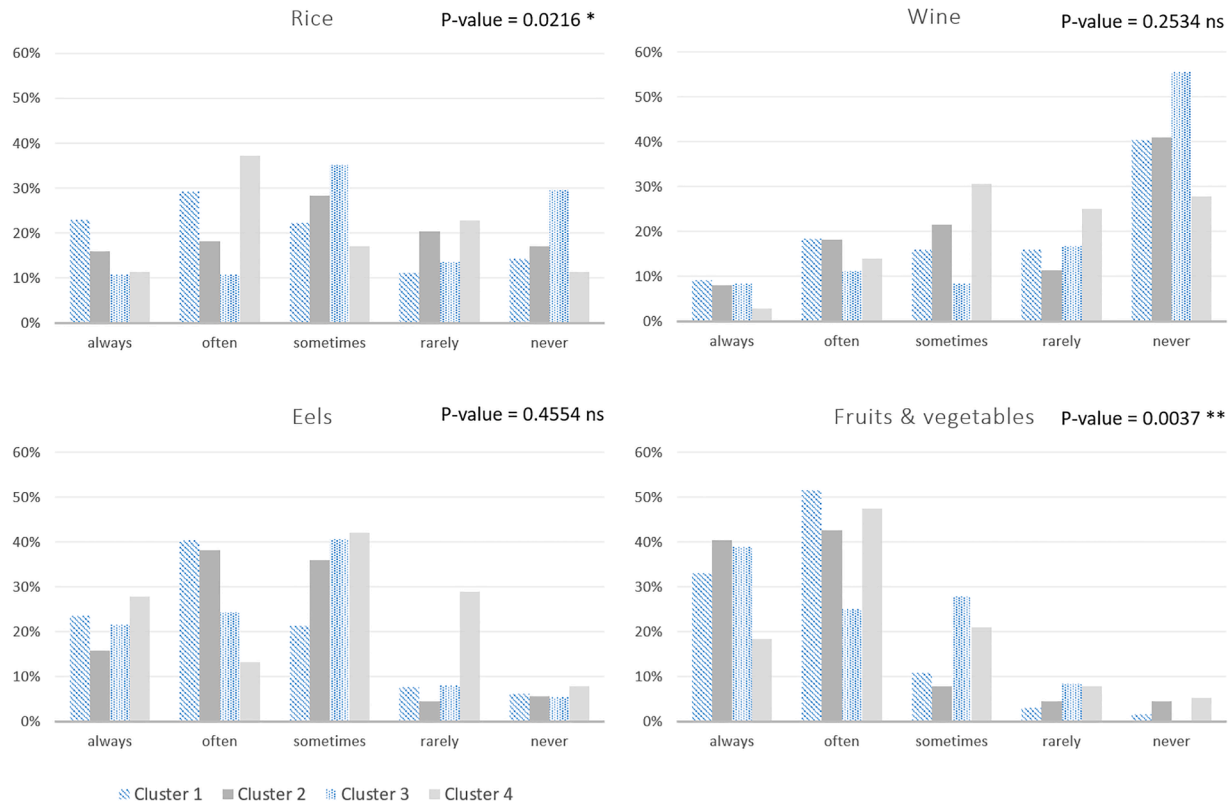

Fig. 4. Frequency of purchase of local food in the four clusters. Test of significance: Chi-square test with p-value *= < 0.05; ** = < 0.01; ns = no significant difference.

rice paddies were also less frequent consumers of local rice. However, the survey also suggests the presence of multifaceted relations that prevent simplistic interpretations. For instance, despite the fact that rice paddies were not considered to be a benefit by a large share of the sample, the consumption of local rice was, in general, frequent. In that respect, the low perception of benefits from paddy fields, and the absence of that landscape element in the respondents' idea of a typical landscape, is remarkable.

This work advocates that reconnecting local society with its regional functionality should entail a wider set of ES. Rather than developing awareness campaigns focused merely on the relevance of land management, but abstracted from the cultural context, targeting provisioning, regulating and cultural services at the same time would be more effective. In practice, this could be accomplished by way of a more direct focus on landscape as an identity construct and through additional efforts to include local residents in land use decisions to reconnect experience, identity, traditions and historical meaning of the territory with knowledge of its functional features.

Authors contribution

ST performed data analysis, interpretation of results and the bibliographic research. MR designed the survey and revised the data analysis. MZ contributed to bibliographic research, data analysis and interpretation of results. DV coordinated the study. All of the authors contributed to writing and revising the paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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