Environmental Economics and Evaluation of the Benefits Deriving from the Regeneration of Natural Ecosystems: The Case of the Diecimare Nature Oasis

Domenico Tirendi

Abstract The intensification and progressive urban growth of the last decades has led to a significant loss of green and naturalistic areas in our cities. Above all in Italy, the creation of new public green spaces can't keep up with the development of the built-up areas. Although it is necessary to provide citizens, through the planning and design of cities, with standards relating to green spaces, the endowment of these often seems lacking, not even meeting the minimum requirements. Living in the city today does not mean living well. Migration from rural areas has progressively increased urban density and anthropogenic pressure towards natural ecosystems. For this reason, in 2015 the United Nations approved the Global Agenda for Sustainable Development (https://sustainabledevelopment.un.org). In particular, Objective 11 of the 2030 Agenda aims to "make cities and human settlements inclusive, safe, durable and sustainable" through actions aimed at "protecting and safeguarding the cultural and natural heritage of the world". Based on this perspective, the objective of the present study is to provide the public operator with elements able to bring out the economic and social benefits related to the adoption of policies of regeneration, reconstruction, recovery, reuse of natural resources and landscape of an important naturalistic area progressively and inexorably abandoned: the Diecimare Park. This is a naturalistic oasis, managed for years by the WWF, an area occupied by chestnut groves and beech trees, elms, alders and poplars planted in the 1700s on the hills that separate the Lattari mountains from the Picentini mountains extending into the municipalities of Cava de' Tirreni, Mercato San Severino and Baronissi. It is a very precious area to be protected and rediscovered as it constitutes a veritable spontaneous botanical garden where hundreds of species of flowers and fauna are mixed. Making an economic assessment of natural and forested public resources to improve and implement services offered to users (information totems, creation of shuttles to/from the city center, creation of car parks, redevelopment of existing paths, creation of new bird observation posts, provision of suitable areas for recreational activities, guided visits by experts, etc.) allows to relate the size of the expenditure to be incurred for the recovery of the forest heritage. These economic benefits can often "escape the market". As they are a public resource, but, through specially prepared assessments,

D. Tirendi (✉)
Department of Architecture (DIARC), University of Naples Federico II, Naples, Italy
e-mail: tirendi@unina.it

G. Mondini et al. (eds.), *Values and Functions for Future Cities*, Green Energy and Technology, https://doi.org/10.1007/978-3-030-23786-8_17

such as the Contingent Valuation (CV) that uses questionnaires to be given to a sample of tourists and residents we can "capture" some intangible benefits such as preserving the quality of life and biodiversity.

Keywords Natural parks · Economic evaluation of natural assets · Contingency assessment · Travel cost method

1 Introduction

Although it is necessary to provide citizens, through the planning and design of cities, with standards related to green spaces, their endowment often seems lacking, not even meeting the minimum requirements. In fact the era of the industrial city, aptly described by Calvino (1963) in "Marcovaldo ovvero le stagioni in città" is now over, at least in Italy.

Parks, therefore, represent the last barrier to oppose the widespread overbuilding of the cities affected by an often ornamental nature.

2 Taxonomy of Landscape Values

Many people, including environmentalists, believe that economic disciplines have not only seriously faced problems related to the natural environment, but have often been co-responsible for the upheavals perpetrated against, as they are limited and oriented towards the sole pursuit of economic efficiency to be achieved minimizing the difference between benefits and costs.

In reality, this could have been shared with a traditional economic approach, but since the 60s (Turner et al. 1993), Environmental Economics have paved the way for the monetization of benefits (also in the form of opportunity costs) that nature can provide, with great economic value.

Nature, in fact, above all in the form of "Park" or naturalistic Oasis offers a series of benefits related to the self-regulation of natural or geo-bio-chemical cycles of water, oxygen, carbon, nitrogen, phosphorus, etc., to provide a suitable habitat, food and regenerative capacity for biodiversity, to mitigate disasters such as landslides, floods, to provide food, materials and energy to people (economic capital) and also to offer tangible and intangible benefits of type aesthetic and recreational, visual-perceptive, therapeutic, educational, cultural, historical, spiritual and religious to people (See Fig. 1: Matrix green typologies in urban areas and related services performed by Millennium Ecosystem Assessment 2005, re-elaborated by PN Studio 2010).

In this regard, the Millennium Ecosystem Assessment describes four categories of eco-system services that can be grouped into four broad categories (Millennium Ecosystem Assessment 2003):

SOIL, NUTRIENTS AND PRIMARY PRODUCTION	FUNCTION	TYPE OF GREEN	Natural areas	Urban and periurban forests	Periurban Parks	Parks and urban gardens	Private green	Vegetable gardens	Filter bands	Rows	Hedges	Roof garden	Vertical green	Cycle paths
	ADJUSTMENT FUNCTION	Environmental	x	x	x	x	x	x	x			x	x	
		Climate	x	x	x	x	x	x	x	x	x	x	x	
		Ecological	x	x	x	x	x	x	x	x	x	x	x	
		Natural risk	x	x	x	x	x		x					
		Soil protection	x	x	x	x	x	x						
		Water regulation	x	x	x	x	x	x	x			x	x	
	ECONOMIC	Energy	x	x	x	x			x			x	x	x
		Food	x	x	x			x						
		Wood	x	x	x	x				x				
	SOCIAL-CULTURAL	Landscaping	x	x	x	x	x	x	x	x	x	x	x	x
		Hygienic	x	x	x	x	x		x	x	x			
		Therapeutic	x	x	x	x	x	x				x	x	x
		Aesthetic	x	x	x	x	x	x	x	x	x	x	x	x
		Educational	x	x	x	x		x				x	x	x
		Cultural	x	x	x	x								x
		Ricreational/Tourist	x	x	x	x								x
		Historic	x	x	x	x				x	x			x
		Spiritual/Religious	x	x	x	x								

Fig. 1 Perceived benefits

– life support (such as nutrient cycle, soil formation and primary production);
– regulation (such as climate and tide regulation, water purification, pollination and pest control);
– supply (such as the production of food, drinking water, materials or fuel);
– cultural values (including aesthetic, spiritual, social, educational and recreational ones).

Attempting to "capture" these benefits is the task of every researcher who sets himself the ambitious goal of evaluating the landscape.

The landscape is a public resource from which society derives both benefits for use and non-use (Signorello 2007). The present contribution aims to offer a summary of the commonly applied methodologies for the economic evaluation of the landscape (Santos 1998; Stellin and Rosato 1998; Nunes 2002; Tirendi 2003; Signorello et al. 2005), not neglecting highlighting the most significant aspects and operational practices of the updated literature concerning the estimation of goods without a market, as well as applying these methodologies to the economic evaluation of a naturalistic Oasis today immersed in degradation and victim of abandonment: the Diecimare Park.

The landscape is a public resource linked to a specific territory, nowadays progressively more fragile because it is subject to "pressures" of various kinds. When it concerns the protection of the natural landscape, which becomes increasingly scarce, due to the wild cementification that has changed the face of our country from the 1950s to the present day, public intervention is invoked up by everyone demanding protection at an appropriate level.

People receive numerous benefits from the landscape whether they use it or not, as summarized in Fig. 1. Its value is not directly detected by the market (shadow-price); however, to know how much these benefits "weigh" in monetary terms (in fact normally only direct and indirect costs are very well known) this exercise is not at all infertile or academic as it is necessary to strengthen and justify public intervention, especially in times such as the current ones of economic crisis, "spread" to the stars, containment of costs of public expenditure and constant growth of inflation.

A public good such as a landscape, a park or a naturalistic oasis, counting many benefits and being non-excludable and non-rival in "consumption", requires complex and articulated theories and evaluation tools to translate the individual usefulness into monetary terms.

The Total Economic Value (TEV) (Turner et al. 1993), refers, in fact, precisely to the assessment of the preferences of individuals and not to the value itself (intrinsic) of environmental resources. The evaluation of the benefits of individuals starts from the assumption that people perceive (and therefore are willing to pay) a "price" for these resources in terms of ticket, tax or contribution, travel expenses, etc. if they receive from their consumption a utility at least equal to a certain monetary disbursement. These individuals, in the same way as any consumer, will compare the usefulness that comes from the use of these goods with the consumption of other goods and/or alternative services (opportunity costs) related to leisure such as visit to a museum or a film at the cinema, etc.

TEV can be interpreted as the sum of the use value and the value independent of use. In turn, the value in use can be traced back to the value of direct use, the indirect use value, the option value or deferred use, while the value independent of use can be assessed as the sum of the value of existence and of hereditary or legacy value (Fusco Girard and Nijkamp 1997).

3 Evaluation Approach

The evaluation of naturalistic and landscape resources, from an exquisitely methodological point of view, lends itself to the use of evaluative tools of the Pigouvian type (Cornes and Sandler 1985), based on the principle "who receives the benefits pays", explained through the use of direct evaluation methodologies such as contingency or indirect assessment such as Travel Costs or Hedonic Prices. The direct methods, based on the questionnaires to be subjected to predetermined samples of individuals, have as a sole contraindication that they have to be considered credible by the interviewed people, as well as that of minimizing the strategic behaviors of these in order not to make the whole evaluation process vain.

If the hypothetical scenarios and the chosen payment vehicle should be credible and strategic behavior minimized or eliminated altogether, the contingency assessment is the evaluation tool that best allows us to provide an accurate estimate of the TEV. It directly consults the end users of a "product" and allows the construction of the most appropriate sustainability indicators to grant landscape-territorial planning with the wishes and preferences expressed by local communities in full transparency, effectiveness and efficiency, as desired by the European Landscape Convention of the Council of Europe (https://www.coe.int/en/web/landscape).

The economic value is based on the economic theory focused on rationality and on the sovereignty of the individual-consumer who will choose to consume one good rather than another based on his own preferences, or more precisely, from the utility that derives from it in terms of compensating or equivalent variation. If the variation of

Table 1 TEV of naturalistic resource, own elaboration

Use value				Non use value	
Related to the market	Not related to the market	Indirect	Option	Existence	Bequest
Wood	Landscape	Climatic effects	Biodiversity	Biodiversity	Biodiversity
Fruits, mushrooms and chestnuts	Recreational services	Salubrity of the air	Landscape	Landscape	Landscape
Hunting		Rainwater regulation	Quality of the air	Quality of the air	Recreational services
Fishing		Biological substances	Rainwater regulation		Market goods
		Reduction of landslide risk	Biodiversity		Quality of the air
		Increase of the price of homes			Climatic effects

the offer of a naturalistic asset such as the Parco Diecimare produces an improvement of individual well-being, the compensatory variation (VC) expresses the maximum willingness to pay (WTP) to ensure an improvement and the minimum willingness to accept (DAA) to offset the loss compared to the expected improvement. If the variation in the offer of the Parco Dicimare, viceversa, would result in a deterioration of individual well-being the equivalent variation (EV) corresponds to the maximum willingness to pay WTP to avoid that decrease in usefulness as well as the minimum willingness to accept a sum of money for compensation for the damage suffered.

TEV of a naturalistic resource can be summarized in Table 1.

Contingent Valuation (CV) (Carson 1997) is an assessment method based on "declared preferences" through the administration of questionnaires on selected samples of individuals who are asked to express their maximum willingness to pay to obtain an improvement or to avoid a deterioration or the loss of a certain public resource under investigation.

It is concretely structured in three phases (own elaboration):

1. Start (who/how/where/when/why): these questions will introduce questions in relation to various aspects: [who] identifying the beneficiaries to be defined through targets and frames of the reference sample; administration of the questionnaire (inquiry to be made online, by post, in person, etc., [where] the place where the property is located and the choice of where to make the surveys (near the survey site or off site); [when] the time in which to carry out the investigation, i.e. when having to analyze the "application": in anticipation of changes to the "offer", after a calamitous event, harmful or better in anticipation of this;

[because] the cause or the purpose of estimation is fundamental. Based on the purpose it will be necessary to define what value to express in monetary terms);
2. Running (design of the questionnaire, choice of the application format, verification in the field with appropriate pilot studies, adjustments in the running and definitive administration of the questionnaire);
3. Finish (verification of the results obtained, econometric analysis of the data).

The CV is, beyond the limits, a powerful tool, versatile and useful in decision-making processes concerning the natural environment and cultural heritage. Turner et al. (2003) report that when a British forestry company thought to drain and use the Flow Country, a wetland in Scotland visited by only a few people, a contingency assessment study was started on questionnaires sent by mail to families, which gave very surprising results. The people, in fact, showed a WTP for the protection of the Flow Country higher than it would have been possible to gain from the cultivation of timber plants. What needs to be minimized and excluded is the adoption by the interviewed subjects of "strategic behavior".

The detractors of this evaluative methodology, in fact, affirm that the hypothetical nature of the scenarios would imply a vague approximation of the real value. The estimate made with the CV is recognized to be legally binding in the USA and regulated by law since the early 90s (Arrow et al. 1993). A 1980 US law, the Environmental Compensation and Liability Act, known as Superfund Law, foresaw that public bodies such as Ministries and Local Governments could claim compensation for damage to the environment including forests, lakes, water, fauna, flora, swamps, coasts, soils, slopes, etc. The DOI (Department of Interior) was asked to shed light on which values and estimation methodologies should be adopted to explain these damages.

The Ministry, in turn, delegated the NOAA (National Oceanic and Atmosphere Administration) to pronounce on the validity of the estimates obtained with the VC and on the opportunity to estimate the passive use values (bequest and existence). There were oppositions to the TEV estimation criterion and the use of CV, but the NOAA asked the two Nobel Prizes in Economics Kenneth Arrow and Robert Solow to chair an expert committee (NOAA Panel) to express themselves on the validity and veracity of the estimates obtained with the CV for the assessment of environmental damage. The Panel set seven rules for a correct use of the CV (Carson 1997):

1. CVs must start with an accurate and understandable description of the scenario;
2. CVs must report to the interviewee that the expense for a certain purpose (valorization of a park, compensation for damage, etc.) would reduce their spending capacity for other goods;
3. To inform the interviewees about the presence of surrogate goods, for example if you are about to ask for a contribution for the maintenance of a certain park to specify how many are already available or are to be;
4. Add to the interview questions to 'check' to see if the respondents have actually understood the questions and identify the reasons for their answers;
5. To prefer questions in a referendum form: yes or no, to take or leave, avoiding open questions, to check the maximum availability;

6. The CV should request the willingness to pay to prevent future accidents rather than the minimum acceptable compensation for an accident that has already occurred (even if the second question is the theoretically correct one for an accident that has already occurred);
7. Prefer the administration of personal interviews, no telephone calls or worse in an epistolary form.

Indirect evaluations using the Clawson method or Travel Costs (TCM) that can be used to estimate the recreational use value of a cultural or environmental resource make it possible to integrate and validate the studies obtained with the CV (Tirendi 2003). The assumption is that the value in use of a resource is worth at least the cost of the trip necessary to visit it. It seems quite obvious, but to many eminent economists the question did not seem such a simple deduction, as often the Directors of the US natural parks turned to them to settle the age-old question of what was the economic value of a park. Unfortunately they always received a negative answer because even with safe values there remained a margin of uncertainty. Fortunately, Harold Hotelling did not think so (Hotelling 1947) and with this insight, dating back to 1947, but perfected later by Wood and Trice (1958) and by Clawson and Knetsch (1966), was the first to provide a monetary measure for recreational services.

In short, the value of a "non-market" resource can be deduced by observing the behavior of some individuals who face a "journey" to enjoy the resource itself. This consumption includes, in the case of a park, the cost of the trip to reach it, the entry ticket and the additional expenses incurred on site as well as the opportunity cost of time. The method presupposes a complementarity between the resource and the expenditure consumed for use, and therefore can also be applied to determine the marginal utility of improving the quality of the resource itself.

4 Territorial Context

The Diecimare Park (Fig. 2) is a naturalistic oasis that extends in the municipalities of Cava de' Tirreni, Mercato San Severino and Baronissi which boasts a thousand-year history. Around the year one thousand, in fact, the mountains of the Diecimare Park belonged, thanks to the donation of the Lombard Prince Gisulfo II, to the Monastery of the SS. Trinità di Cava de' Tirreni and the Municipality of Cava de' Tirreni. Because of the frequent controversies on how to manage the common property, the Royal Council of 1580 decreed that the Church used only the right of grazing, while citizens of Cava were granted the civic use of obtaining lumber. In 1770 the inhabitants of Casale di S. Lucia attempted, tilling the existing wood, to make the Valley of Diecimare cultivable, but there were landslides caused by the first rains and the immediate restoration of the Valley was ordered by the Decurionato, an ecclesiastical authorities. When in 1866 the immovable properties of the Ecclesiastical Authorities were transferred to the State, the area of the Diecimare Park also became property of the State. More recently, due to the excessive exploitation of natural resources, it

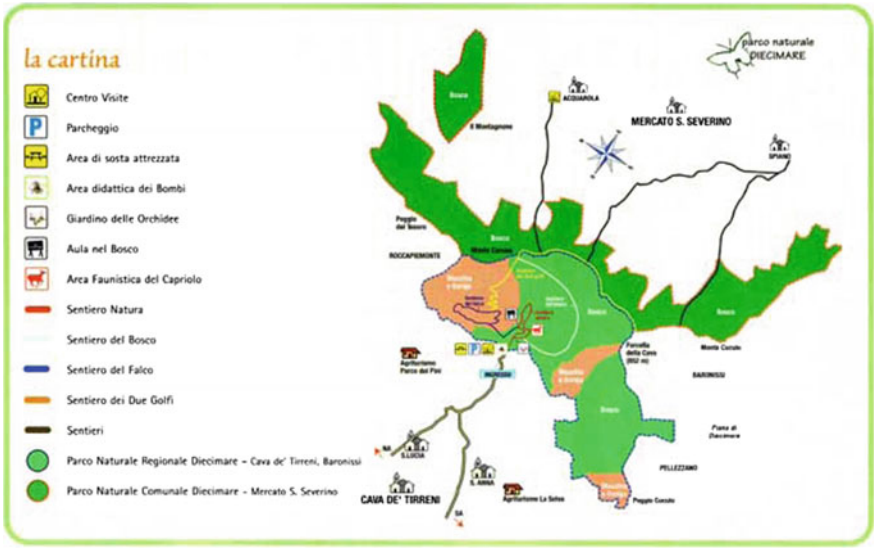


Fig. 2 Map of the park (information panel in the park)

was intended to safeguard a part of this area by creating a protected natural area in 1980. Unfortunately, almost forty years later, it is in a state of neglect and widespread degradation. The territory specifically concerns an area bounded by the high grounds of Monte Caruso and Forcella della Cava (832 m asl) and covers about 444 ha. These terrains have marine origins while the Diecimare plain is made up of debris and pyroclastic material coming from the Campi Flegrei caldera. The slopes along Mount Caruso are covered with steppe areas and Mediterranean scrubland consisting of myrtle, holm oak, lentisk, heather and strawberry tree. On the other hand, the slopes of Forcella della Cava are decidedly greener and are characterized by the presence of oak, alder and chestnut woods. The fauna is very rich especially for insects, among which the macaon stands out (Fig. 3), a very elegant and colourful butterfly symbol of the Park.

The Park, due to the very varied presence of butterflies and insects including the rhinoceros beetle, the bumblebee (Fig. 4), the praying mantis and the stick insect, as well as being a site chosen by migratory birds, mostly raptors, both nocturnal and diurnal, and many other smaller species such as titmouse, finches, wagtails and blackcaps that inhabit many trees, makes up a real open-air educational laboratory for the observation and study of insects and birds.

The neglect and abandonment, even of the WWF, which until a few years ago was in charge of this naturalistic oasis are putting a strain on the existence of the Park, whose infesting vegetation has now made some paths impassable. From the entrance of Cava de' Tirreni there is a parking lot and a visitor centre (which is currently closed) where volunteers welcomed people.

Fig. 3 Macaone butterfly (reproduction of watercolor painting by Lucia Matteo, private collection)

Fig. 4 Signage of the park. *Source* authors' picture

Fig. 5 Bumblebee *Source* authors' picture

Inside the Park there were some equipped rest areas that were used mostly during the summer and Easter Monday, as well has educational observation areas of bumblebees, orchids, butterflies (Fig. 5), the wildlife area of roe deer and the depths of the forest where nature itself demonstrated its daily miracles. There are four main paths (Fig. 6):

1. The Nature Trail that is easy to follow and full of educational panels, ideal for school children and beginners as it allows you to have a general view of the habitats present in the Park, along the faunal area of the roe deer and the orchid garden.
2. The Path of the Woods that allows you to admire the last patches of mountain and sub montane forest.
3. The Path of the Falcon that branches off the slopes of Monte Caruso where it is easy to see hawks and buzzards.
4. The path of the two gulfs, which after an uphill climb allows you to follow the ridges between Monte Caruso and Forcella della Cava, where you can observe both the Gulf of Salerno and Naples.

Fig. 6 Park avenue *Source* authors' picture

5 The Survey and Outcomes

The survey was conducted in 2009 on a sample of 500 individuals, when the Parco Diecimare (at least as far as the territory of Cava de' Tirreni) was still in good condition as it was still managed by the WWF. Subsequently, mainly because of arson and lack of funds, the agreement with the WWF ended and began the slow and inexorable decline of the area mainly caused by illegal spills of asbestos sheets, flues and pipes (waste from building sites), from continuous damage to the posters

still present on the paths of the natural itineraries and fire sighting towers. There are also damages the picnic area, the small hut that served as a visitor centre (only the foundations remain) due to by vandalism and by the many fires that have not even spared the area once reserved for roe deer.

Two questionnaires were used, one with the bidding-game format (subject of this contribution) and the other in dichotomous format. The technique of eliciting the application format to be used in the CV investigations involves four main types: (a) bidding-game, (b) payment card, (c) open-ended and (d) dichotomous choice.

The chosen method of bidding game is based on the simulation of a real "auction game" between interviewer and interviewee in which, after having defined an initial price suggested by the interviewer, the price itself is repeatedly modified on the basis of acceptance or refusal of the interviewee, to establish the maximum price that the latter is willing to pay to win the asset. One of the main advantages of this technique derives from the ability to provide comparatively better results than other techniques, as it constitutes a favourable market situation for respondents (Cummings et al. 1986). Contrarily, one of the main disadvantages of this format is that the price defined by the interviewer could influence the respondents' statements by determining what is called an "anchorage problem" (Blame et al. 1999) at the price initially proposed. This problem has been resolved offering four different levels of the initial bid: €5, €8, €10, €16.

After putting the interviewed subject at ease, giving him a series of verification questions to understand if this was his first visit to the Park (otherwise he had to register how many times he had visited or he would have visited during the year), if the visit itinerary included other places (and if so, to avoid the "part of whole bias"), if he had been particularly interested in the protection of natural resources and if during the year he had visited other Parks. After this first step, the second phase was to briefly describe the Diecimare Park, while the third presented the hypothetical scenario and triggered the "auction game". The hypothetical scenario was as follows:

"Currently he has not paid anything to access the Park (if the interview is conducted on-site) or currently the entrance to the Park is free and the guided tours cost €3 per person. The Municipalities of Cava de' Tirreni, Mercato S. Severino and Baronissi, with the aim of improving and expanding the services offered, are planning to introduce a shuttle service that connects the entrance with the parking area, the expansion of the areas intended for picnics, the redevelopment and implementation of existing routes through the creation of new paths, the introduction of additional fences and the improvement of services within the Park such as the creation of additional observation points, information boards and an astronomical observatory and guided tours by experienced staff. This would require an economic contribution that would reflect the cost of the new services offered. If you had an entrance ticket for the Diecimare Park, would you be in favour or against it?".

The fourth (and last part) of the survey includes the socio-economic characteristics of the interviewed sample and the geographical area of origin.

The results of the survey in the form of a frequency histogram are shown in Fig. 7. Subsequently, the cumulative frequency curve was calculated and through Microsoft Excel software to estimate the functional form that would best give mathematical

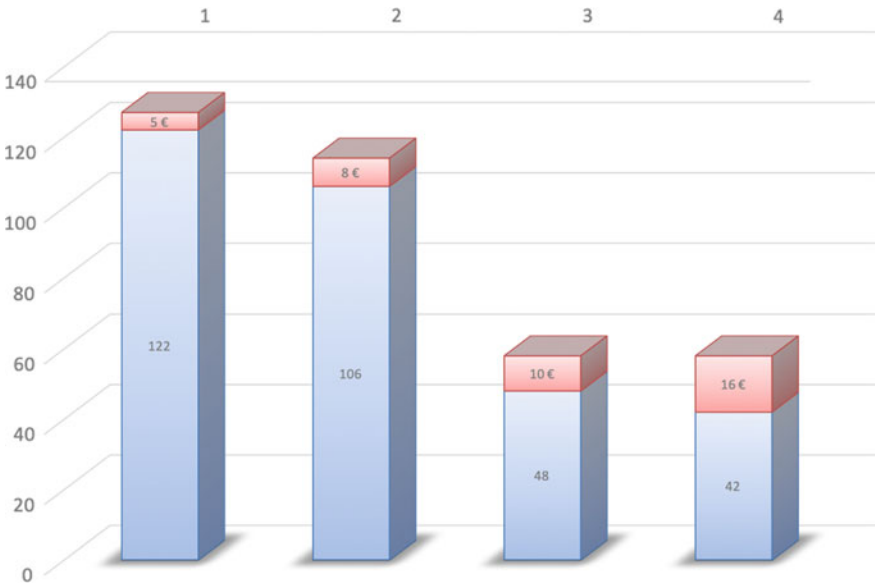
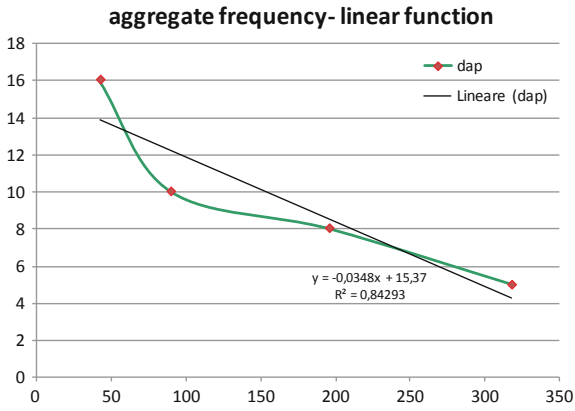


Fig. 7 Frequency histogram, own elaboration

Fig. 8 Linear function, own elaboration



significance to the data collected. The estimated functional forms were: linear, exponential and logarithmic. The logarithmic function gave a better R-squared (0.95688) and therefore has been used (Figs. 8, 9 and 10).

The utility of individuals is expressed by the of the consumer's surplus and is defined as the positive difference between the price that an individual is willing to pay to receive a certain good or service and the market price of the same good. The maximum that an individual is willing to pay is called a "reserve price". For example: if an individual is willing to pay €16 for a particular asset, but finally gets the same good at €10, he will have a (totally psychological) surplus of €6.

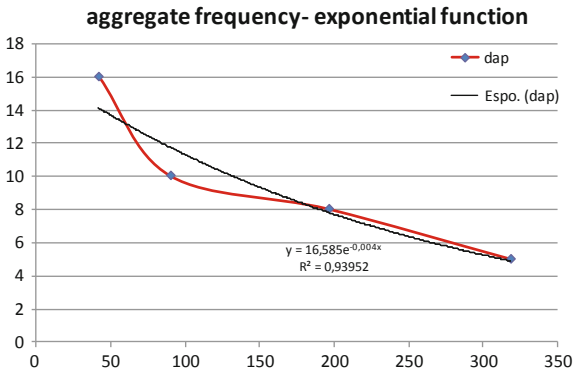


Fig. 9 Exponential function, own elaboration

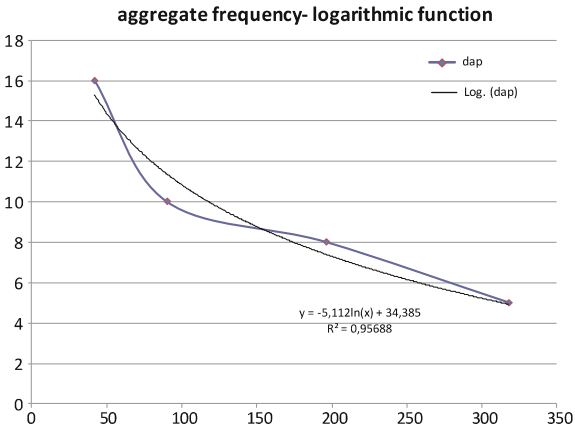


Fig. 10 Logarithmic function, own elaboration

With reference to the aggregate function of individual annuities, by extension, consumer surplus is defined as the sum total of individual surplus.

In general, the demand for an asset decreases as the price increases, so the demand curve has a decreasing trend (see Figs. 8, 9 and 10). In the case of "non-market" goods, for which individuals can not bear any price, the whole area under the demand curve will be identified as consumer surplus.

Therefore the logarithmic function proved to be the best option to represent the curve of the declared preferences.

The area under the demand curve, duly "discounted" to current events, will represent the recreational use value of Diecimare Park. In the face of 318 visits declared by the sample of 400 respondents in May and June 2009 we will have:

$$\text{Consumer's Surplus} = \int_{1}^{318} \text{DAP}\,\text{dN} = \int_{1}^{318} (34{,}385 - 5112\ln \text{F})\text{dN} = 3.157\,€$$

Table 2 Number of inhabitants directly involved, own elaboration

Town	Number of inhabitants
Mercato San Severino	22.346
Cava de' Tirreni	50.968
Baronissi	17.061

Unit values in euro per hectare			
	Vmax	Vmin	Rif. Tab.
Arable land irrigated	107.000	50.000	H703A
Arable land	40.000	20.000	H703A
Irrigate garden	115.000	55.000	H703A
Vineyard	60.000	40.000	H703B
Olive grove	43.000	22.000	H703G
Orchard	90.000	52.000	H703C
Oaks tree field	9.000	6.000	H703D
Coppice wood	7.000	2.200	H703I
Chestnut	43.000	20.000	H703D
Citrus grove	125.000	60.000	H703F
Lemon grove	150.000	70.000	H703F
Carob grove	15.000	10.000	H703M
Pasture	5.000	2.500	H703A
Abbandoned land	15.000	10.000	H703L
Unproductive wasteland	4.000	3.000	H703M

Fig. 11 Unit values in euro per hectare (Iovine and Curatolo 2014)

This value is divided by the number of visits declared to obtain the average DAP which is €9.93 ≈ €10.00.

This value represents the consumer surplus expressed by the interviewed sample.

To extend the data of the "sample" to the entire population of users of the Park, reference was made to the total number of inhabitants of the three municipalities (Table 2) in which the Diecimare Park is located. The assumption is that the "population" involved would behave similarly to the sample interviewed on site.

The population is given by the following proportion:

$400 : 318 = 90.375 : X$

$X = 71.848$ visits/year

The consumer's surplus, therefore, will be: €718.480, which discounted a rate of social discount of 2% will give a value of use of the Park amounted to €35,924,000 which corresponds to a VET of about €110,000,000 which, considering the 444 ha, it ensures an economic value of about 248,000 €/ha, far superior to the most profitable crop (Limoneto) present in Cava de' Tirreni (Fig. 11).

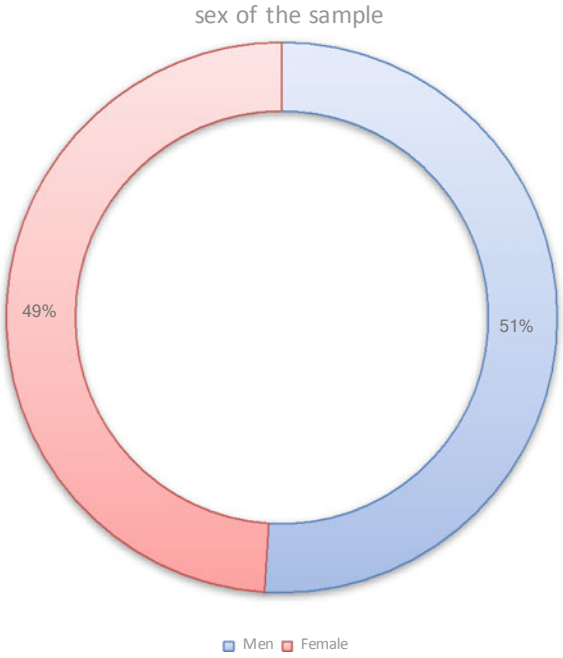


Fig. 12 Sex, own elaboration

The following are the statistics on the sample of the interviewees (Figs. 12, 13, 14 and 15).

The results obtained with the Contingency Assessment were subsequently compared with an indirect evaluation method such as the Travel Cost Method. It uses the following analytical formulation to estimate the value of recreational use, through the costs incurred to reach the site of interest:

$$CT = \left[\text{km\_tot}\ \frac{\text{Fuel Cost}}{5}\right] + \left[\frac{\text{Km\_tot}}{\text{Average value}}\ \frac{\text{Income} \times 12}{1730}\right] 0.333$$

wherein:

Km_tot is obtained from the complete distance of return;
Fuel cost is obtained from the cost of the fuel used (petrol, gas, diesel);
Average value is obtained from the average speed assumed in southern Italy in mixed cycles (city/highway);
1730 is obtained from the average annual working hours of an Italian citizen;
0.333 is obtained from the opportunity cost evaluated as a third of the hourly wage.
In light of these considerations, having used the price per liter of petrol as fuel cost,

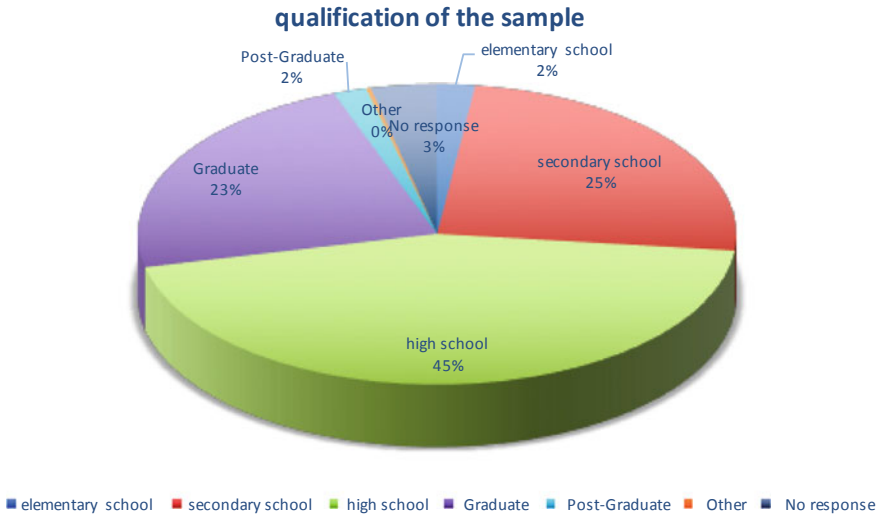


Fig. 13 Qualification, own elaboration

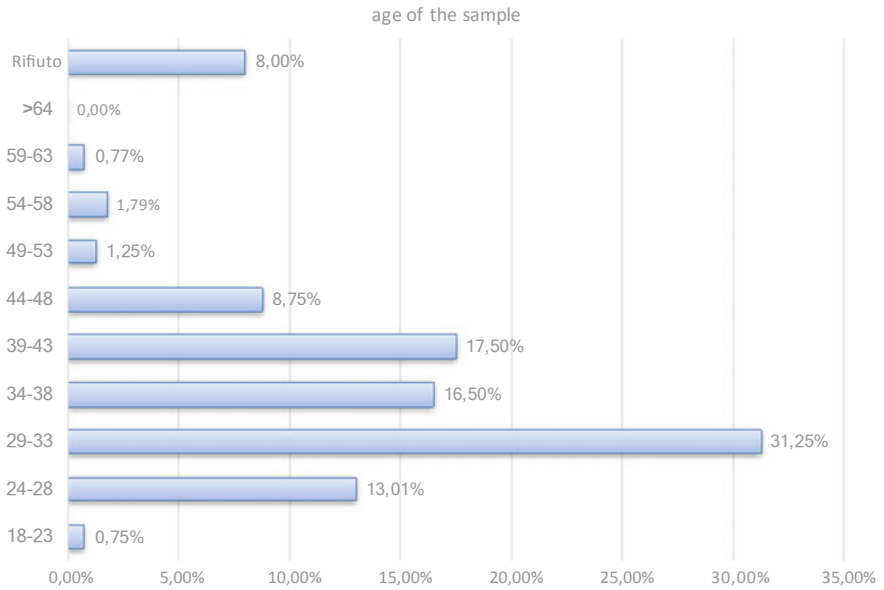


Fig. 14 Age, own elaboration

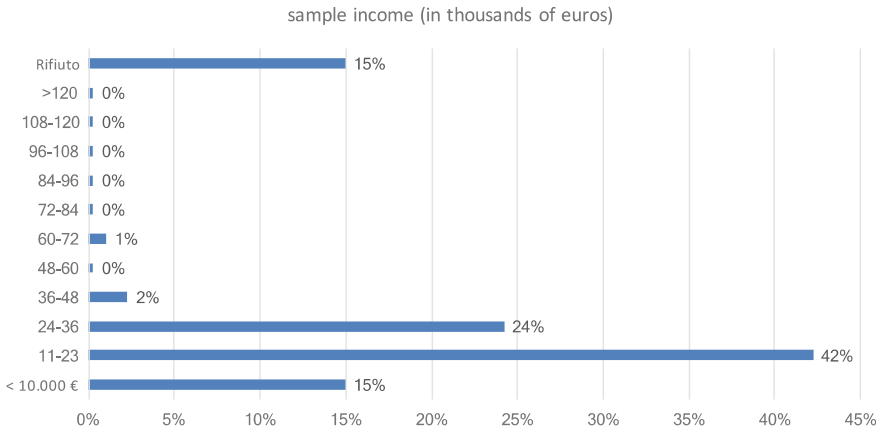


Fig. 15 Income, own elaboration

PROV	F	WTP
Caserta	2	€ 33,00
Benevento	9	€ 31,00
Avellino	11	€ 30,00
Napoli	100	€ 18,00
Prov Na	373	€ 12,00
Salerno	406	€ 6,00

Fig. 16 Origin of visitors and travel cost, own elaboration

equal to €1568/l and as an average income of €20,000, the aggregate frequency and the related curve were obtained, as well as always through Ms Excel we proceeded to obtain the logarithmic regression that reported a R2 equal to 0.9378, as represented in Figs. 16 and 17.

The area under the curve was calculated with the following defined integral:

$$\text{Consumer surplus} == \int_{1}^{406} \text{FN}\,\text{dN} = \int_{1}^{406} (40{,}299 - 4756\ln \text{F})\text{dN} = 6{,}649{,}389\,€$$

which divided the 406 presences returns a value of about €16, which is higher than €10 estimated with the CV, also because this estimation model also includes the opportunity cost.

Whether using "artificial markets" that make it possible to estimate the willingness to pay for use and non use values, through the Contingent Valuation, both using the Travel Cost Method, is necessary to give a monetary value to the environmental goods.

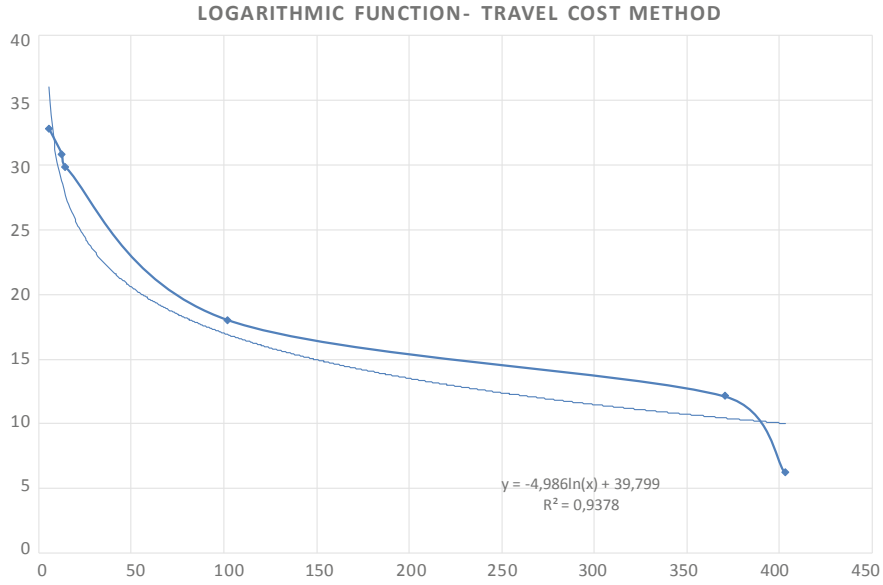


Fig. 17 Logarithmic function—estimate of the frequency curve, own elaboration

Precisely because environmental goods are "outside the market", political and economic operators are led to underestimate the benefits due to the high uncertainty that weighs on their overall values and meanings and, on the contrary, to favor those goods whose advantages are less "blurred" and expressed clearly in monetary terms; moreover, economic operators who exploit and pollute natural resources are often not inclined to cover their costs.

The monetary valuation of environmental goods without a market may be more or less imperfect; nevertheless, an explicitly formulated assessment for the benefit of political decision-makers and the public is always better than nothing, since in this case actions are undertaken on the basis of some implicit evaluation, which is hidden from public opinion (Turner et al. 2003).

This study is emblematic to make the environmental, recreational, touristic and landscape importance of a site in a state of neglect to be understood through the benefits (including economic) lost to politicians and citizens, so that everyone is aware of the richness of our environmental and cultural heritage.

Acknowledgements The author intends to thank the students of the course of Urban Economics and Estimo, School of Architecture, University of Naples "Federico II", Monumental Complex of S. Maria del Rifugio of Cava de' Tirreni a.a. 2008–09 which coordinated by the undersigned, proceeded to materially carry out the interviews. The author also thanks Lucia Matteo for the concession of the watercolor image shown in Fig. 3 depicting the Macaone butterfly, symbol of the Diecimare Park.

References

Arrow K, Solow R, Portney PP, Leamer EE, Radner R, Schuman H (1993) Report of the national oceanic and atmospheric administration panel on contingent valuation. Fed Reg 58:4602–4614
Blame RK, Bennett JW, Morrison MD (1999) Yea-saying in contingent valuation surveys. Land Econ 75:126–141
Calvino I (1963) Marcovaldo, ovvero le Stagioni in città, Mondadori, Milano, ed. 2016
Carson RT (1997) Contingent valuation: theoretical advances and empirical tests since the NOAA panel. Am J Agric Econ 79:1501–1507
Clawson M, Knetsch JL (1966) Economics of outdoor recreation. The Johns Hopkins Press for Resources for the Future, Inc, Baltimore
Cornes R, Sandler T (1985) Externalities, expectations, and pigouvian taxes. J Environ Econ Manage 12(1):1–13
Cummings RG, Brookshire DS, Schulze WD (1986) Valuing environmental goods: a state of arts assessment of the contingent valuation method. Totonia, NJ, Roweman and Allanheld
Fusco Girard L, Nijkamp P (1997) Le valutazioni per lo sviluppo sostenibile della città e del territorio. Franco Angeli, Milano
Hotelling H (1947) The economics of public recreation. The Prewitt report. National Parks Service, Washington
Iovine A, Curatolo M (2014) Listino dei valori immobiliari dei terreni agricoli. Campania 2015, Exeo
Millennium Ecosystem Assessment (2003) Ecosystems and human well-being. Island Press, Washington, DC
Millennium Ecosystem Assessment (2005) Vivere al di sopra dei nostri mezzi: patrimonio naturale e benessere umano. www.millenniumassessment.org
Nunes PADL (2002) The contingent valuation of natural parks. Edward Elgar, Northampton
Santos JML (1998) The economic valuation of landscape change. Edmond Elgar Publishing, USA
Signorello G (2007) La valutazione economica del paesaggio: aspetti metodologici e operativi. XXXVI Incontro di Studio Ce.S.E.T., Firenze University Press, pp 83–102
Signorello G, Missiato M, De Salvo M (2005) The economic valuation of landscape. An annotated Bibliography, Envalab Working Paper, Catania
Stellin G, Rosato P (1998) La valutazione della funzione ricreativa di un'area protetta. In Stellin G, Rosato P, La valutazione economica dei beni ambientali. Metodologia e casi studio, Cittàstudi ed
Tirendi D (2003) La valutazione di contingenza per la stima delle risorse culturali ed ambientali, in Genio Rurale - Estimo e Territorio, no 5. il Sole 24 Ore Edagricole, Bologna, pp 12–22
Turner RK, Pearce DW, Bateman I (1993) Environmental economics. An elementary introduction. John Hopkins University Press, Baltimore
Turner RK, Pearce DW, Bateman I (2003) Economia Ambientale, il Mulino. Bologna, Italia
Wood S, Trice A (1958) Measurement of recreation benefits. Land Econ 34:195–207. University of Wisconsin Press, USA