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D28/A

ECONOMIC VALUATION OF THE RECREATIONAL BEACH USE: THE ITALIAN CASE-STUDIES OF LIDO DI DANTE, TRIESTE, OSTIA AND PELLESTRINA ISLAND

Final Report

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INTRODUCTION

Environmental net benefit estimation is part of the public project appraisal process in the EU. More specifically, the demand for environmental evaluation at project level is expected to increase in the near future for the implementation of "a policy for the development of sustainable environment-friendly tourism in coastal areas" (Council of Europe, Recommendation N.(97) 9).

Coastal protection is a fundamental task of public organisations such as local, regional and national government. In their role of increasing the social welfare and custodianship of the common resources, they can plan to defend or provide a public beach through public funds. Investment in low crested structures (LCS) is frequently required in order to defend beaches from erosion. The amount of public funds involved is in general considerable, and because public funds are scarce the implementation of LCS projects competes with the implementation of other projects. Policy-makers who have to decide about the implementation of LCS projects require a clear understanding of the benefits and costs of every project, and have to be convinced that the users of the recreational beach services will have a net benefit. In other terms, the pursuit of a sustainable development requires the destination of public funds for the defence of the coast to be guided by a complete Cost-benefit Analysis (CBA).

One of the main difficulties of the CBA is to convert into financial terms all the benefits and costs which can be ascribed to a project about a beach, even those not established by the market. In this awareness, from the economic point of view, the task of DELOS is to find out whether in Italy the individuals' preferences for different beach scenarios can be expressed in money terms. This needs the choice of a specific economic method to assess the non-marketable use benefits resulting from the management of coastal sites where beaches play an important economic role. As regards the assessment of beach recreational use, different methods are suggested for estimating beach use value not established by the market – the contingent valuation method (CVM), the travel cost method (TCM) and the transfer benefit function (TBF) - and according to the situation the most suitable method has to be applied to obtain the best results. More specifically, given the situation, not only the choice of the best method but also the best way to apply it depends on the experience and sensitivity of the economist carrying out the evaluation.

This DELOS report consists of three parts. The first describes the general economic framework for the rational management of beaches and the theoretical foundations of the different methods used for estimating the non-marketable use value of a beach; the second part focuses on the choice of the suitable method for estimating the use value of the Italian beaches chosen as DELOS case-studies - the different methods are compared, and the choice of the CVM in the value of enjoyment version (VOE) is justified; the third part presents the results of the application of the CVM in the VOE version to the DELOS Italian case-studies of Lido di Dante, Trieste, Ostia and Pellestrina Island.

I. ECONOMIC FRAMEWORK FOR RATIONAL COASTAL MANAGEMENT: USE VALUES

I.1. The CBA applied to rational beach management

Beaches are a resource which favour recreational activities and tourism, defend properties from direct wave action by dissipating wave energy on the beach, and protect land from flooding by means of dunes.

In this DELOS research the focus is on the recreational use of beaches. They are enjoyed by many people, including residents and national and foreign tourists. According to beach facilities, such as sunbathing buildings, lifeguard, etc., beaches can be distinguished into: i) developed beach, when the number of facilities is high; ii) semi-developed beach, when the number of facilities is low, iii) undeveloped beach, when facilities do not exist. In addition, as regards the recreational activity done on the beach, the informal user is distinguished from the specialist user. Informal users visit the beach for ordinary recreational activities such as sunbathing, swimming, walking, and so on. Specialist users, instead, visit the beach for specific activities such as sailing, boating, bird watching, surfing, and so on. As regards DELOS Italian case-studies, only informal recreational activities on the beach are considered.

Today, the preservation and defence of beaches has to be the reply to the past strong, uncontrolled and often unsustainable development of many coastal areas. The aim is to prevent them being depleted, endangered and improperly used. One detailed study about coastal management in all its aspects is the 'Yellow Manual', by Penning-Rowsell and others (1992).

Because of the scarcity of natural resources, economists associate the conservation problem with the question of the optimal intertemporal utilisation of the natural resource stocks. *Sustainability*, in fact, requires the maintenance and/or improvement of the integrity of the life-support system on Earth, and a *sustainable development* must meet the needs of the present generation without compromising the ability of future generations to meet their own needs (Munasinghe and Shearer, 1995). More specifically, the Council of Europe (1997) claims that "sustainable tourism development meets the needs of present tourists and host regions while protecting and enhancing opportunity for the future. It is envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support system."

One method to pursue sustainability is Cost-benefit Analysis (CBA). The CBA is defined in terms of satisfaction of preferences, or economic welfare, intended as wants or desires: everything that satisfies a desire is useful and is considered a benefit or gain; everything that reduces a desire (or causes damage) is considered a cost or a loss. This method is based on the Pareto interpretation of efficiency, which means that a situation is Pareto optimum if no consumer can be made better off without making another one worse off. In addition, a non- optimal situation can be considered optimal in the Pareto sense if the person who gains from a change is potentially able to compensate the person who has a loss, though remaining in a situation better off than the initial one. The constraint that a sacrifice (measured in terms of welfare) requires at least a potential compensation is important for the practical application of CBA. Every project about a natural resource has to be considered for implementation only if:

$$\sum_{i=i}^{n} B_i - \sum_{j=1}^{k} C_j > 0 \qquad (1)$$

where $i = 1,\ldots,n$ individuals who have a benefit B from the implementation of a project, and $j = 1,\ldots,k$ individuals who instead suffer a loss C.

More specifically, because a project manifests its consequences in a time horizon, future costs and benefits have to be discounted, and the basic criterion for accepting a project is:

$$\sum_{t=0}^{T} (B_t - C_t) / (1+r)^t > 0, \qquad (2)$$

where T is the time horizon, and r is the discount rate. The *net present benefit* of the proposed project is discounted over the total life of the project. The debate about the right level of discount is still open (Penning-Rowsell *et al*., 1992, pp. 19-21).

In this way, the procedure of CBA produces a simple parameter on which the project choice has to be based, and it is very convenient to have a common numeraire (money) which places the environmental costs and benefits on the same scale of the economic costs and benefits. For each single project, benefits have to be greater than costs, and given alternative projects a policy-maker has to choose the one to which the maximum difference, or net benefit, corresponds.

I. 2. Beach as quasi-public good

A sustainable development applied to coastal management means basing development and environmental policies on a comparison of costs and benefits about each project, the aim of which is to improve the quality of the coast (Pavasovic, 1996). One of the main problems of CBA is to transform into monetary terms all costs and benefits, because not all of them are marketable. In other words many of them have no price. In general, if we apply CBA to coastal management, we see that many coastal goods and services are traded on normal markets and are therefore considered *private goods*, whereas many others are not traded on normal markets and are in general free of charge, therefore they fall into the categories of pure *public goods* and *quasi-public goods*. They are an extra market activity, and are therefore not included in the GNP.

Private goods have the characteristics of divisibility and of exclusivity of other people from their use, and therefore they have a market price. As regards coastal management, important potential private damages of non protection of the coast from the sea are lost agricultural output, damage to flooded properties, and lost tourist output, and they are evaluated by reference to existing market prices. Public goods, or collective goods, instead are defined as those goods that "all enjoy in common", because they do not have the characteristics of divisibility and exclusivity (Samuelson, 1954, p. 387); therefore the market is unable to establish a price for them. For example, many individuals can visit a beach for recreational activities, such as sunbathing, swimming, fishing, walking, picnicking, etc. without preventing others from doing the same things, and therefore the beach and its services are considered in the general category of public goods. More specifically, services of open-access beaches, are classified as *quasi-public good* because a beach is a "congestible" good; in fact its carrying capacity can be reached (Turner, Bateman, Brooke, 1992). The use that a person makes of a beach can be considered a case of public good until it reaches the congestion point, but beyond this point the more visitors are on the beach, the poorer each visitor's experience.

Nevertheless public evils also exist. For example, if a beach is protected from erosion by LCS, some negative effects also have to be considered: conventional groynes may reduce the recreational enjoyment because of their aesthetic intrusiveness, while off-shore breakwaters may be a hazard to boating and may reduce longshore drift and sediment supply and cause erosion to neighbouring beaches (Penning-Rowsell *et al*., 1992). In addition, depending on the situation, the quality of the sea water may deteriorate. The values of these consequences are not evaluated by the market.

I. 3. Use values and non-use values of a beach: the total economic value (TEV)

What is the total economic value of a natural resource? More specifically, what different values can be ascribed to a natural resource such as a beach? The debate on this topic is still open. We highlight only that the anthropocentric view of valuation refers the environmental value to the preference of human beings, and does not admit the so-called "primary value" which is instead admitted by the non-anthropocentric view (Turner, 1999). Primary value (PV) means that the environment also has an intrinsic value independent to the individual's preference and that could be ascribed to the system considered as a whole for its ecological functions.

To recognise primary value or not is a philosophical question, in which we do not want to enter. We remind the reader to the wide literature available, and we only mention Madariaga and McConnell (1987), Bishop and Romano (1998), Turner (1999), Price (2000), Spash (2000). Strong sustainability is pursued if primary value is admitted, while weak sustainability does not admit primary value. Therefore, if primary value is recognized, it cannot be added to the TEV because it is not based on individual preferences and cannot be considered in CBA. According to Turner (1999), we can only write:

$$TV = TEV \text{ and } PV.$$

The CBA is considered a method to pursue only weak sustainability. The anthropocentric view of valuation is based on the distinction between use values and non-use values (Turner et. al., 1994; Bower and Turner, 1998; P.Palomè, A. Van der Veen, S. Marzetti, 2001). Use value is the amount a person would elicit for use of the beach by the person making the valuation. The present use may be direct (fishing, recreation) and indirect (storm protection, flood control); while, when a person elicits a value for future beach use benefits, s/he makes reference to option price (Brookshire et al., 1983) - for example, if an irreversible erosion endangers the future availability of a beach, someone might be willing to pay for its defence even if s/he does not go to the beach now).

Non-use values can be distinguished in: i) bequest value, which measures the amount a person would pay for preservation of the beach for use by future generations; ii) existence value, which represents the amount the person who makes the valuation would pay only for knowing that a beach exists, for example, because s/he also attributes to it an intrinsic value – in other terms**,** the loss of the beach may be considered a damage only because it no longer exists.

Therefore, from the economic point of view, for the evaluation of a beach it is fundamental to know all the items of the TEV, which can be written: TEV = use value (direct

and indirect) + option price + bequest value + existence value. It depends on factors such as the characteristics of the beach, the protection degree, how much people know about the true state of the beach, and the demand for beach services. In general, if beach services are easily replaceable, use values prevail, whereas non-use values are considerable if beach services are not replaceable.

When a policy-maker has to choose a project about a beach, the TEV must be estimated and included in the CBA. Nevertheless, not all the different values of the TEV are established by the market. When beach services can be evaluated using market prices, this is very convenient, because making the CBA is only a question of computation. Instead where there are no market prices, problems arise. For example, informal recreational activities such as sunbathing, swimming, walking and bird watching have no market price, but they can represent an important part of the TEV of a beach mainly when tourism is well developed. In addition, option price and non-use values are also not evaluated by market.

The task of the economists has been to establish methods to estimate them, otherwise these non-marketable values could not be included in the CBA. More specifically, the evaluation of non-marketable use and non-use values in economic terms "stems from a belief that unless the value of natural resources is expressed in monetary units it will continue to be assigned a zero value, and will not therefore be incorporated into the decision making process" (King, 1995, pp.130).

Different economic methods exist, involving the creation of an artificial market, and their application depends on the good to be valued, and more in general on the specific situation considered (NOAA, 1993). The practical difficulty lies in obtaining rational and consistent expressions of value from people. A detailed review of the existing methods is in P.Palomè, A. Van der Veen, S. Marzetti (2001). In this DELOS report the focus is on methods of non-marketable use value assessment of a beach, while the reader is referred to the DELOS report D28/B, for the evaluation method of option price and non-use values.

I.4. Non-marketable use values of a beach: theoretical basis of the economic valuation

As regards the assessment of the informal recreational activities on a beach, two empirical methods exist which are based on the simple idea of asking beach visitors specific questions by means of a survey: the Travel Cost Method (TCM) and the Contingent Valuation Method (CVM). A wide literature exists about the characteristics of these two valuation methods (Palomè, Van der Veen, Marzetti, 2001). Here the characteristics most relevant to this research are highlighted.

According to the TCM, the willingness to pay for beach use is estimated from the willingness to pay for the travel cost to the beach in question. The TCM consists of a survey by questionnaire. Non-marketable use value of a beach is assessed by asking every respondent: '*What is the distance travelled from your home to this beach?'* The cost of this trip is considered the individual value of the recreational activities done on that beach. This method is based on a number of assumptions (Pearse, 1968). Amongst them we mention that the travel cost must be paid exclusively for visiting the beach. Therefore, one of the most important limitations of the TCM is that it cannot be applied to multiple-intention holidays.

The CVM[1], instead, aims to create a hypothetical market which permits respondents to elicit non-marketable value by means of a survey. With this technique, every respondent expresses a value which is contingent on the hypothetical scenario created within the survey. The CVM philosophy, generally known in the willingness to pay (WTP) version, is: " If you want to know what something is worth, go to those who might value it and ask: 'what are you *willing to pay* for it?'" (Price, 2000). Of course this procedure can evaluate damages, and the question is: What are you *willing to accept* as compensation for it? Another version of the CVM philosophy focus on the *value of enjoyment* (VOE), and the question may be: "What value do you put on your enjoyment of a daily visit to …?" (Penning-Rowsell *et al*., 1992, p.247). This value represents a benefit or a loss, whether the beach change is considered an improvement or a worsening respectively.

The TCM and CVM are based on the well known consumer theory: individual values would reflect individual preferences - or utility, or enjoyment, or welfare - according to the constraints perceived by him/her. Before presenting this economic theory in a concise way, it is useful to highlight that the demand for public or quasi-public service such as the recreational use of a beach can be also modelled in the same way as the demand for private services; therefore, some basic elements of consumer theory about private goods and public goods are presented.

I. 4.1. Consumer theory: private goods

Let us consider the consumer's behaviour about private goods. We assume that preferences are described by a continuous utility function $U(\mathbf{x})$ strictly convex in **x,** where **x** is a vector of goods quantities, which satisfies the neoclassical assumption of diminishing marginal rates of substitution (see Varian, 1984, for example). An agent is rational if s/he chooses the most preferred consumption bundle from the set of the possible alternatives of consumption.

In the most simple form, the consumer's problem in *maximising* his/her utility U drawn from private goods, given his/her income, can be represented as follows:

$$v(\mathbf{p}, Y) = \max U(\mathbf{x}) \quad \text{s.t.} \quad \mathbf{p}\,\mathbf{x} \leq Y, \tag{3}$$

where $\mathbf{p} >> 0$ is a vector of known prices, $Y > 0$ a known level of income and $\mathbf{p}\,\mathbf{x} \leq Y$ is the expenditure function. The solution is constituted by a set of ordinary or Marshallian demand functions $\mathbf{x} = \mathbf{d}(\mathbf{p}, Y)$ and an indirect utility function $v(\mathbf{p}, Y) \equiv u$. For any given values of **x** and Y, we can write the inverse functions of the ordinary demand functions $\mathbf{p} = \mathbf{d'}(\mathbf{x}, Y)$. As regards every private good, as shown in figure 1, the area p"a p' under its demand curve d, between the price paid p' and the choke price p", is named *Marshallian consumer surplus* (see figure I.1). An ordinary demand function is given by data obtained from the application of the TCM.

[1] The explosion of the application of the CVM was during the 1980s. During the 1960s instead it was used sporadically only in the USA. In the 1970s there was an increase in the application of this method, and by the end of the decade the CVM was officially recommended as valuation technique by the US Water Resources Council. In Europe the first application was in the 1970s (Bateman, Willis, 1999).

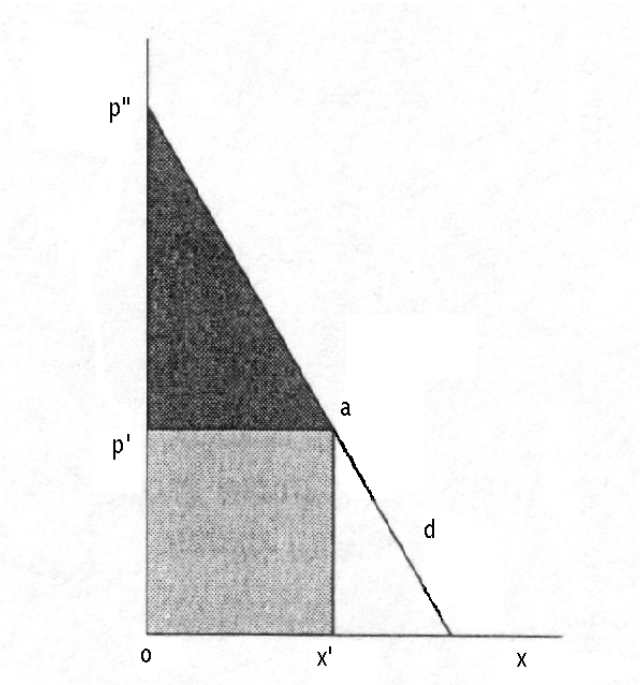


Figure I.1: Marshallian consumer surplus

Modern *consumer theory* also provides a way to represent the value or change in the respondent's income (for example the willingness to pay) which, coupled with a change in the considered good, leaves his/her utility unchanged (Varian, 1984, pp. 122-6). Therefore, the *problem of minimisation* of the individual expenditure in private goods, given a fixed level of utility, is written:

$$e(\mathbf{p}, u) = \min \quad \mathbf{p}\,\mathbf{x} \qquad (4)$$
$$\text{s.t.} \quad U(\mathbf{x}) \geq u,$$

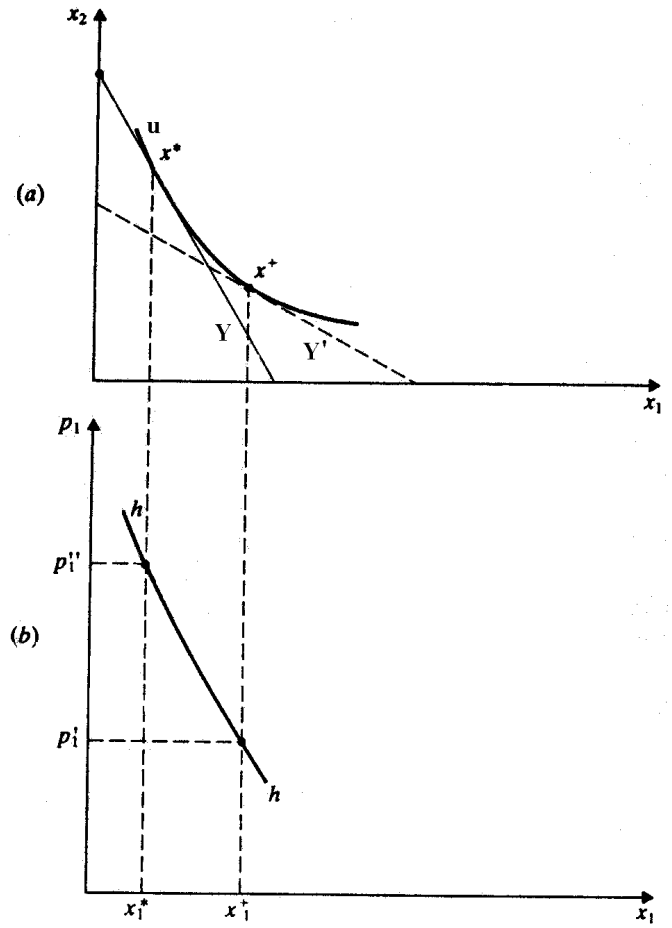
where **p** is a vector of prices, **x** is a vector of quantities, and u is a fixed level of utility. As solution we obtain a set of compensated (Hicksian) demand functions $\mathbf{h}(\mathbf{p}, u)$, and the minimum expenditure or the minimum amount of income which satisfies the utility level u, given **p**, which is $e(\mathbf{p}, U(\mathbf{x})) \equiv Y$.

The expenditure function has the following properties:

a) non decreasing in **p**;
b) homogeneous of degree 1 in **p**;
c) concave in **p**;
d) continuous in **p**;
e) if $\mathbf{h}(\mathbf{p}, u)$ is the expenditure-minimising bundle necessary to achieve utility level u at prices **p**, then $h_i(\mathbf{p}, u) = \partial e(\mathbf{p}, u) / \partial p_i$ for i = 1,…,n assuming the derivative is defined and $\mathbf{p} >> 0$.

The compensated demand function $\mathbf{h}(\mathbf{p}, u)$ is constructed by varying prices and income to maintain the consumer's utility at a fixed level, because the income changes must compensate the price changes. A graphical representation, where $\mathbf{x} = (x_1, x_2)$, $\mathbf{p} = (p_1, p_2)$

and $p_1 x_1 + p_2 x_2 = Y$, is given in figures II.2. Starting from the model of the utility maximisation and expenditure minimisation, the Hicksian demand function at constant utility *u* is obtained by the indifference curve *u*. In figure I.2a, the indifference curve *u* shows how the consumption changes with p_1, while p_2 remains unchanged; *Y* changes at *Y'* to keep the utility level *u* constant. Therefore the expenditure function slides down to *u*. In figure I.2b the curve *hh* is the Hicksian demand function at constant utility *u*: a reduction in price, from p_1'' to p_1', to maintain the constant utility $U(x^*)$, leads the consumer from x^* to x^+ and therefore his demand increases from x_1^* to x_1^+.



Figures I.2a and I.2b: Indirect compensation function

In this case, the area under the demand curve between the price p_1 paid for x_1 and the choke price is named the *Hicksian consumer surplus* (CS). The Hicksian demand function results from the application of the CVM, because the survey is designed in consideration of the hypothesis that the utility of the respondent must remain unchanged.

I. 4.2. Consumer theory: quasi-public good

It is possible to model the state of affairs about a *quasi-public good* such as a beach in at least two ways. i) *Beach available in fixed quantity*, which can be used by "each individual without subtraction from any other individual's consumption of that [beach]" (Samuelson, 1954, p.387). In this case a beach is considered like pollution, national defence, and the fire-brigade service. This is the general way to model public goods, and it can be used to assess use values of course, but also non-use values. ii) B*each services can be modelled in private-goods terms*, because each individual may make a different number of visits; this kind of model is also applied to woodland.

I. 4.2.1. *Beach available in fixed quantity*

As regards model i), let us suppose that a beach is also available in fixed quantity *Q,* about which the individual has some preferences (Hanemann, 1999). Therefore $Q = Qi$ "simultaneously for each and every *i*th individual". We can write the indirect utility function:

$$v(\mathbf{p}, Q, Y) \equiv U, \qquad (5)$$

and the expenditure function:

$$e(\mathbf{p}, Q, U) \equiv Y, \qquad (6)$$

where $U \neq u$, because the utility function becomes $U(\mathbf{x}, Q)$. The expenditure function instead remains $\mathbf{p}\,\mathbf{x} \equiv Y$, because for the sake of simplicity we suppose that the public good has price $p = 0$.

Let us suppose that the quantity of the beach changes from Q to Q' because it is protected from erosion, for example. An artificial increase in beach width can be considered of value from the recreational use point of view because it reduces crowding, for example, but it can also be considered a loss of enjoyment if the beach visitor prefers the beach in its natural state. The economic consequence of a beach change can be explained by the indirect utility function and also the expenditure function.

Using the indirect utility function (5), the consumer's utility will consequently change from the initial utility $U = v(\mathbf{p}, Q, Y)$ to the final utility $U' = v(\mathbf{p}, Q', Y)$, given $\mathbf{p}$ and Y. By analogy with the price change considered above for private good, we can define $CS = C$ the Hicksian *compensating measure* as follows:

$$v(\mathbf{p}, Q', Y - C) = v(\mathbf{p}, Q, Y), \qquad (7)$$

which is the compensation paid or received that does not modify the initial level of utility even if the quantity of the public good changes. The agent is entitled to his status quo endowment of property rights. If instead the agent is entitled to a set of property rights other than those currently held, we make reference to the final utility U', and we can define $CS = E$ the Hicksian *equivalence measure*:

$$v(\mathbf{p}, Q', Y) = v(\mathbf{p}, Q, Y+E). \qquad (8)$$

If the change in quantity is considered an *improvement*, then we write $U' - U \geq 0$ and: a) C is the maximum WTP for the implementation of the change, or the amount of income that a respondent would renounce in order to compensate the increase of utility obtained by having the beach width increased, for example; and b) E is the minimum WTA to renounce it,

or the increase of income that the respondent would accept to compensate the reduction of utility suffered by excluding him/her from the recreational opportunity, for example. Whereas, if the change is considered a *worsening*, then U' – U ≤ 0 and: c) -*E* is the WTP to avoid the change, and d) –*C* is the WTA to tolerate it. These four concepts of Hicksian consumer surpluses are implied in the CVM (Mitchell and Carson, 1989, pp. 23-5; Hanemann, 1999, pp. 44-5). In figure III.3, for example, given the price of the public good p = 0 and the change of the beach width from Q to Q', if the change is considered an improvement, a + b = *C* and this area is the WTP for the change; otherwise a + b + c = E, or the WTA to renounce it. In the case of a worsening, a + b = –*C*, or the WTA to tolerate the change; and a+ b + c = - E, or the WTP to avoid the change (Mitchell and Carson, 1989, p. 24).

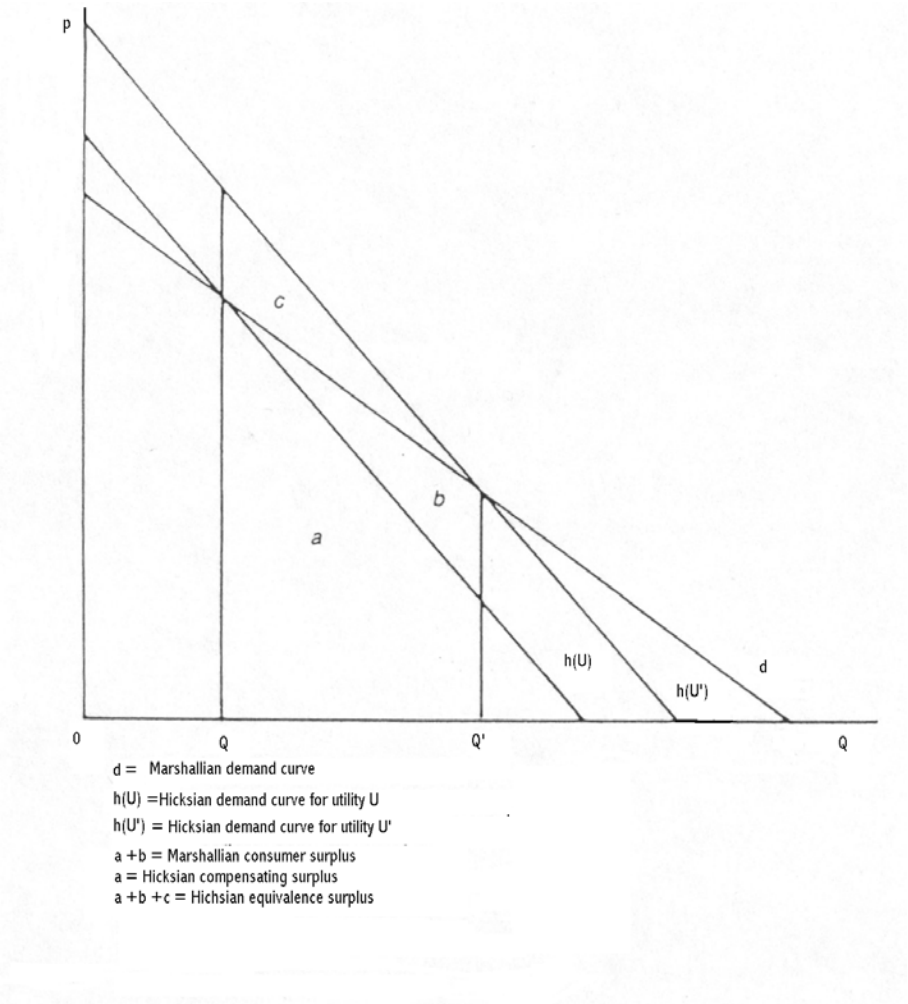


Figure 3: Hicksian consumer surpluses for a change in beach width

Finally, if we consider the expenditure function (6), the consumer surpluses (CS) can be represented as follows:

$$CS = [\, e(\mathbf{p}, Q, U) \equiv Y\,] - [\, e(\mathbf{p}, Q', U) \equiv Y'\,]. \qquad (9)$$

If CS = $Y - Y' > 0$, then Q' is preferred to Q, and the respondent is willing to pay for the change and will maintain his/her utility level unchanged. If CS = $Y - Y' < 0$, then the

respondent is willing to accept a compensation to leave the utility unchanged (Mitchell et al, 1989, pp. 26-7).

I. 4.2.2 *Beach services modelled in private-good terms*

Beach visits, even if there is open access, can be considered as a private good measured in *numbers of visits* per season or per year made by each person. This model is valid only for use values (Sudgen mentions this model as regards woodlands, 1999, p.132). Therefore by creating an *imaginary market*, a user could buy the numbers of visits q at the imaginary price w. By analogy with private goods (model (3)), we write (Bateman and Willis, 1999):

$$\begin{aligned} v'(\mathbf{p}, w, Y) = &\max\ U(\mathbf{x}, q) \\ &\text{s.t.}\quad \mathbf{px} + wq \le Y. \end{aligned} \qquad (10)$$

The solution is the ordinary demand functions $\mathbf{x} = \mathbf{d}(\mathbf{p}, w, Y)$ and $q = d(\mathbf{p}, w, Y)$, and the indirect utility function $v'(\mathbf{p}, w, Y) \equiv U$.

The corresponding expenditure minimisation problem is:

$$\begin{aligned} e'(\mathbf{p}, w, U) = &\min\ \mathbf{px} + wq \\ &\text{s.t.}\quad U(\mathbf{x}, q) \ge U. \end{aligned} \qquad (11)$$

The solution is the compensated demand functions $\mathbf{x} = \mathbf{h}(\mathbf{p}, w, U)$ and $q = h(\mathbf{p}, w, U)$, and the expenditure function $e'(\mathbf{p}, w, U) \equiv Y$.

For any given values of q, $\mathbf{p}$, and U, the inverse function of the ordinary demand function $q = h(\mathbf{p}, w, U)$ is:

$$w = h(\mathbf{p}, q, U), \qquad (12)$$

which is the *inverse compensated demand function* for q. It means that the agent would pay an hypothetical price w - or would express a value w of the visit enjoyment - for q numbers of visits and s/he will attain the utility level U also by buying private goods at prices $\mathbf{p}$. Of course $h(\mathbf{p}, q, U)$ can be considered the marginal WTP or WTA for an incremental unit of visits to the beach, or also the shadow price of a visit.

In addition, if the number of visits changes from q to q', we can write for compensating variation and equivalence variation respectively:

$$C = C(\mathbf{p}, q, q', Y) = \int_{q}^{q'} h(\mathbf{p}, q, U)\, dq, \qquad (13)$$

$$E = E(\mathbf{p}, q, q', Y) = \int_{q}^{q'} h(\mathbf{p}, q, U')\, dq. \qquad (14)$$

In this model a change in beach width can, therefore, be introduced as an attribute of a beach. For example, if an increase from *Q* to *Q'* is considered an improvement, the demand curve of visits to a beach h = h(·) shifts outward from h to h' (Luken, Johnson, Kibler, 1992). At the imaginary price *w*, the number of visits increases from *q* to *q'* and the increased willingness to pay for the beach width increase is measured by the increase of the consumer surplus represented by the area between the demand curve h and h'.

I. 4.3. Aggregate values

If respondents elicit a value for the enjoyment or utility they would obtain from the availability of a public good such as a beach, it is also appropriate to compute the *aggregate value* of the public good considered. Once the individual values have been obtained by means of a CVM survey, the total benefits for the beach being evaluated can be calculated.

From a theoretical point of view, this aggregation problem consists of the determination of the aggregate demand or bid/valuation curve for public goods. In performing this aggregation, nevertheless, we have to highlight that the management of a beach can be modelled considering the beach as a public good available in fixed quantity *Q*, or alternatively that we can build a model where the number of visits *q* are considered as the quantity of beach service consumed. Following Samuelson (1954), Bradford (1970) shows that, if a beach is considered in fixed quantity - as presented in section I.4.2.1 - we have to sum the individual valuation curves vertically, and therefore the total value curve can be identified with the appropriate consumer surplus measure at the fixed level of provision *Q*. If, instead, the number of visits to a beach is considered, and the beach services are treated as a private good - as in section I.4.2.2, the aggregate demand is obtained by doing the horizontal sum of the individual demands at the different levels of the imaginary price. Figure I.4 is a graphical representation of the consumer surplus as measure of the total value of a beach in the case of two individuals (Marzetti, 1991).

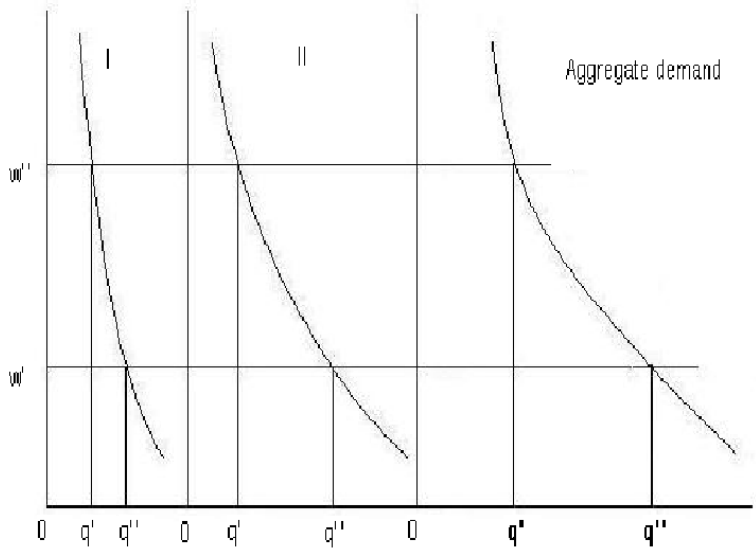


Figure I. 4: Aggregate demand curve

II. METHODOLOGY: THE CONTINGENT VALUATION METHOD IN THE VALUE OF ENJOYMENT VERSION

II. 1. The need for new surveys

In general, as regards CBA, a policy-maker must decide whether to extrapolate the results of non-marketable benefit evaluations done on other sites or to commission a new evaluation study. However it is time consuming and very expensive to carry out a valuation survey. Therefore researchers have suggested saving time and money by using benefits *transferred* from other studies regarding other sites (study sites) to a new site (named policy site). This is the procedure of the Benefit Function Transfer (BFT), whereby the willingness to pay or the value of enjoyment for an improvement of beach quality is generalised to other empirical situations (secondary data). One of the main problem about the BFT is the possibility of yielding valid and reliable estimates. Researchers need to transfer the demand function of the beach use - obtained by the application of a method of valuation at the study site - to the policy site and to test the equality of estimated coefficients at the policy site and study site.

In DELOS research, the BFT has been described and critically analysed by Palomè (2003), *Extracting a Benefit Transfer Function from CV Studies*, D11. For the purpose of this research I only briefly highlight that one of the main issues of BFT regards the possibility that the benefit transfer studies yield valid and reliable estimates. Therefore the use of an existing study to represent another situation must respect some basic criteria:

- non-marketable goods need to be the same (for example coastal recreational activities depend on the characteristics of the beach – sand or pebbles; wide or narrow –the quality of the sea water, the weather, the facilities on/near the beach, and so on);
- population characteristics should be similar for the policy and study sites;
- a researcher cannot switch welfare measurements from willingness to pay to willingness to accept, because the latter is usually greater than the former (Boyle and Bergstrom, 1992), nor can s/he compare the results of the WTP survey with those of the VOE survey, because WTP may incorporate use value as well as non-use value, and their apportionment is not possible (Penning-Rowsell et al., 1999).

In addition, Whitmarsh et al. (1999) highlight the existence of a "degree of site specificity" which may justify estimates not perfectly congruent with eventual standard data.

We found no application of economic valuation methods to sites very similar to the Italian case-studies, and therefore it was not possible to transfer benefits from other sites to these sites. More specifically, the DELOS bibliographical research showed that there were no applications of the TCM and CVM for estimating non-marketable benefits to Italian beaches, nor applications of valuation methods to the Mediterranean sea beaches, but mainly applications to British and US beaches. Secondly, the available benefit estimates are not the result of homogeneous situations: the characteristics of the coastal sites and populations are different, different methods and different payment vehicles are used. As regards use values, for example, Penning-Rowsell *et al*. (1992) and Whitmarsh et al. (1999) apply no payment vehicle because they use the VOE method, while Silberman and Klock (1988) and King (1995) consider WTP in the form of a daily admission fee, and Bell (1986) considers an annual pass. Therefore, in order to quantify non-marketable values for Italian case-studies, specific interview surveys were carried out before and after the implementation of a project about coastal management in Italy.

II. 2. Methodology used for the Italian Case-studies

Given the need for new surveys for the Italian case-studies, the CVM in the VOE version is applied to assess recreational or *use values* following the approach set forth by Penning-Rowsell *et al.* (1992) in the *Yellow Manual* (YM) about coastal management. This choice needs to be justified.

II.2.1 The Choice between TCM and CVM

As regards the choice between TCM and CVM, the reasons for the claim by Penning-Rowsell et al. (1992) that the CVM is more suitable than the TCM for coastal recreation in British sites also apply to Italian coastal sites. In fact on the Italian coast, "first, there are a large number of roughly comparable sites … and the distance-decay factors found to operate in other contexts are not applicable here. Also decisions to visit the coast may be conditioned by decisions unrelated to distance such as proximity to family, traffic delay and road conditions. A second reason … is that … visits to coastal sites may be combined with pleasure motoring or may be unplanned and result from a spontaneous stop at an appealing location." In general, people can do different activities, such as shopping, visiting inland sites, museums and the archaeological part of the site. "It is therefore not possible to separate out the different components of travel cost" (Penning-Rowsell *et al*., 1992, p. 66). A third reason is that the coastal site may be frequented mainly by residents, therefore the cost of travelling may be very low or even zero and in this way its recreational value would be underestimated. More specifically, considering international tourism sites, the TCM is not suitable for tourists who travel long distances and visit the site only once per year, because their trip usually has multiple destinations: the international travel cost and the costs of the tourist's stay are related to all the on-site activities. In practice it is not possible to split the travel cost into all its different components.

As regards coastal management, the choice of the CVM implies another choice, since it can be applied either in the WTP/WTA version or in the VOE version. Comparing these CVM versions, we highlight that the WTP/WTA needs the specification of a payment vehicle, such as tax, entry charge, rate, voluntary donation and so on, and in this way the income constraint is expressed. The VOE does not need this specification but, although the CVM in the VOE version does not reflect the real constraint of income when individual values are expressed, the evaluation question is designed in such a way as to highlight the basic problem of the economic valuation: agents must choose between alternatives (Whitmarsh *et al*., 1999). In the case of a beach, visiting a beach means sacrificing some other recreational activity such as, for example, going to the cinema.

Therefore, the VOE method has the advantage of avoiding all the criticisms about the choice of the payment vehicle, which can determine responses biased towards underestimation or overestimation. Green and Tunstall (1991), for example, highlight that "the risk of introducing unfamiliar mechanisms (such as admission pass) is that responses may reflect attitudes towards the payment mechanism rather than attitudes towards the good." On the contrary, if the payment vehicle is familiar (such as entrance fee), respondents may consider only the range of values that they are used to paying. In addition certain payment vehicles, such as fee, extra tax and rate, may be unpopular. More specifically, the experience shows that respondents who express zero WTP bids may object to the daily entrance fee because they consider the management of public good (such as beaches) a task of government (King, 1995). Laarman and Gregersen (1996), in fact, specify that the charging of a fee raises

the question as to whether an environmental resource should be provided as free good or not. Is access to a natural resource, such as a beach, everyone's right? Should low-income people be excluded from the appreciation of nature? These questions raise a concern for equity, which could determine public resistance to any form of payment.

The VOE method also avoids the problem as to whether an elicitation question in a survey is phrased as WTP or WTA. In fact considerable evidence exists that WTP and WTA for changes in quantity of a public good generally differ. It seems that in a number of surveys respondents elicited greater WTA values than the WTP values for the same public good. Transaction costs, loss aversion, uncertainty and survey-related phenomena seem to be reasons for this behaviour. For example, Mitchell and Carson (1989) highlight that when the quantity of the public good is fixed, people are more sensitive to a loss than a gain, and therefore would elicit a greater WTA than WTP. Nevertheless, respondents would find it difficult to elicit a WTA value because they do not find it plausible. For more details about this topic we refer the reader to the extensive literature summarised by Mitchell and Carson (1989), and Hanemann (1999).

In addition, another aim of DELOS research is to study the possibility of performing a transfer benefit function as regards the beach use value (see Palomè, 2003, DELOS, D11). Most European CVM applications have been carried out in Great Britain, and mainly in the VOE version (Penning-Rowsell et al., 1992; Whitmarsh et al., 1999). Therefore, the need to collect further data useful for a possible transfer benefit function was another reason for the decision to apply the CVM in the VOE version to the Italian case-studies about beaches.

II. 3. Empirical results of the CVM

The data obtained by means of a CVM survey can be used:

1) to estimate the average daily beach use value;
2) to evaluate the recreational average gain and loss of enjoyment;
3) to evaluate the total annual recreational value;
4) to describe the distribution of individual values of enjoyment;
5) to simulate a demand function for recreation.

II 3.1 Average daily use value of a beach

The assessment of the average daily use value of a beach is the first step of the CVM survey. The reason why it is convenient to estimate the *daily use value* of a beach, instead of the beach use per visit, is specified below in section II 3.3.

It is expected that beach visitors will elicit positive values just because they use the beach, also taking into account their income constraints. The average mean value of a daily visit must be computed for each scenario. However, it is expected that some visitors will elicit zero value even if they use the beach. Zero values have to be justified to decide whether they should be considered in the computation of the mean use value. More specifically, if a number of zero bids are protest bids, they must be excluded from the mean value computation. For example, some respondents could say that the valuation question is not well constructed, others could claim that the beach use should remain free, others could say they do not have enough information or they are unable to elicit a value. More specifically, as

regards public goods, people can behave as free-riders. In fact if people are aware that - once it is provided - they can enjoy the public good even if they pay nothing for it, they may elicit zero values. So they behave strategically by declaring not to prefer the good in order to avoid making any contribution. Therefore in a CVM survey "the key question is not whether any one individual will contribute, but whether enough individuals will contribute rather than free-ride (Blamey, 1997, p.52)."

In addition, it is recommended that non-responses are excluded from the mean computation, while the exclusion of extreme values depends on the specific situation (see Penning-Rowsell et al., 1992).

II.3. 2. Average recreational gain and loss of enjoyment

The CVM provides the appropriate Hicksian measure without directly estimating the Hicksian compensated demand curve. In fact the CVM survey allows calculation of the gain and loss of enjoyment for each individual per visit.

Since individuals may visit other sites after a beach change (the implementation, or the non-implementation of a LCS project, for example), for a specific site, we should distinguish people who continue to visit the site from people who transfer their visit to an alternative site (Penning – Rowsell et al., 1992). Therefore, given a certain beach change:

a) if people continue to visit that site, the recreational gain or loss in enjoyment per visit is the difference between the VOE of a visit in the status quo, and the VOE after the implementation of that project; therefore for each individual it is:

$$D = Vp - V, \qquad (15)$$

where D is the net gain, or net loss, in enjoyment, V is the VOE in the status quo, and Vp is the VOE after the implementation of the project;

b) if people transfer the visit to another site:

$$Da = (V - Va) + (Ca - Cs), \qquad (16)$$

where Da is the net gain, or net loss, when people visit an alternative site, Va the VOE in the other site, Ca the cost per visit to the alternative site, and Cs the cost per visit in the status quo. Let us suppose that a rational individual has a loss in enjoyment after the implementation of the project. S/he will rationally decide to go to another site if loss D is greater than Da, otherwise s/he will continue to visit the same site. According to this economic theory, irrational respondents are those who would visit another beach even if the loss Da is greater than D after the implementation of the project.

Gain and loss should be computed for each individual, and then the mean gain or loss of the whole sample. It is recommended that irrational responses are excluded.

II. 3. 3. Total annual recreational value

If every respondent elicits how much enjoyment he/she would obtain from the daily use of a beach, it is also appropriate to compute the *aggregate value* or total recreational net benefit per year of the beach considered. We need to test whether the beach aggregate value per year could be increased by the implementation of a LCS project.

Let us consider a resident survey or a catchment survey. Given a representative sample of the site residents or people who live in the catchment area, the total annual recreational net benefit B is obtained as follows:

$$B = N\, q_m\, D_m, \qquad (17)$$

where D_m is the estimated mean gain (loss) of enjoyment per adult daily visit, N is the total population of the site or catchment area, and q_m the mean adult daily visits per annum ($N\, q_m$ total number of daily visits per annum).

If instead we carry out an on-site survey, the equation (17) has to be computed taking into consideration not only residents but also day-visitors and tourists. Data about the total number of visits per annum of locals, day-visitors and tourists are needed to compute the total recreational benefits per annum. Penning-Rowsell et al. (1992, pp.80-1) recommend using the best local and national records and, where this kind of data are not available, they present a list of possible methods of obtaining site specific estimates such as car and coach park records, records of entry to beach facilities, estimates obtained through surveys of coastal businesses. In general, in well developed tourist sites official data exist about arrivals and night stays of tourists, recorded at least yearly. In particular these data are useful to compute the tourist aggregate recreational use value of a beach. Official data about residents' and day-visitors' visits per year are not always available, and they can be obtained by means of the CVM by asking residents and day-visitors the number of daily beach visits per year.

This aggregation method is fully valid for a resident survey because people are interviewed at home and the sample is representative of all the residents of the site. Instead, for the on-site survey, people who do not visit the beach in the survey time but only in the rest of the year are not interviewed, so the estimated mean gain and loss from a change is obtained only from visitors at the survey time.

We also highlight that some respondents - tourists and residents - may go to the beach more than once per day because they live or are staying near the beach. Nevertheless, to compute the tourist recreational aggregate value, it is useful to estimate the daily use value of a beach instead of the beach use per visit, because official data about tourist niht stays - and day stays - are available.

In the CBA the aggregation level in general is national economy and not merely local economy. In fact, as regards use value, "if changes at a particular coastal site simply result in a transfer of recreation from one site to another without any overall gains and losses in the value of the enjoyment of the recreation once travel costs have been taken into account, then no national economic gain or loss will be involved in the change (Penning-Rowell et al., 1992, p.64)." In particular Penning-Rowell et al. (1992) suggest not to interview foreign tourists.

The presence of foreign tourists characterises a situation in which the recreational value is not only appropriable by the national community who pay for the conservation project. Foreigners use the beach, but they pay nothing not even in tax because the beach is a public good (see also Daniel, 2001). Arrow *et al.*(1993, p.10 and pp. 16-7) in general claim that "it is sometimes difficult determining the 'extent of the market'. … Undersampling and even zero sampling of a subgroup of the relevant population may be appropriate if the subgroup has a predictably low valuation of the resource." Therefore, if the subgroup consists

of foreigners in a well developed international tourist site, the "foreign" use value of a beach cannot be neglected since this would mean neglecting an important part of the aggregate recreational value of that beach.

The task of this DELOS research is not to compute the aggregate use value of the Italian beaches considered as case-studies because its aim is to find out whether in Italy recreational beach value can be expressed in monetary terms.

II 3. 4 Recreational beach use model

The questionnaire highlights that the VOE depends on a number of variables. In general, for each individual the following model is considered (Bell, 1986, Klock, 1988, King, 1995):

$$VOE = w\,(q, \mathbf{V}, \mathbf{A}, \mathbf{G}, \mathbf{T}, \mathbf{W}, \mathbf{O}, \mathbf{VOEs}, \mathbf{VOEa}, \mathbf{F}, \mathbf{C}, \mathbf{S}, \mathbf{I}), \qquad (18)$$

where:

VOE = individual VOE per beach daily visit;

q = individual number of visits (beach days per annum)

V = a vector of beach visit characteristics such as the time of visit (weekend, other days), the number of hours per daily visit and the recreational activities done;

A = a vector of beach attributes, such as beach width (*Q*), water quality, crowding (square metres of beach per person), characteristics of the sites near the beach;

G = visiting group, child in a visiting group;

T = a vector of trip attributes, such as distance from the beach, means of transportation, travel time;

W = a vector of different weather, such as spring/summer and autumn/winter;

O = alternative beaches;

VOEs = a vector of the VOE of possible alternative scenarios of the considered site

VOEa = a vector of the VOE of alternative sites;

F = a vector of facilities available, such as sunbathing buildings, lifeguard, parking lots, beach volley field;

C = a vector of costs, such as cost of beach trip**,** cost of alternative beach trip;

S = a vector of socio-economic attributes, such as, total household income per year, sex, age, education, marital status;

I = a vector of survey influences, such as starting point and interviewer.

From the theoretical point of view, the relation between beach days *q* and the VOE is the recreational demand function. An increase in beach days should move the user down the function and the consequence is that the VOE decreases; while an improvement in beach quality or an income increase, given the number of beach days, should shift this demand curve to the right and the consequence is that the VOE increases. This function is 'simulated' because it is the result of a hypothetical market behaviour created by the CVM survey, based on the hypothesis that a public good such as daily beach use is considered as a private good.

This model is used to check the validity and reliability of the survey results. In general this is done by correlation and regression analysis. A wide literature exists on this aspect of the CVM method; see Bateman et al, 1999 for example. Validity is concerned with the issue of whether the questionnaire really measures what it was originally intended to do;

in this respect, bias is the term of difference between the estimated value and the true value. Theoretical validity evaluates whether the results are consistent with theoretical expectations; this typically involves a regression of the VOE with other independent variables to check whether the direction, magnitude and strength of the relationships among variables are consistent with what would be expected according to economic theory. Reliability refers to the extent to which the variance of the VOE given by respondents is due to random sources of noise. The variance in the VOE elicited for the beach use depends on two main factors: a deterministic component, which is the normal variation in the VOE among individuals, and a random error due to imperfections in the survey instrument (its concepts, wording and method of presentation) and the sampling design. In addition, if CV studies use relatively small samples or describe scenarios that respondents find unclear or unrealistic, the estimates obtained could differ widely from the true value; therefore great attention has been paid to these last two aspects.

II. 3. 5. Distribution of individual benefits

A LCS project can pass the CBA test, without considering the fact that a consequence of its implementation may be that poor people become poorer and rich people become richer. In other words, a consequence could be a redistribution of welfare that society considers undesirable from a moral point of view. A policy-maker is interested in the distribution of benefits from a project change (Mitchell and Carson, 1989). Information about redistribution of benefit and loss is obtainable from the CVM survey by creating a simple graph whose abscissas are amounts of enjoyment in Euro, and ordinates are the percentages of respondents who express the different values of enjoyment.

II.4 Kinds of CVM survey according to the relevant population

According to the relevant population, or those who benefit from the beach, we distinguish different kinds of survey:

i) an ‘on-site survey’, when interviews are done on the beach. People who use the beach are not only residents but also day-visitors and tourists, and the cheapest way to interview them is on the beach.

ii) a ‘resident survey’, when people who use the resource are mainly or exclusively residents of that site, and the interview is at home.

iii) a ‘catchment survey’, when people who are interested in the beach use are interviewed at home but they live in an area wider than that considered for residents, such as a regional, national or international area.

The choice of one of these types of survey, or a survey consisting of more than one of these types of survey, depends on the specific situation considered and on the available amount of funds. In particular, if an on-site survey is carried out, only current users are interviewed and the limit of this approach is that potential new users who would benefit from a change to the coast are not considered; while if a resident survey or a specific survey in the catchment area is carried out potential new users are also interviewed. As regards DELOS case-studies, the choice of the kind of survey according to the relevant population is justified in the specific section dedicated to each site.

II. 4. The CVM in the VOE Version: Survey Design

We have highlighted that when a beach is used for recreational activities, economists speak of beach recreational use value. Beaches are in general considered public goods, and because of this nature the market does not establish recreational use value. The practical difficulty lies in obtaining rational and consistent expressions of value from people who use the beach, because the market is unable to establish the recreational value of that beach. The CVM survey in the VOE version permits recreational use value to be estimated for each individual by asking each beach user the value s/he attributes to the enjoyment obtained from a daily visit to the beach.

The CVM survey consists of four steps: i) survey design, ii) pilot survey, iii) sampling design, iv) main survey. From the economic point of view we mainly focus on some aspects of the survey design. For the other steps of the CVM survey we only highlight very briefly some characteristics, and we refer the reader to the specific literature.

II. 4. 1 Survey design

At the heart of the CV approach is the questionnaire, which attempts to develop a plausible scenario in which evaluation can be made.

In its wording the questionnaire can be divided into sections as follow:
i) to collect information about respondent's residence and if s/he is resident, or day-visitor or tourist;
ii) to collect information on the type and frequency of beach use;
iii) to evaluate the enjoyment of a visit to the seafront in its current condition;
iv) to evaluate the change of enjoyment after the possible erosion of the beach;
v) to evaluate the change of enjoyment after a hypothetical LCS project;
vi) to collect data about the social characteristics of respondents.

The basic VOE questionnaires used for the Italian case-studies are those published in the *Yellow Manual* (Penning-Rowsell *et al.*,1992, Appendices 4.2 (a) and (b)): the Standard site user questionnaire and the Standard residents questionnaire. The elicitation method for the VOE response is Open-ended (OE): the respondent is free to state any amount. The structure of the *Yellow Manual* valuation question is as follows (site survey):
- 'We are trying to find out how much value you, as individual, put on your *enjoyment of this visit to this seafront today.*
- Now this is an unusual question to ask so let me explain it to you in this way: Think of a visit or activity you have done in the past which gave you the same amount of enjoyment as your visit to this seafront today (a show card with a list of possibilities is shown).
- Now think about how much that visit (or other activities) cost you. Remember that the cost of a visit may include petrol and parking costs or bus or train fares as well as admission charges and any costs.
- You can use the costs of that visit (or other activities) as a guide to the value of your enjoyment of today's visit to this seafront.
- So, now, what value do you put on your individual enjoyment of this visit to this seafront?'

The questionnaire has to be constructed to reduce and possibly avoid endogenous sources of error such as:

i) s*trategic behaviour* – respondents attempt deliberately to influence the outcome of the survey by intentionally distorting the use value elicited;
ii) *compliance behaviour* - respondents perceive the expectation of either the sponsor of the survey or the interviewer;
iii) *information bias* - because of incomplete or superfluous information;
iv) *anchoring bias* - the entrance ticket of other beaches and the amount paid for sunbathing building facilities, for example, can be considered as a guide for eliciting the use value;
v) *methodological misspecification bias* - some people may be unfamiliar with the valuation question, so the answer may be biased because the respondent actually answers a different question.

Results depend on the information given to the respondent about the beach change being evaluated. When interviewees are visitors to the beach (on-site survey) or residents of coastal sites (resident survey), respondents have use experience of the beach. To limit the risk of respondents giving an incorrect interpretation of changes due to a LCS project, drawings can be used. In addition, a face-to-face interview is recommended because:
i) the physical presence of the interviewer favours respondents' co-operation,
ii) more complicated scenarios can be better explained,
iii) the interviewer can also furnish additional data by expressing his/her opinion on the respondent's understanding of the questions (a specific section can be included at the end of the questionnaire).

II. 4. 2. Pilot survey

Most of the biases that may occur in a CVM survey are related to the questionnaire structure. Since it is difficult to foresee every possible error, we need to reduce as far as possible the probable errors deriving from an incorrect wording of the questionnaire. The pilot survey has the aim of discovering the possible biases that may occur in a CVM survey because of the questionnaire structure. It can be of 30-50 interviews carried out to test the questionnaire and reveal questions that need improving before the main survey is done.

II. 4. 3. Main survey and Sampling design

A main survey of at least 500-600 interviews is recommended to estimate use value with at least 95% of confidence level. Interviewees are also recommended to be aged 18 plus. The survey can be done by academic researchers with experience in this field or by a market research firm. It is important that interviewers are experienced and well trained people to avoid bias. For further details see Penning-Rowsell *et al*., 1992.

The random sample has to be designed by experts in this field according to the kind of survey (resident survey, on-site survey and catchment survey), the characteristics of the site and relevant population.

The relevant population, or beach visitors, are distinguished in groups: i) *residents* who live in the site; ii) *day-visitors* are visitors that return home to sleep; iii) *tourists* stay away from home for at least one night. In addition they can be distinguished in: iv) *domestic visitors* and v) *foreign visitors*. This last distinction is very important for Italian sites, because numerous foreign tourists visit Italy every year. Domestic visitors can be residents, day-visitors and tourists. Foreign visitors are mainly tourists.

II. 4. 4. Innovation done to the Yellow Manual questionnaires

The *Yellow Manual* questionnaires do not distinguish the beach use value according to the different seasons: i) in the resident questionnaire, respondents are asked to elicit the value of 'an average visit', and also are asked 'how often, on average' they visit the beach in spring/summer and autumn/winter; ii) in the site questionnaire visitors are asked to elicit their 'enjoyment of this visit to this seafront today', and they are also asked 'how often, on average' they visit the seafront per year. In addition it is suggested that interviews should be carried out at different times of the year. Nevertheless, if only one survey time can be chosen, the summer period is recommended because in this period there is the largest number of visitors.

Nevertheless, in many coastal sites - in particular in the Italian coastal sites - weather and temperature conditions are very different according to the season: very hot and sunny in summer, and cold in winter. In these sites it is useful to distinguish the beach use at least according to spring/summer and autumn/winter. For the Italian case-studies it was possible to organise a survey at only one time, therefore the British VOE questionnaire structures were adapted to this specific characteristic of the Italian coastal sites by asking the beach use value in i) spring/summer, and ii) autumn/winter. In addition, questions about the kind and frequency of beach use in spring/summer and autumn/winter were also included in the questionnaires.

III. THE ITALIAN CASE-STUDIES OF LIDO DI DANTE, TRIESTE, OSTIA AND PELLESTRINA ISLAND: RESULTS

In DELOS, four CVM surveys in the VOE version were done with the aim of obtaining data about individual beach use value in Italy.

Two *main surveys* were carried out in:
i) Lido di Dante (Ravenna): on-site survey of 600 face-to-face interviews on the beach (stratified random sample) in summer 2002. Evaluation of the beach use in three different scenarios in spring/summer: status quo, hypothetical erosion situation, and hypothetical protection of the sand beach. Foreign visitors were also interviewed.

ii) Barcola seafront (Trieste): resident survey of 600 face-to-face interviews at home (stratified random sample) in November 2002. Evaluation of the beach use in two scenarios in spring/summer and autumn/winter respectively: status quo and hypothetical artificial new beach.

As regards these two main surveys, the basic structures of the *Yellow Manual* on-site and resident questionnaires were used; they were adapted to the specific aims of each survey and also to the specific site and population characteristics according to the results of the specific pilot surveys done in each Italian site.

Two *experimental surveys* were carried out in:
iii) Pellestrina Island (Lagoon of Venice): resident survey of 80 interviews and on-site survey of 75 interviews, July 2002. Only one scenario: status quo of the sand beach in spring/summer and autumn/winter;

iv) Ostia (Rome): on-site survey of 100 interviews, summer 2002. Two scenarios: status quo and hypothetical situation of erosion in spring/summer.

Because the number of interviews is too small to consider their results reliable, these two experimental surveys had the following main purposes: i) to see if Italian respondents properly understood the unusual valuation question on beach use; ii) to see whether in Italy it is right to distinguish the recreational beach value according to different seasons; iii) to see whether respondents in the well-developed area of Ostia beach would find it more difficult to reply to this question than respondents in the undeveloped areas of Ostia and Pellestrina beach (undeveloped); and to obtain data useful for possible future main surveys in these two sites. It will be shown that according to these two surveys the majority of respondents understood the valuation question, and respondents in sunbathing buildings had no difficulty in replying compared with those on the undeveloped beach.

III. 1 THE CVM SURVEY OF LIDO DI DANTE (RAVENNA)

III. 1.0 Introduction

The Lido di Dante CVM survey was carried out in Summer 2002 (one time survey) for the purpose of finding out whether individuals' preferences for different beach scenarios could be expressed in money terms (Barbara Zanuttigh provided the photographs and photomontages of the different scenarios). More specifically, its main aims were i) to estimate the monetary value of the enjoyment of a daily visit to the beach in its current condition, after a hypothetical erosion of the beach, and after a hypothetical protection of the beach; ii) to find out whether in these two hypothetical situations of the beach respondents would change their number of visits and would go to another beach.

III.1.1 The Lido di Dante resort

The Lido di Dante is a very small Italian seaside resort on the North Adriatic Sea, 7 km from the town of Ravenna. In 2001 residents were only 304 people. The use of the beach for recreational activities and the considerable beach erosion made this site an interesting research field according to the integrated coastal management approach. The sandy beach of Lido di Dante has a concave shape and is more than 2500 m long (Archetti et al., 2000). For the purpose of the CVM survey the beach was divided into three areas: i) the Northern beach 1 (almost 600 m long) is subjected to great erosion and therefore protected by groynes, renourishment and semi-submerged breakwaters; this is the developed beach area because sunbathing establishments are present. ii) The Northern beach 2 is subject to less erosion and protection, and is semi-developed because only one sunbathing establishment is present (photo III.1.1). iii) The Southern beach instead has undergone very slight erosion and is in a very natural state, without buildings or tourism facilities (undeveloped area – photo III.1 2). Erosion is mainly caused by land subsidence and low sediment transport rates of the nearby river mouth. Together with the building of tourism facilities, erosion has altered and partially destroyed the coastal pinewoods and dunes of the Northern beach.

Photo II.1.1: Lido di Dante Northern beach – Present state

Photo III.1.2: Lido di Dante Southern beach – Present state

The Lido di Dante beach is visited by local residents, day-visitors and tourists mainly for informal recreational activities. Tourism is well developed and foreign tourists are numerous, mainly attracted by the natural state of the Southern beach. Tourism benefits from the widespread offer of rented accommodation and the existence of campsites. In the past, the major importance of tourism for the local economic activities justified Ravenna City Council's plan for defending the Lido di Dante Northern beach from erosion.

III. 1.2. Economic Valuation of the Lido di Dante Beach Recreational Use: Survey Design

As regards the Lido di Dante case-study, the TCM cannot be applied because the travel cost cannot be ascribed exclusively to the beach visit. In addition, the CVM in the WTP version needs the specification of one payment vehicle, such as tax and entry charge which may be considered unpopular, and therefore able to generate a number of protest bids (Laarman and Gregersen,1996). At the survey time any form of payment vehicle for the Lido di Dante beach use would have been unpopular, therefore the WTP in the VOE version was chosen for the evaluation survey because its application does not need any form of payment vehicle to be specified.

The basic structure of the VOE questionnaire used for the Lido di Dante case-study is the standard site user questionnaire published in the 'Yellow Manual', and it was adapted to the specific characteristics of this site. In its wording the CVM section of the questionnaire was divided into parts: i) to collect information about respondent's residence; more specifically if s/he is resident, or day-visitor or tourist; ii) to collect information on the type of beach use, and number of visits in spring/summer and autumn/winter; iii) to evaluate the enjoyment of a daily visit to the seafront in its current condition in spring/summer and autumn/winter; iv) to evaluate the change of enjoyment after the possible erosion of the beach in spring/summer and, whether respondent would go to another beach, to find out the VOE and cost of transport of the alternative beach; v) to evaluate the change of enjoyment after the hypothetical protection project in spring/summer, and, whether respondent would go to another beach, to find out the VOE and cost of transport of the alternative beach; vi) to collect data about the social characteristics of respondents; vii) to obtain information about respondents' comprehension of the questionnaire by interviewers.

More specifically, the elicitation question was asked about the status quo, a hypothetical situation of erosion, and of protection. In addition, as regards the eroded and

protection scenarios, respondents were asked whether they would reduce their number of visits to the Lido di Dante beach, and would go to an alternative beach. As regards the protection scenario respondents were also asked whether they would be in favour of or against the hypothetical change. The inclusion in the Lido di Dante VOE questionnaire of one specific question about the status quo use value in autumn/winter is an innovation of the 'Yellow Manual' questionnaire, which does not distinguish the beach use value according to the different seasons. In order to prevent the Lido di Dante questionnaire being too long, the beach use value, number of visits and activities in autumn/winter were asked only for the present state of the beach.

The relevant population, or those who benefit from the beach, are distinguished in residents, day-visitors and tourists. Residents are very few, and the beach is mainly visited by day-visitors and tourists. Therefore an on-site survey was carried out; face-to-face interviews of 15-20 minutes were done on the beach by trained interviewers. Before carrying out the main survey of 600 interviews, a pilot survey of 50 interviews was carried out with the aim of testing the questionnaire and revealing questions that need improving. The sample of respondents, aged 18 plus, were randomly chosen, and beach visitors were stratified into the three areas mentioned above. Because foreign tourism is well developed in Lido di Dante (32.1% of total tourists and 17.7% of the whole sample), foreigners were also interviewed.


Photomontages III.1.1 and 2: the Northern beach in the hypothetical situations of erosion and protection


Photomontages III.1.3 and 4**:** the Southern beach in the hypothetical situations of erosion and protection

In the case of the Lido di Dante survey respondents have use experience of the beach; in addition, to limit the risk of respondents giving an incorrect interpretation of the two hypothetical beach changes, the photomontages III.1.1 and III.1.3 were shown and described as regards the hypothetical situations of erosion; while as regards the defence project, photomontage III.1.2 shows the renourishment situation of the Northern beach, and III.1.4 shows the nourishment situation of the Southern beach described to interviewees.

III.1.3. CVM Survey Results

III.1.3.1 The Recreational Value of the Lido di Dante Beach in the present state in different seasons

The random sample of the Lido di Dante survey consists of 53.5% tourists, 44.8% day-visitors and 1.7% residents; 302 males and 298 females. 17.7% are of foreign nationality. The interviews were done by a market research firm.

III.1.3.1.a Activities and time spent on the beach: present state

The activities and the time spent on the beach change according to season. The present state of the Lido di Dante beach has been investigated in two different seasonal periods: i) spring/summer and ii) autumn/winter.

i) As regards the present state of the beach in **spring/summer**, the mean number of days spent on the Lido di Dante beach is: tourists 12.44, residents 46.70 and day-visitors 22.91. 37% of respondents usually go to the beach more than once per day. The majority of them go to the beach in groups, and 47.5% of people go to the beach mainly to sunbathe and relax. Figure III.1.1 shows the percentage of respondents according to the main activities (as first choice) done on the beach in spring/summer.

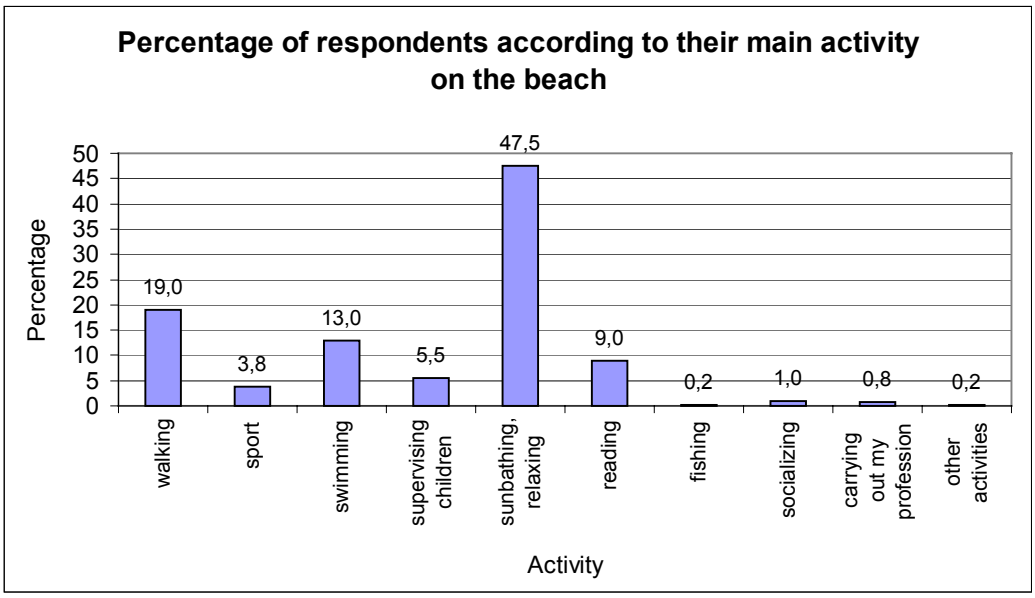


Figure III.1.1: Main activities on the beach in spring/summer

In particular, in the area North1 54.5% of subjects mainly supervise children playing on the beach and 50.0% read. As second choice, the second most preferred activity is sunbathing and relaxing (24.2%). 32.5% of respondents perform just one activity, and only one foreigner, an employee aged 31-40, prefers fishing as second activity.

In spring/summer the daily beach use is intense as shown by figure III.1.2; people stay on average more than 3 hours per day.

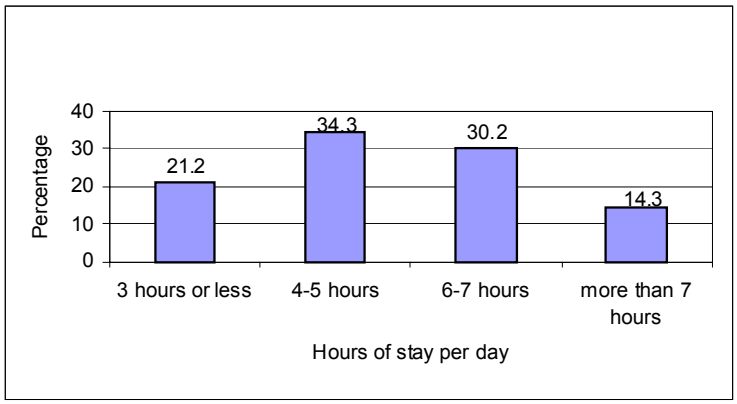


Figure III.1.2. Percentage of respondents - daily hours on the beach

ii) As regards the beach recreational use of the present state in **autumn and winter**, the majority of respondents only walk (91.2% of the visitors). The other activities were chosen by less than 3% of interviewees. More specifically, as shown by figure III 2.4, 24.5% of the respondents went to the Lido di Dante beach during the last winter period; 95.3% of foreign people did not visit this sea front from October to March, 60.0% of residents went to the Lido di Dante beach and 17.1% of tourists visited the beach (figure III.1.4).

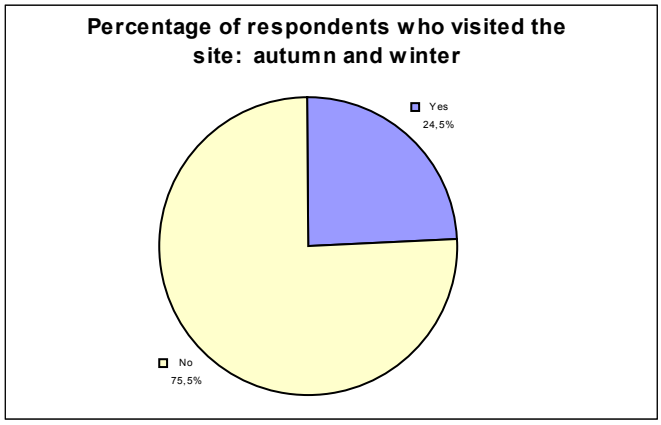


Figure III.1.3

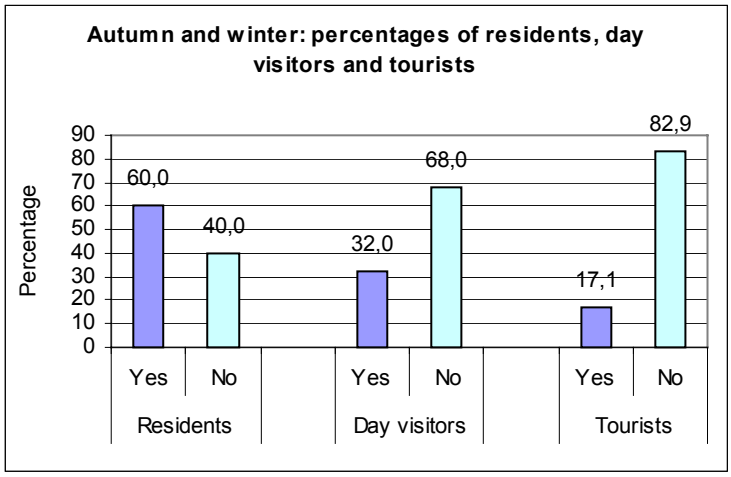


Figure III.1.4

In autumn/winter, people who go to the beach spend an average daily time of 64.29 minutes there; figure III.1.5 shows the daily time spent on the beach in the low season according to the different areas of the Lido di Dante beach.

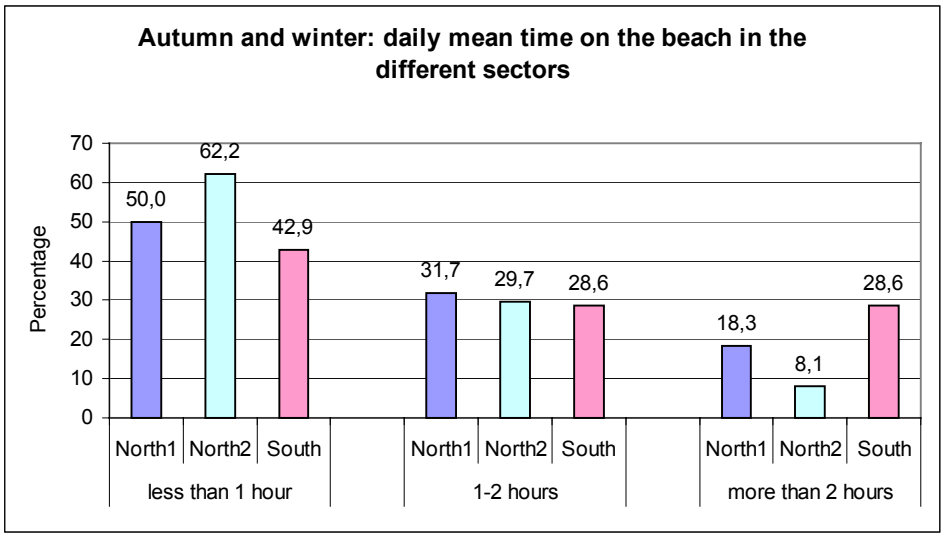


Figure III.1.5

Respondents were also asked to rate the Lido di Dante beach in the present state as a place to visit (Figures III.1.6. and 7.). The mean rating is 6.66; a higher rating was given by foreigners (7.08), teachers (7.29) and housewives (7.12). 61.3% of respondents rated it between 6 and 8.

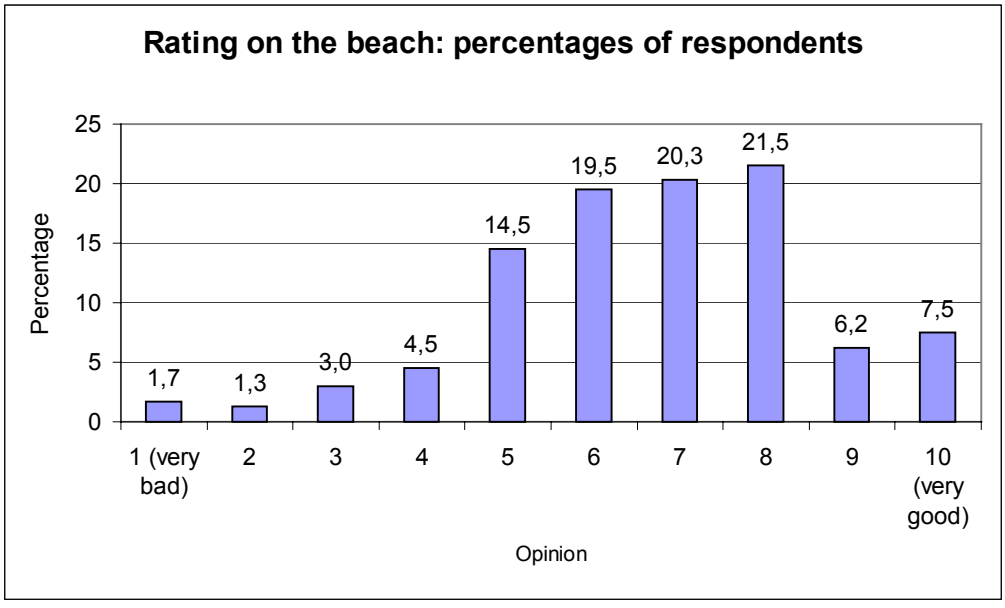


Figure III.1. 6: Opinion about the Lido di Dante beach as place to visit

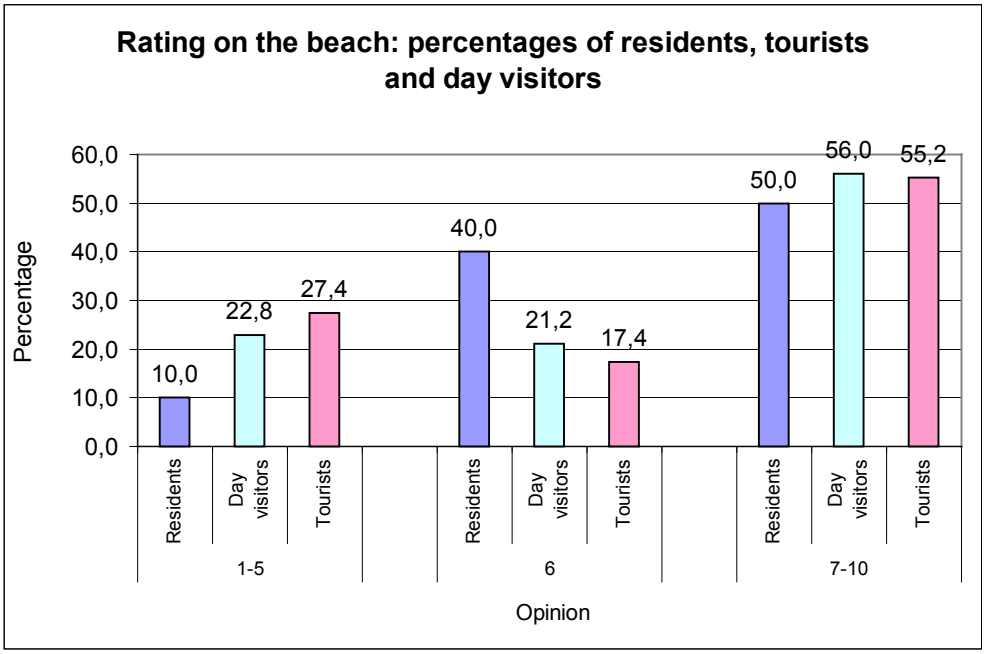


Figure III.1.7: Different kinds of visitor – Opinion about the Lido di Dante beach

According to the rating (from one to ten) of this beach as a place for the different recreational activities, Figure III.1.8 shows that the Lido di Dante beach seems to be suitable for all the recreational activities.

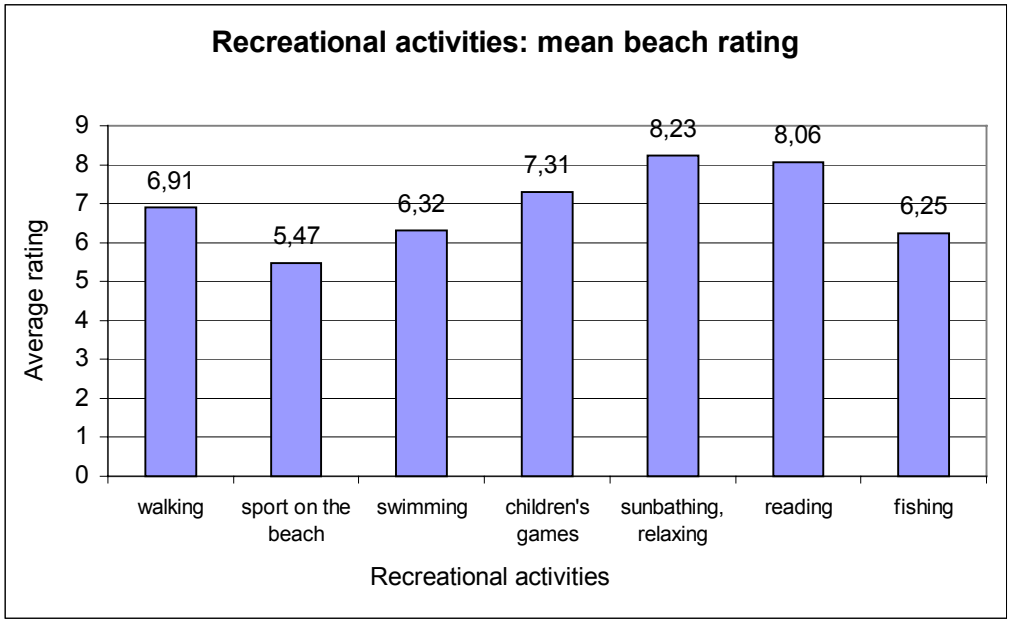


Figure III.1.8: Beach rating according to beach activities

"Sunbathing, relaxing", "children's games" and "reading" obtained a mean rating higher than 8. Sports have the lowest rating (5.47), and 32.8% of respondents did not rate this activity or did not practise it on the beach. There is no great difference in the opinion given in the three sectors of the beach; in particular most of the people who rated the beach 1 'very bad' for "walking", "swimming" and "playing" were in the South area.

III.1.3.1.b The recreational use value of the Lido di Dante beach

In the Lido di Dante application of the CVM in the VOE version almost all respondents elicited positive values, and protest bids were very few. A number of interviewees elicited very high values (more than 100 Euros), which were excluded from the computation of the mean value; the highest number of extreme values (19.8%) is about the beach use value of the present state. Very few respondents assigned zero value to the beach use (2.7% about the present state of the beach); the majority of them justified it by declaring that they do not have satisfaction staying on the beach (for example they are on the beach only for their children) and were considered in the mean value computation.

As regards the **status quo** of the Lido di Dante beach, table III.1.1 shows the mean daily use values in Euros according to beach characteristics and seasons. Comparing these mean values, as regards Lido di Dante beach characteristics, the undeveloped area (South) is evaluated higher than the developed (North 1) and semi-developed (North 2) areas of Lido di Dante beach, because the South beach is natural with dunes, which is very rare in the region. As regards season, in autumn/winter only 24.5% of respondents visit the Lido di Dante beach, and it is evaluated much lower than in spring/summer.

Table III.1.1: Status quo – daily mean use values (Euros) of the Lido di Dante beach

Mean value (Std.dev.)	Spring/Summer	Autumn/Winter
Whole sample	**27.67 (27.64)**	**4.10 (12.80)**
Visitors only∗		**17.29 (21.54)**
Developed area	**25.41 (26.01)**	**16.38 20.50)**
Semi-developed area	**27.21 (27.21)**	**17.60 (22.65)**
Undeveloped area	**32.44 (29.38)**	**19.62 (23.62)**

[∗ 'Visitors only' means visitors to the Lido di Dante beach in Autumn/Winter]

Considering the whole sample, in spring/summer (autumn/winter) the median is 20.00 (0.00) € and the mode is 10.00 (0.00) €. More specifically, in spring/summer 66.6% of respondents elicited a value between 0.50 € and 50.00 €, and 20% of respondents between 20.50 € and 50.00 € (figure III.1.9). These values were computed excluding from the calculation extreme values over 100 €. This decision needs justification. The Lido di Dante survey is mainly characterised by several values higher than 100 € as regards the status quo (19.8%) mainly in spring/summer, while as regards the hypothetical scenarios of erosion and protection these values are lower: 2.7% and 10.8% respectively. In autumn/winter they are less than 1%. A justification may be that some people who did not properly understand the first valuation question for the status quo in spring/summer understood better with the subsequent valuation questions and therefore gave a lower value for the other scenarios. Because the highest number of extreme values refer to the status quo and protection situation, six preliminary computations of the mean value for these two different scenarios were done excluding values higher than 800, 500, 300, 200, 100 and ≥ 100 € each time. These values were compared: i) up to the exclusion of extreme values > 200 €, the mean use value of the protection scenario is lower than that of the status quo, whereas if values > 100 € and ≥ 100 € are excluded, the mean value of the protection scenario is higher than that of the status quo; ii) up to the exclusion of values >100 €, the median is always 20 €; it becomes 15 € only for the status quo if values ≥ 100 are excluded. Therefore, it was judged reasonable to consider values higher than 100.00 € as extreme values, and to exclude them from the mean computation.

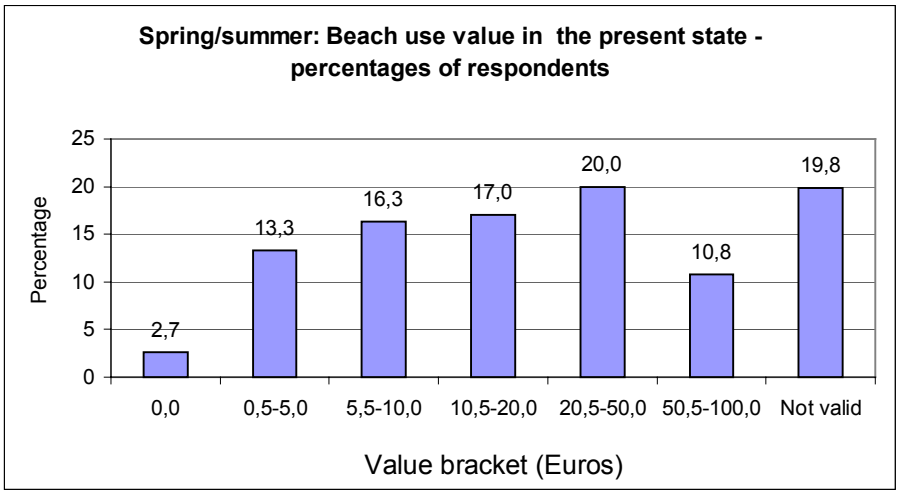


Figure III.1.9

In autumn/winter, instead, only 20.9% of respondents elicited a value between 0.55 € and 50 €.

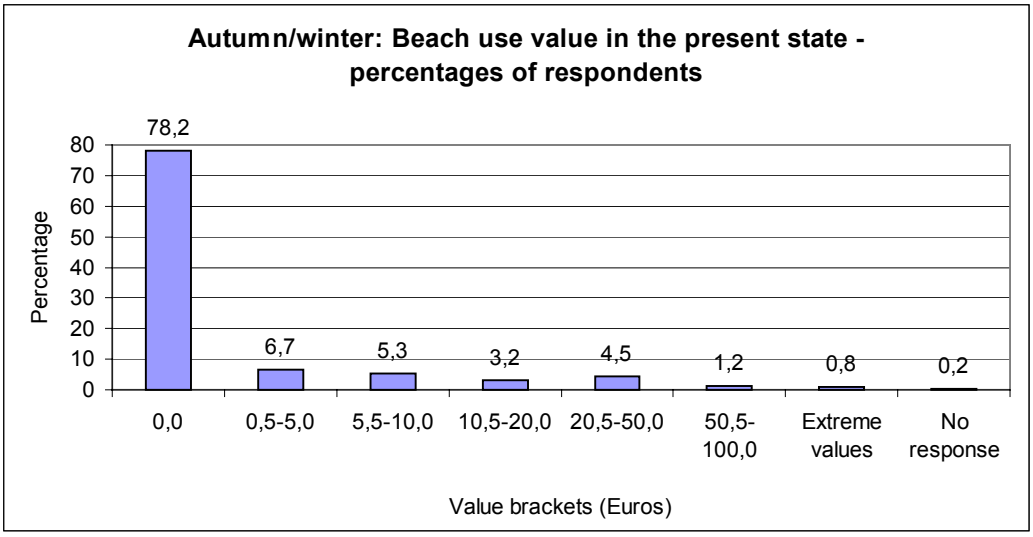


Figure III.1.10

The Lido di Dante beach use values also change according to population groups. More specifically, as regards the present state of the beach in spring/summer, residents, day-visitors and tourists elicited 10.25, 23.21 and 32.28 Euros as daily mean values respectively, while in autumn/winter 27.89, 4.32 and 3.25 respectively. In addition, figure III.1.11 shows the change in the daily use value of the present state according to nationality. We highlight that foreign visitors elicit higher values than Italian visitors; people from Holland and Italy give the smallest values (22.50 € and 26.45 € respectively), while Swiss interviewees give very high values. In autumn/winter the Lido di Dante beach is visited almost exclusively by Italian people.

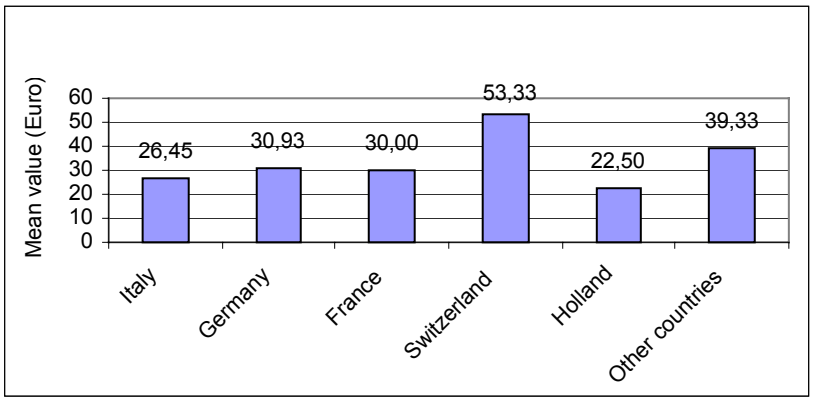


Figure III.1.11: Nationality– Mean use value in spring/summer – present state

As regards income, 52.5% of respondents declared their household income bracket. Figures III.1.12 (spring/summer) and III.1.13 (autumn/winter) show that people with high incomes generally elicited lower beach use values than respondents with lower income.

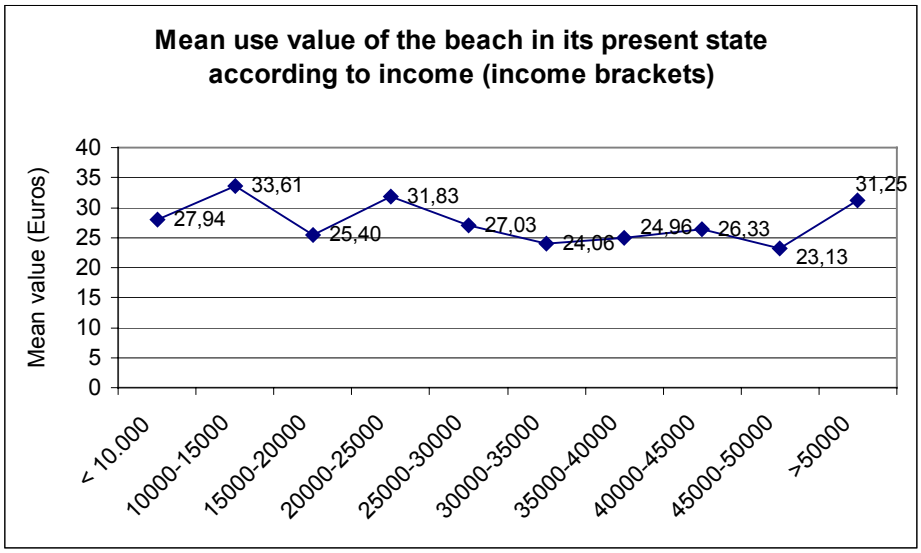


Figure III.1.12: spring/summer – mean use value according to income

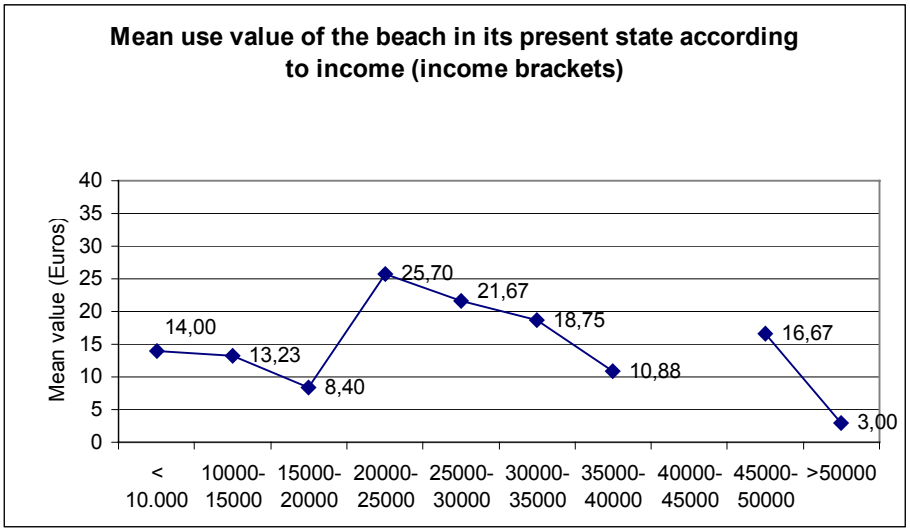


Figure III.1.13: Autumn/winter – mean use value according to income

III.1.3.2 Daily mean gain and loss of enjoyment about the Lido di Dante beach in the scenarios of protection and erosion

Table III.1.2 shows the mean values of enjoyment according to the beach scenarios of erosion and protection, also distinguished according to the three Lido di Dante beach areas.

Table III.1.2: Spring/summer - Mean use values (Euros) according to different scenarios

Mean values (Std.dev.)	Situation of erosion	Situation of protection
Whole sample	**13.26 (19.77)**	**28.37 (25.79)**
Developed area	**11.47 (16.27)**	**27.43 (23.60)**
Semi-developed area	**9.94 (17.17)**	**26.35 (25.16)**
Undeveloped area	**21.49 (26.20)**	**33.39 (30.16)**

Compared with the mean economic value of the present beach state (see table 1), in spring/summer the change in the mean value of enjoyment due to erosion is considerable (from 27.67 to 13.26), while there is little change as regards the situation of protection (from 27.67 to 28.37). In particular, according to the different areas of the Lido di Dante beach, the undeveloped or natural area is also evaluated highly in the hypothetical situation of erosion.

The contingent valuation survey permits the mean gain and loss of enjoyment to be calculated for each individual per daily visit, and then the mean gain and loss can be computed as the mean of individual differences. Since individuals may visit other sites because of the beach erosion and also the project implementation, people are distinguished into: i) those who continue to visit the site, and ii) those who transfer their visit to an alternative site. As regards the Lido di Dante CVM survey, the average gain and loss is computed according to the Penning – Rowsell et al. (1992) method (presented in Section I, chapter 1 of this report), considering the use value elicited for the alternative beach and also the cost of transport to the other beach.

The Lido di Dante beach has alternative beaches in the vicinity: i) in the hypothetical situation of *erosion* 16.4% of respondents would never visit Lido di Dante beach, 29.1% would visit less or much less often, and the majority of them (people who never visit and visit less often) would go to another beach, while 2% would visit the eroded beach more and much more often; ii) in the hypothetical situation of *protection* 82% of respondents are favourable to the implementation of the protection project; only 4.8% would reduce the number of visits and the majority of them would go to another beach. In spring/summer the mean daily use value of the alternative beach for respondents who would go to an alternative beach in the hypothetical scenario of erosion is 29.58 €, while in the protection scenario it is 31.26 €. As regards spring/summer, table III.1.3. shows the daily mean gain or loss (in Euros) of enjoyment for each scenario.

Table III.1.3.: Daily mean loss and gain in spring/summer (Euros)

Mean values	Loss because of erosion	Gain because of protection
Whole sample	**12.29**	**1.29**
Visit to an alternative beach*	**3.50**	**11.17**
Same beach*	**14.92**	**0.92**

[* 'Visit to an alternative beach' means that people would go to another beach, and 'same beach' that they would not go]

These data show that, in general, in the situation of erosion, rational respondents who would visit another beach report a smaller loss than people who would not go to another beach; while in the situation of protection, rational respondents who would go to another

beach increase their gain compared with people who would not go to the alternative beach. In addition, in the hypothetical eroded beach 2% of respondents would have a gain of enjoyment, instead of a loss, because they prefer the erosion situation to the status quo; while in the situation of protection just over 6% of respondents would have a loss of enjoyment, but they would not visit another beach. Moreover, if we distinguish respondents into sub-groups of people who go and do not go to an alternative beach, and compute the mean use value of the beach in the status quo and situation of protection respectively, respondents who visit an alternative beach evaluate the Lido di Dante status quo higher (28.82 €) than the protected scenario (28.61 €), while people who remain on the Lido di Dante beach evaluate the protected scenario higher (28.28 €) than the status quo (27.27 €). This confirms the respondents' consistence in eliciting beach use values.

The computation of the aggregate value or total recreational net benefit per year about the hypothetical changes to the Lido di Dante beach is not the task of this research, because the main interest is in the valuation of individual use value for different beach scenarios in money terms. Nevertheless we highlight that no official data about the total number of visits per annum to the beach are available; only data about tourists are available from local records. Nevertheless, the CVM survey data show that 44.8% of respondents are day-visitors and they visit the beach on average just under 23 days per year; while residents visit the beach 46.70 days.

Finally, as regards the question "Would you be in favour of or against the implementation of this protection project of the Lido di Dante beach?" (on being shown the photomontages III1.2 and III1.4), the great majority of respondents were in favour of the implementation of the protection project. Only 2.7% were not in favour. According to the beach sector, respondents' opinions are shown in table III. 1.4.

Table III.1.4: Opinion about the hypothetical protection project of Lido di Dante: percentage of respondents

	In favour	Indifferent	Not in favour	No response
North 1 area	87,1	4,3	2,7	5,9
North 2 area	78,4	4,4	2,0	15,2
South area	77,9	5,0	3,5	13,6

According to nationality, figure III.1.13 highlights that the smallest percentage (66.2%) of respondents in favour were Germans, while the greatest (100.0%) were Dutch.

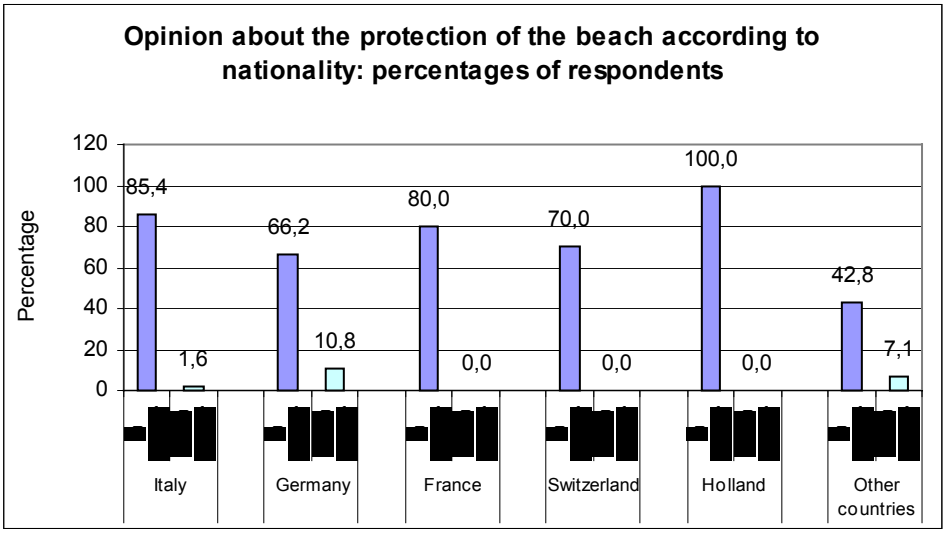


Figure III.1.13: Nationality – Opinion about the hypothetical Lido di Dante protection project

III.1.4. Regression Analysis

The results described above would permit a computation of the aggregate beach use value, if data on the annual number of visits to the Lido di Dante beach were available, but if we want to know the determinants of the beach use value they must be modelled parametrically. In other words, we try to find a causal relationship between the individual value of enjoyment expressed in monetary terms and its explanatory variables, such as number of visits per season, number of daily hours spent on the beach, household income, value of alternative beaches and social characteristics of respondents. Nevertheless, as Whitmarsh et al. (1999) highlight, there is no model able to describe all the variables on which the value of enjoyment depends. Therefore, a number of attempts were made to test the validity and reliability of the economic results of this survey.

The recreational use value model, described in Section II (par. II. 3.4, equation (18)) of this DELOS report, was estimated using linear regression and tobit functional forms. The results obtained by these two parametric models are similar. Both confirm that the use value of the status quo is positively related to those of the erosion and protection scenarios, and of the alternative beach. In addition there is a significant relation between the daily value of enjoyment and the middle-high income categories of households; nevertheless this relation is negative, showing that respondents with middle-high income elicited use values lower than respondents with lower income (see also figures III 1.12 and 13). Finally, a significant relation also exists between the recreational use value and certain ratings (on a scale from 1 to 10) on the quality of the Lido di Dante beach.

Table III.1.5 shows the results as regards the status quo in spring/summer obtained by the tobit model: P = 0.10 cut-off value; number of observations = 564; Pseudo R^2 = 0.1335; and Log Likelihood = - 1615.03.

Table III.1.5: Regression coefficient of the beach use model

Explanatory variables	**Coefficient**	**P-value**
Use value in condition of beach erosion	0.438	0.000
Use value in condition of beach protection	0.505	0.000
Use value of alternative beach	0.104	0.000
Annual household income category: 15,000/19,999 €	- 7.562	0.012
Annual household income category: 20,000/24,999 €	- 5.963	0.084
Annual household income category: 25,000/29,999 €	- 8.988	0.016
Annual household income category: 30,000/34,999 €	- 7.452	0.079
Annual household income category: 30,000/34,999 €	- 9.661	0.030
Beach quality rating 4	- 13.184	0.004
Beach quality rating 5	- 7.210	0.018
Beach quality rating 6	- 9.346	0.001
Beach quality rating 7	- 5.716	0.038
Education: university degree	6.312	0.033
Constant	18. 315	0.011

We highlight that this table shows that, as trend, the coefficients of the beach quality ratings decrease as the rating increases, suggesting that respondents giving a high rating elicited higher use values than respondents giving a low rating.

III.1.4 Conclusions

The British 'Yellow Manual' questionnaire was adapted to the specific characteristics of the Lido di Dante site, and was innovated by including specific questions about the VOE in autumn/winter. The daily use value in the low season is considerably lower than in the high season, justifying in this way the seasonal distinction of the beach use value. Foreigners were also interviewed, and the Lido di Dante survey results show that the majority of foreign visitors elicit higher values than Italian visitors.

The results of the Lido di Dante CVM survey cannot be generalized to other empirical situations, because they are contingent to the specific scenarios described in the Lido di Dante survey. Nevertheless, they confirm the conviction that beach visitors in Italy are very sensitive to the defence of beaches from erosion: the daily reduction of enjoyment for the hypothetical situation of erosion is fairly high, as is the percentage of visitors who would reduce the number of visits because of erosion.

III.2. THE CVM SURVEY OF THE BARCOLA SEAFRONT (TRIESTE)

III.2.1. Introduction

This DELOS study deals with the economic valuation of the recreational benefits due to a possible artificial expansion of the beach on the Barcola shoreline in Trieste justified by the need to satisfy the demand for recreational activities of the residents of Trieste. Recreational activities represent *use values*, and "informal" activities such as sunbathing, swimming and walking are non-marketable use values. The City Council of Trieste supports this research and is a Primary End User of DELOS.

We have not found any application of evaluation methods to sites very similar to the case-study of Trieste, and therefore the transfer of benefits from other sites to this Italian site was not possible. In order to quantify non-marketable values about the Barcola seafront before and after the implementation of the project, a specific interview survey was carried out. The CVM in the VOE version was applied. The theoretical economic basis of the assessment of use values, the reasons of the choice of the VOE procedure, and the characteristics of the VOE procedure are explained in Sections 1 and II of this report. We only highlight that the TCM cannot be applied in the Trieste case-study mainly because the Barcola seafront is exclusively used for recreational activities by residents, and therefore the cost of travelling is very low or even zero - in this case, the cost of the distance travelled to visit Barcola cannot be considered the value of the recreational activities. In addition also the CVM in the WTP version was considered not suitable because any payment vehicle would be unpopular.

III.2.2. Characteristics of the study area

Trieste is a town in the North-East of Italy of almost 235,000 inhabitants (2001 figure III.2.s). It is on the Northern Adriatic sea and near the border with Slovenia. The Barcola site involves a strip of the coast between Miramare castle and the town of Trieste, 2400 mt long. Viale Miramare, the road that forms the inland boundary of the reinstatement area, was built

following the profile of an old abrasion terrace formed by the action of the waves. The Barcola promenade is defended from the sea by an artificial wall that protects the road and pedestrian paths. The Barcola coastline is divided into two different areas: the first includes yacht and canoe clubs, a small pinewood, and the small harbour of Barcola; the second includes the area for sunbathing, consisting of concrete changing-rooms (Topolini), a very small pebble beach and the small Cedas harbour. This second area could be changed to satisfy the increasing demand for recreational activities by residents because in spring/summer the Barcola beach is very crowded as shown in photograph 1.

Photograph 1: Barcola beach in the present state

III.2.3. The Barcola project of building a new artificial beach defended by LCS

The Barcola site in DELOS is studied only from the economic point of view. The City Council of Trieste sent us the scientific reports (Brambati, 2000) and the project which won the international public competition for the reinstatement of the Barcola seafront, which may be modified and adapted according to the results of this DELOS survey.

i) The scientific report on the technical rules of implementation of a project describes the characteristics of the Barcola coast, the possible consequences of implementation of a project about the expansion of the beach, and the characteristics that a project has to satisfy to avoid major damages to the Barcola environment and to the current use of the seafront for recreational activities. This report from Trieste City Council concludes that there are no elements contrary to the implementation of a project on Barcola seafront. In addition it give information about the facilities that can be built if the promenade is restructured. From the

economic point of view, this information was useful to create the questionnaire; according to the CVM, a change in beach size according to a chosen project, and the possible change in beach informal services must be properly described to favour the elicitation of bids because respondent evaluation depends on the kind of change.

ii) The project as regards the artificial change of the Barcola beach consists of the building of two artificial beaches, each 400 m long and 40 m wide, defended by low crested structures (see photomontage 1). This change would satisfy the demand for beach recreational activities from local residents who visit the Barcola seafront.

Photomontage 1: Simulation of the Barcola seafront after the building of the artificial beach ('Nuova spiaggia' means 'new beach'.)

III.2.4. The CVM survey about Barcola seafront: survey design

In October –November 2002 a survey of 600 interviews was carried out in the town of Trieste according to the guidelines of section II of this report. Interviews were done by a market research firm. Anonymity is guaranteed. In this DELOS case-study, a residents survey (Penning-Rowsell et al., 1992) is the most appropriate method to assess the recreational use of the beach, because it is exclusively visited by residents. In this way, not only the current use of the beach, but also the potential new use after the changes to the coast was estimated.

The CVM survey has the following main aims:

i) to evaluate the enjoyment of a daily use of the seafront in its current condition in spring/summer and in autumn/winter;
ii) to evaluate the change of enjoyment after the expansion of the beach according to the public project in spring/summer and in autumn/winter;
iii) to collect information on type, frequency and duration of use of the Barcola beach, and on the social characteristics of respondents.

This information is important for the management of the Barcola coast. More specifically, in its final wording the CVM questionnaire about the Barcola seafront is divided into sections. The *first* section contains questions of a general nature regarding the respondent's general opinion about the quality of life in Trieste. The *second* section seeks information on attitudes toward the beach (daily visit), whilst the *third* section investigates the respondent's familiarity with the seafront including questions about the number and duration of visits to the Barcola beach, the type of recreational activity undertaken and means of transport. The *fourth* and *fifth* sections are the heart of the questionnaire since they include the evaluation questions. Respondents were first asked how much they value the recreation activities of a daily visit to the Barcola seafront in the present conditions, then whether they would have an increase or a decrease in enjoyment from the expansion of the beach after the project implementation and finally asked to elicit the daily use value of the new artificial beach. These values were elicited for spring/summer use and also for autumn/ winter use of the seafront. Some questions to identify protest answers are also included here. In the *sixth* section the valuation of an alternative site is required from those respondents who do not agree with the project and there is also a question where people can freely express their opinion about the project to build the new beach. All respondents are also asked to say whether or not they are in favour of the implementation of the new artificial beach. The last two sections ask about some personal characteristics regarding respondents' socio-economic features, and about the interviewer's opinion of respondents' comprehension of the questionnaire.

The order of the questions can influence the responses, therefore personal questions are placed at the end of the interview. Most of the biases that may occur in a CVM survey are related to the questionnaire structure. A pilot survey of 50 interviews was carried out to explore the weaknesses of the questionnaire before taking it into the field.

III.2.5. Empirical results of the CVM survey

A random sample of 600 people aged 18 plus was chosen from the residents of Trieste. The main characteristics of the Trieste population is the predominance of old people, and this is also a distinguishing feature of the random sample (see figure III.2. 1).

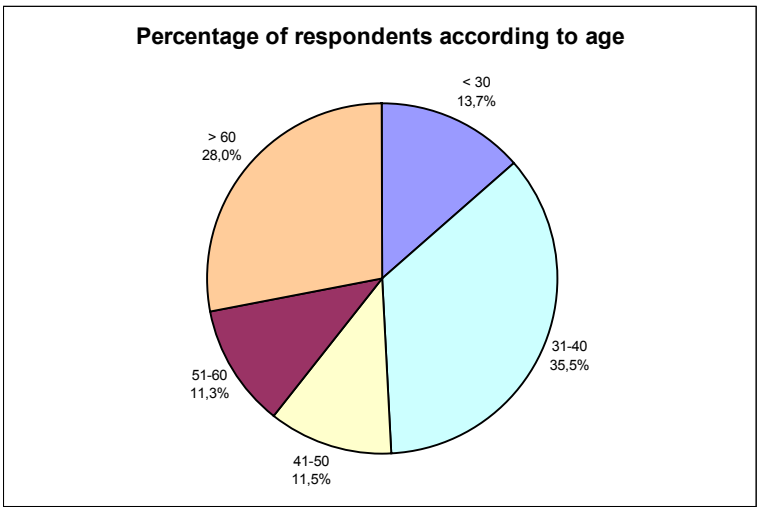


Figure III.2.1: Composition of the random sample according to age

III.2.5.1 Barcola seafront in its Present state: activities and number of visits

As regards the residents' attitude towards use of the seafront in its present state, the majority of respondents in general consider the Trieste seafront highly important, and in particular, as regards Barcola seafront, 57% of respondents think that it is the right place for recreational activities. Figure III.2. 2 shows that the mean rating is 7.6 on a scale from 1 to 10, and only 11% of respondents gave a rating lower than 6.

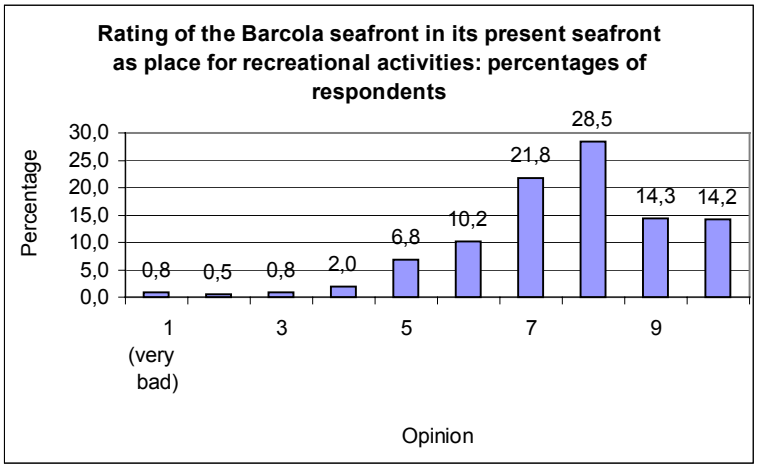


Figure III.2. 2: Barcola seafront rating in its present state

The main activities done on the Barcola seafront in the present state are walking (97.3%), sunbathing (88%), jogging (81%) and swimming (80.7%), as shown in figure III.2. 3.

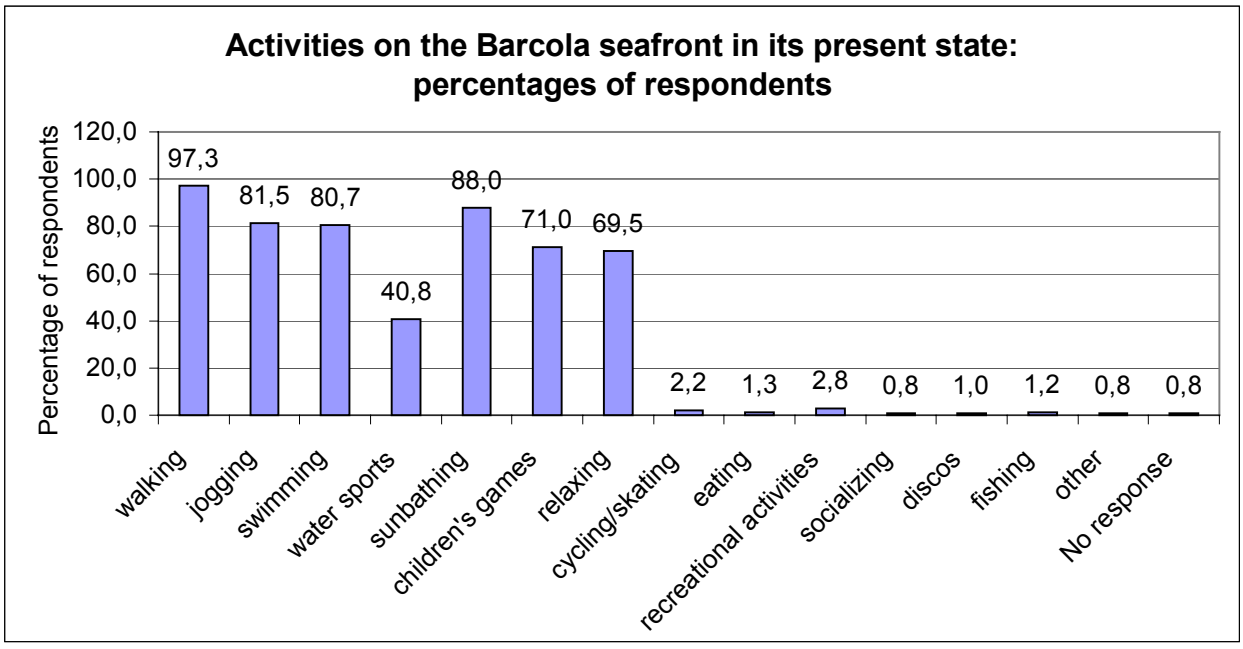


Figure III.2.3: Activities on the Barcola seafront in its present state

The majority of Trieste residents (63.8%) go to the Barcola seafront. They are mainly young and middle-aged people. Reasons why the remaining respondents do not visit this seafront are as

follows: 27.3% go somewhere else, 14.3% do not have time because they work, 13.4% for health reasons, and 4.6% do not like Barcola seafront.

As regards the number of days spent on the beach in **spring/summer**, figure III.2. 4 shows, for example, that 21.4% of residents go to the seafront on more than 30 days, 21.1% less than 7 days, and 11.5% go 11-15 days.

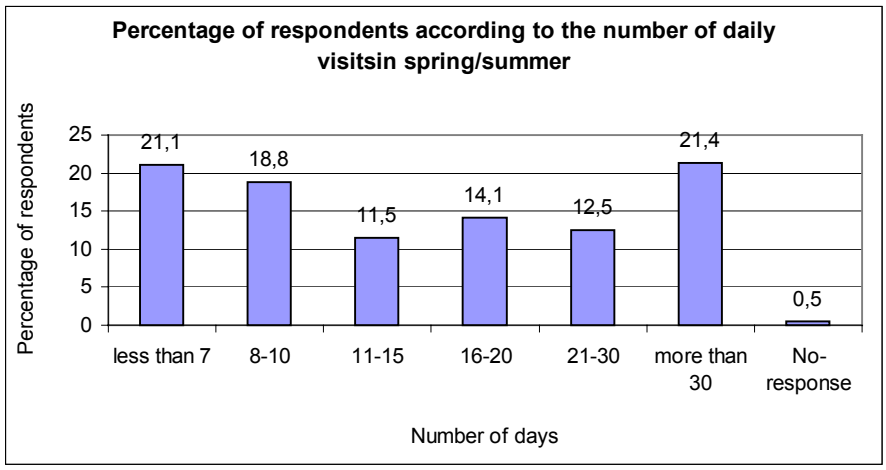


Figure III.2. 4

The average number of days spent on the seafront is 23.5 days (Std. Deviation 23.2). More specifically, the mean number of visits is greater than that of the whole sample for people aged 20-30 (26.9 days) and 41-50 (26.6), people with an income lower than 10,000 € (26.5), housewives (37.7) and labourers (26.8); while it is lower for people aged 31-40 (mean= 18.9 days), with an income greater than 30,000 € (16.8), teachers (19.3), managers and officers (18.9), and unemployed people (17.4).

As regards respondents' activities on the Barcola seafront in spring/summer, figure III.2. 5 shows the respondents' preferences. Walking is the activity most preferred by 88.3% of people, relaxing the second most preferred by 71.3% of respondents; sunbathing and swimming follow with 67.9% and 64.5% of preferences respectively. In particular, 25.0% of people aged 20-30 and 5.5% of respondents over 50 like jogging, while 16.7% of people aged 20-30 and 36.6% aged 41-50 play with children on the seafront.

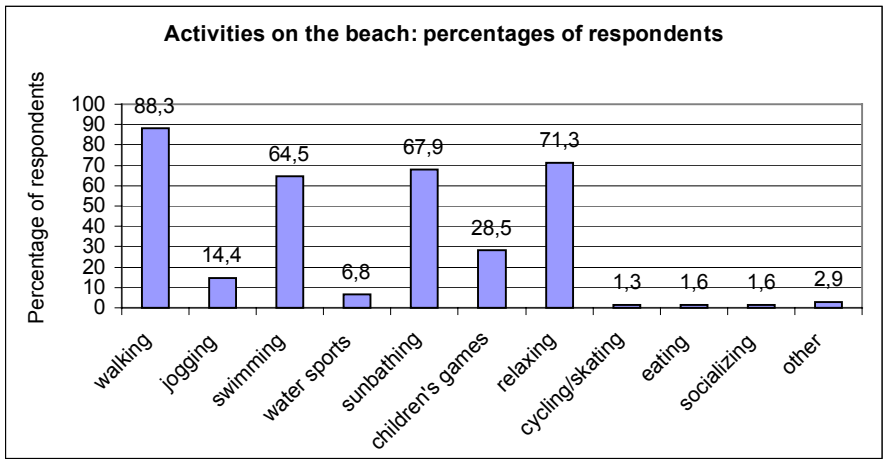


Figure III.2. 5

In spring/summer respondents stay on the seafront a mean time of 161.7 minutes (Std. Deviation= 79.4) per day. The mean daily time of stay is 156.6 minutes for men and 167.3 for women. Figure III.2. 6 shows the frequencies according to different intervals of time per day. 76.2% of respondents usually go to the Barcola seafront in groups, and 40.8% of the groups include boys or girls under 15 years of age.

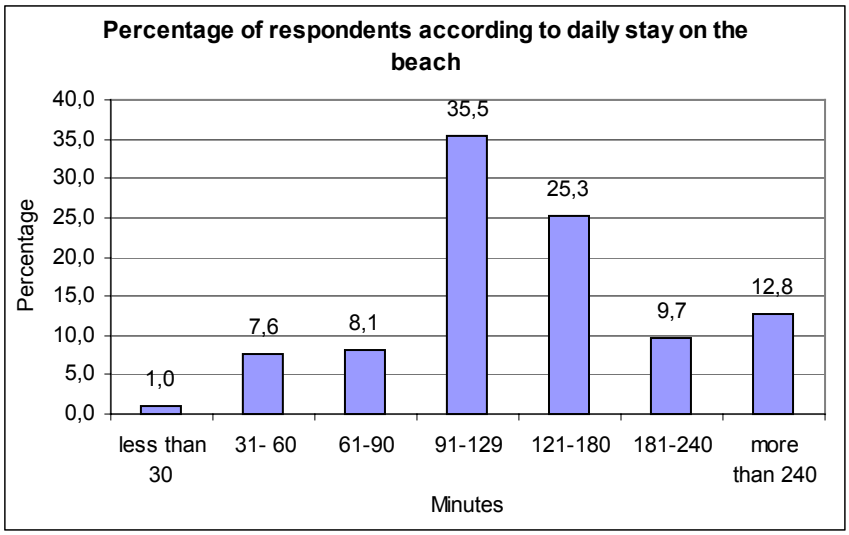


Figure III.2. 6

As regards **autumn/winter**, 73.5% of respondents go to the Barcola seafront. More specifically, in autumn/winter the Barcola beach is visited by 92.9% of students, 83.4% of office workers and 81.3% of teachers. Figure III.2. 7 shows the number of visits of these respondents in the low season. 51.0% of residents visit the Barcola beach less than 10 days. The mean number of days is 18.3 (Std. Deviation = 23.3). The mean number of daily visits is greater than that of the whole sample for housewives (24.5) and pensioners (24.2); while it is smaller for managers and officers (14.2), office workers (13.5), teachers (10.4), and unemployed people (10.0).

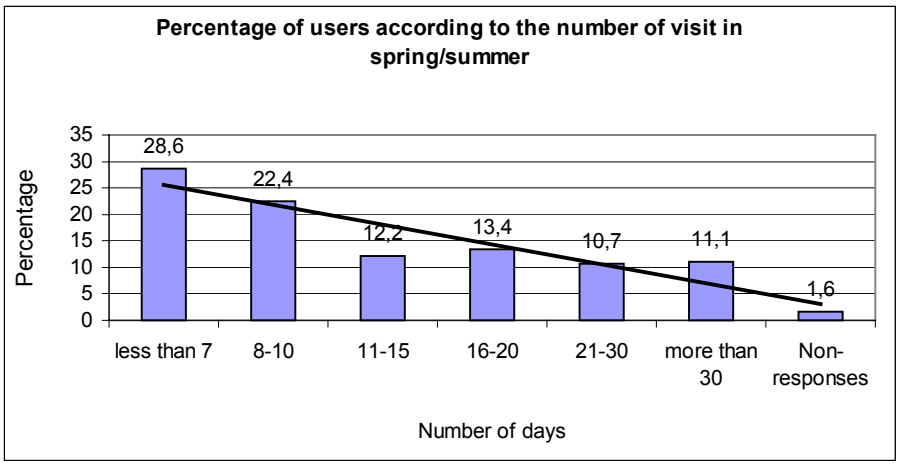


Figure III.2. 7

In autumn/winter 97.3% of the people like walking, and 70.1% relaxing. Respondents spent on the Barcola beach a mean time of 105.8 minutes (Std. Deviation= 52.9). See figure III.2. 8 for the frequencies according to different time brackets.

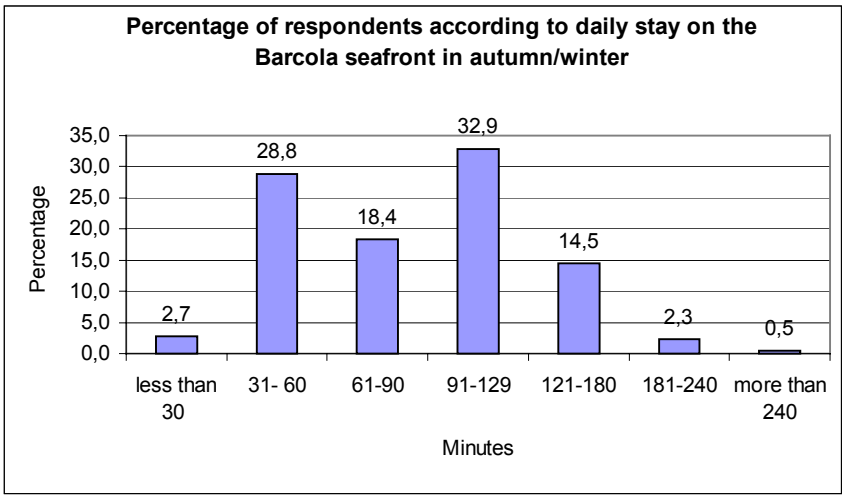


Figure III.2. 8

III.2.5.2. *The recreational use value of the Barcola seafront in its present state*

The aim of this section is to find out the monetary value of the daily use of the Barcola beach according to the VOE method, presented in section II of this DELOS report. It has been distinguished according to two seasons: i) spring/summer and ii) autumn/winter.

i) ***Daily use value in spring/summer***

Excluding very few extreme values higher than 100.00 €, the mean daily use value of the Barcola seafront in spring/summer is 5.24 € (Std. Deviation = 7.66), the median 2.00 € and the mode 0.00 €. figure III.2.9 shows the frequencies according to different use value brackets. 35.8% of respondents elicited 0.00 €, because they do not go to the Barcola seafront for recreational activities since they mainly go to another beach or are older people. 25.2% declared a value between 1.00 and 5.00 €. In addition, 7.7% of respondents did not answer (because they were not able to quantify this enjoyment), 3.5% gave a protest bid (specifying that the seafront has no monetary value, even if they use it for recreational activities), and only 0.2% gave values higher than 100 euros; all these were excluded from the mean computation.

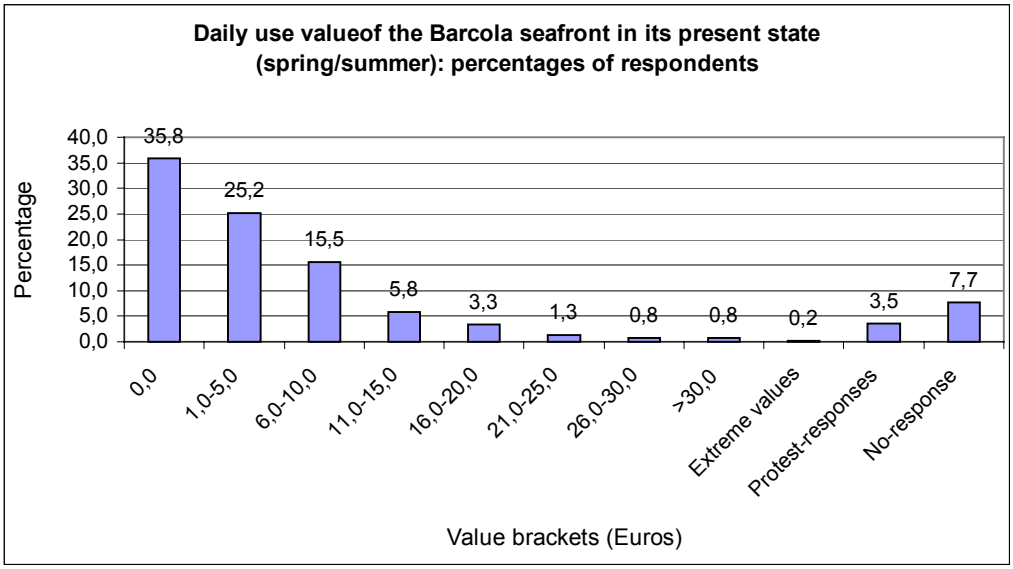


Figure III.2. 9

As regards sex, the mean daily use value for men is 5.57 €, and for women 4.99 €. In addition, people under 30 elicited the highest mean use value (6.99 €) and people over 60 the lowest (3.79 €); while, according to occupation, unemployed people elicited 3.03 €, housewives 3.93 €, and students 9.92 €.

The relation between daily mean value and income is described in figure III.2.10; 80.2% of respondents declared their household income bracket. People with high income over 40,000 € elicited a daily use value lower than that elicited by respondents with lower income.

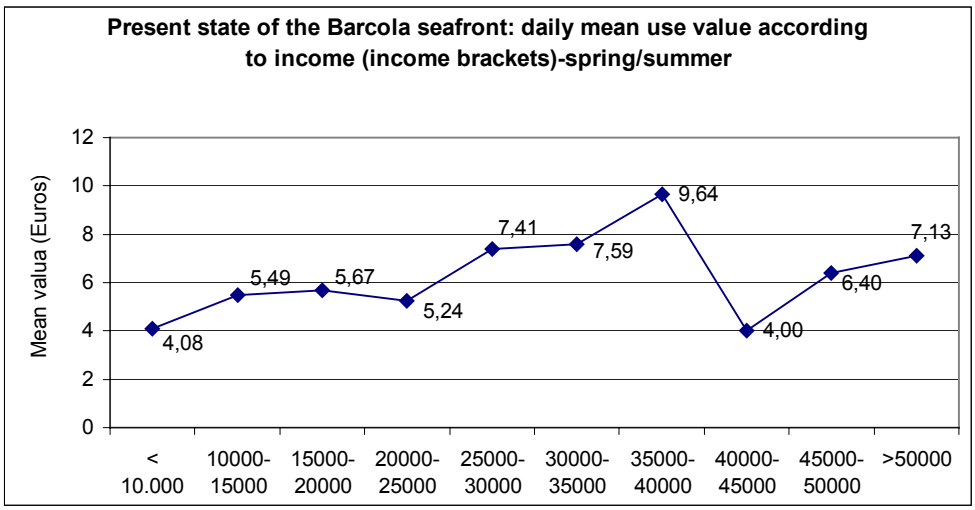


Figure III.2. 10

ii) ***Daily use value of Barcola seafront in autumn/winter***

The 'Yellow Manual' resident questionnaire has been innovated including a specific question on the beach use value in autumn/winter. The mean daily use value in the low season is 5.25 € (Std. Deviation 7.97), the median is 2.00 € and the mode is 0.00 €. These values are obtained considering zero values (26.5% of people do not visit the Barcola beach in the low season) and excluding a very few values higher than 100.00 €, protest responses and non-responses.

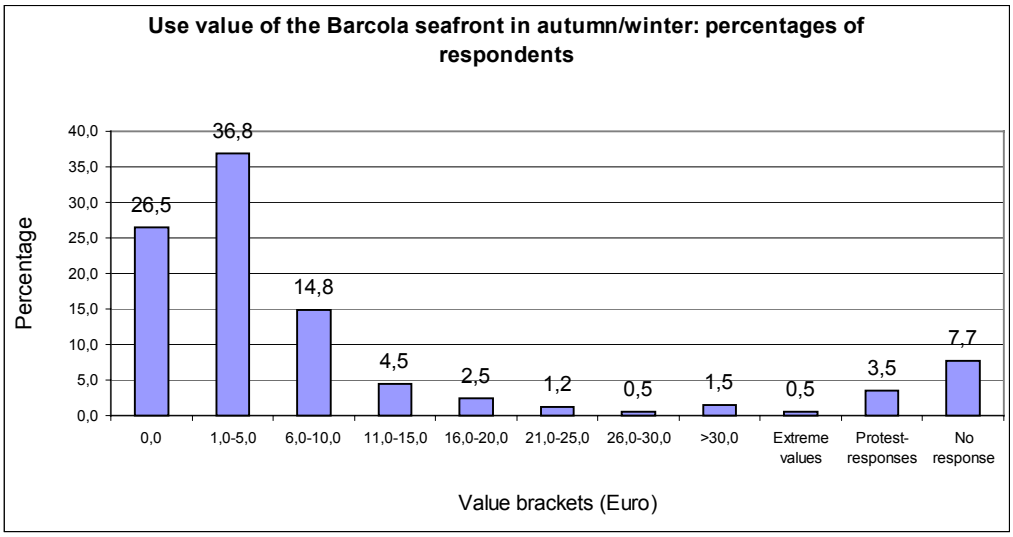


Figure III.2. 11

Figure III.2. 11 shows the frequencies according to the different use value brackets. In particular, as regards sex, men give a mean value (5.82 €) higher than that elicited by women (4.89 €). According to age, the highest mean value is elicited by people aged 46-50 and the lowest by people over 60, while according to occupation the smallest mean values of enjoyment are those of unemployed people (2.67 €), entrepreneurs and traders (3.65 €) and housewives (3.82 €), while the highest values is elicited by students (9.08 €).

The relation between the daily mean value in autumn/winter and respondents' income is described in figure III.2.12.

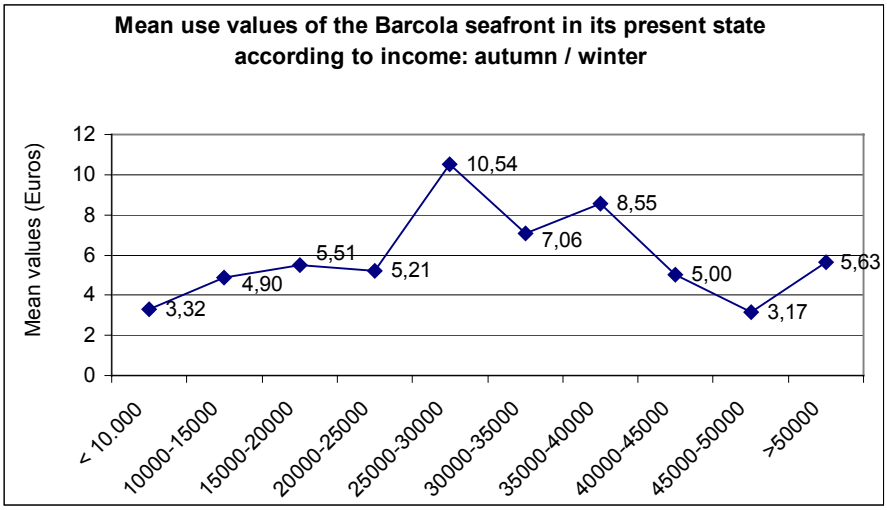


Figure III.2. 12

III.2.5.3. *Barcola seafront project: the recreational value of the new beach*

Respondents were also asked to elicit a monetary value on the enjoyment obtained from the hypothetical scenario of beach expansion according to the Trieste City Council project described in the photomontage 1. The daily mean use value of the new beach is asked in two seasons: i) spring/summer and ii) autumn/winter. 81.0 % of respondents would go to the new artificial beach

(figure III.2. 13). In particular, 100.0% of students and 62.5% of unemployed people would go to the new Barcola beach.

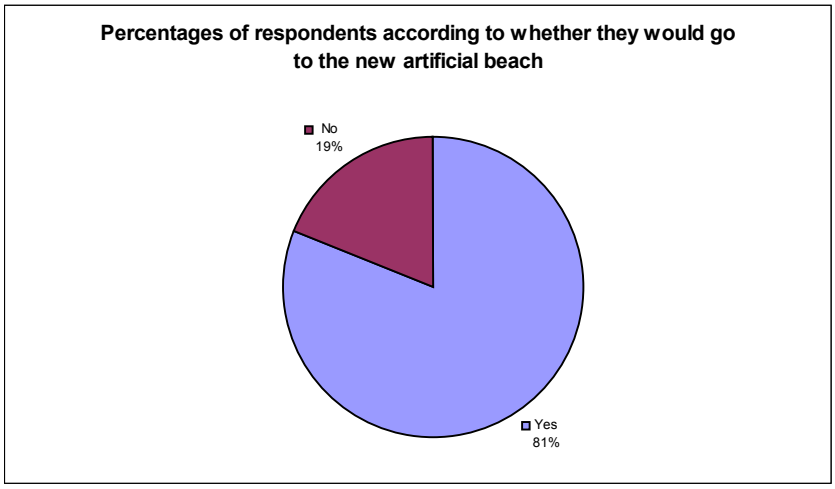


Figure III.2. 13

The great majority of respondents (83.1%) who would go to the new beach would get much more and more enjoyment from the new artificial beach, and only 2.9% % of interviewees would have a reduction in the daily enjoyment (see figure III.2. 14).

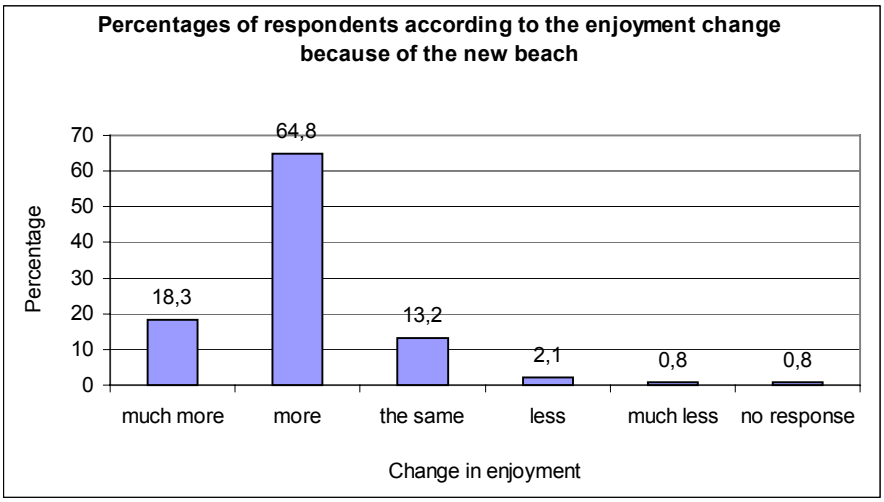


Figure III.2. 14

i) ***Daily mean use value in spring/summer***

The mean is 8.32 € (Std. Dev. 10.84), the median is 5.00 € and the mode is 0.00 €. These values are obtained considering 23.8% of zero values (people who would not go to the new Barcola beach), and excluding extreme values, protest bids and non-responses. 26.2% of respondents elicited a value between 1.00 € and 5.00 €, as shown in figure III.2. 15.

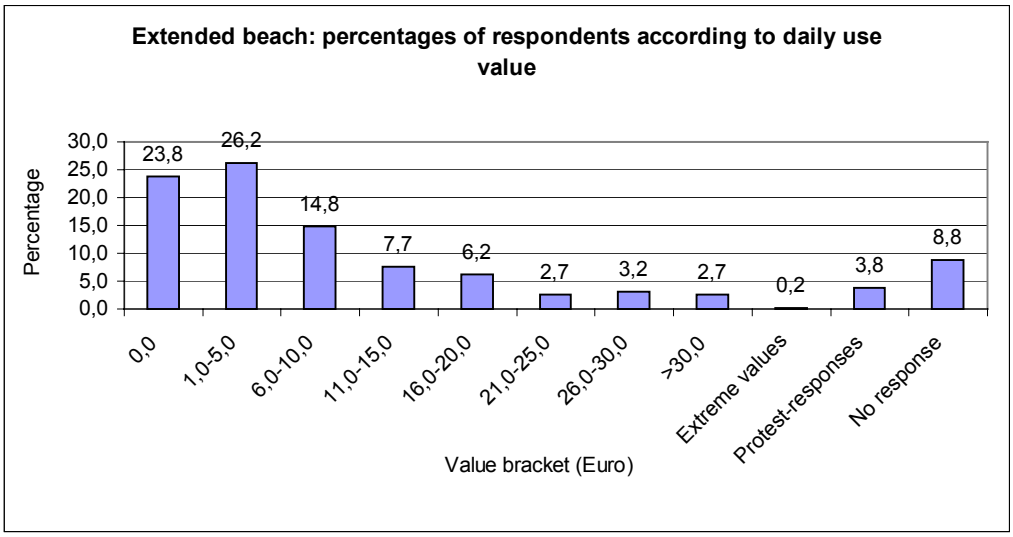


Figure III.2. 15

In particular, men elicited a higher mean value (8.92 €) than women (7.72 €)**,** and there is also a significant difference according to age, especially between people under 30 and over 60 (figure III.2. 16).

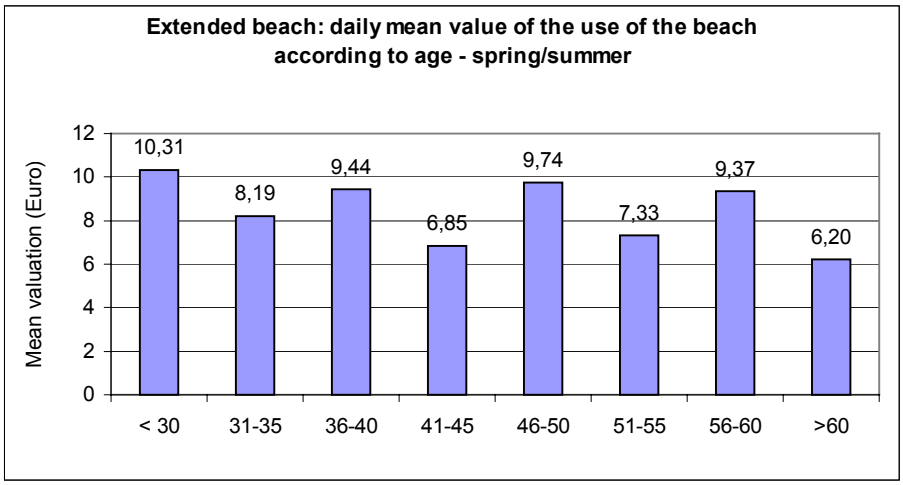


Figure III.2. 16

As regards occupation, unemployed people elicited a mean use value of 5.50 € and housewives 5.85 €, while the highest mean value was elicited by students (15.62 €). As regards income too, even in the hypothetical situation of extended beach in spring/summer people with the highest incomes elicited lower use values than people with lower income as shown in figure III.2.17.

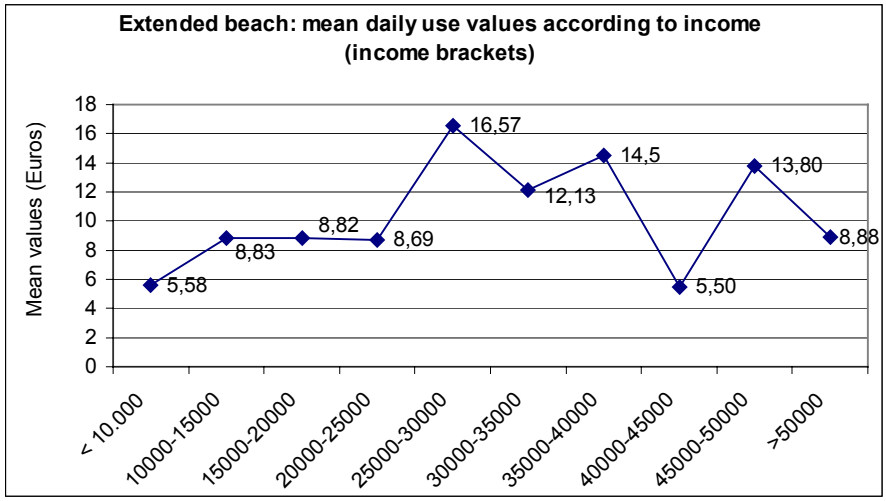


Figure III.2. 17

ii) ***Daily mean use value in autumn/winter***

As regards the recreational value of the extended Barcola beach in autumn/ winter, the mean use value is 6.45 € (Standard Dev. = 9.14), the median 3.00 € and the mode 0.00 € . These values are obtained considering the whole sample, including people who would not go to the extended Barcola beach in autumn/winter (figure III.2.18).

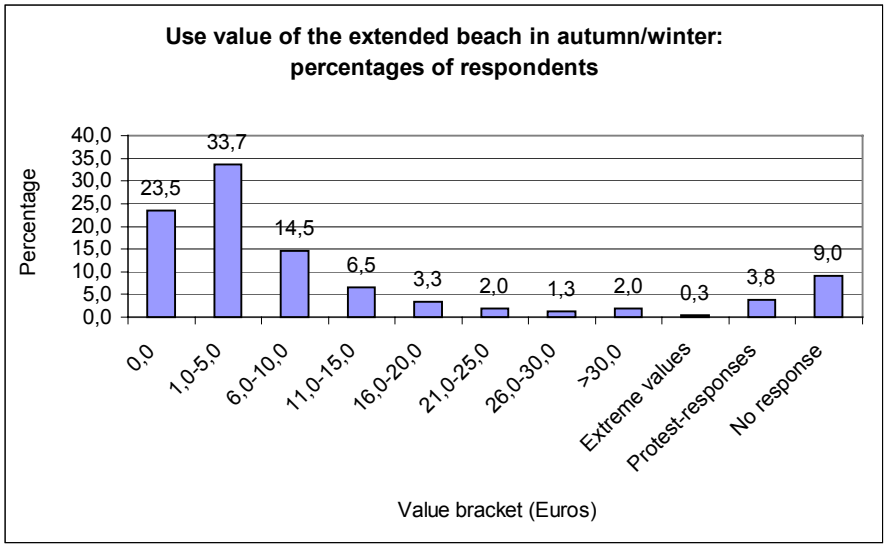


Figure III.2. 18

Men give a higher mean value (6.99 €) than that declared by women (6.00 €). There are also some differences according to age, especially between people aged 46-50 (8.19 €) and people over 60 (5.25 €) while as regards occupation, the lowest value of enjoyment is given by unemployed people (3.83 €), housewives (4.54 €), and entrepreneurs and traders (4.90 €), while the highest values were declared by students (12.31 €). The relation of the daily mean value of the extended beach in autumn/winter to the income level is described in figure III.2.19.

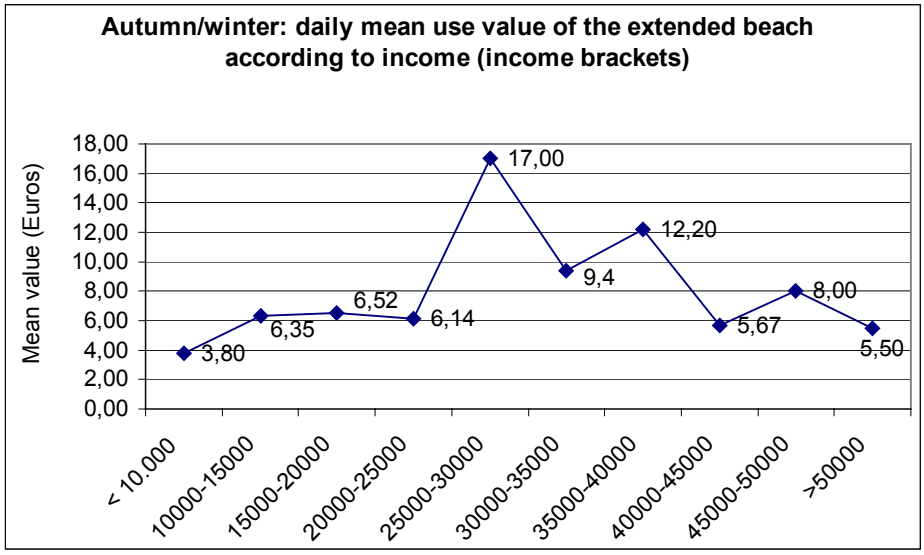


Figure III.2. 19

iii) Change in the number of beach visits, mean gain of enjoyment and preferences on the implementation of the Barcola project

A significant percentage (65.8%) of people who would go to the new artificial beach (81% of the total sample) claim that if the beach was actually extended they would visit it more or much more. Instead, only 4.5% of respondents would visit this beach less or much less often (figure III.2. 20). Since the Barcola seafront has alternative beaches near Trieste, 28.7% of respondents that would not go to the extended beach (19% of the total sample) would go to another beach instead. 11.8% do not answer, while 59.6% do not go to an alternative beach. In particular, as regards age, 38.5% of people aged 20-30 and 73.6% of respondents over 50 would not go to another beach.

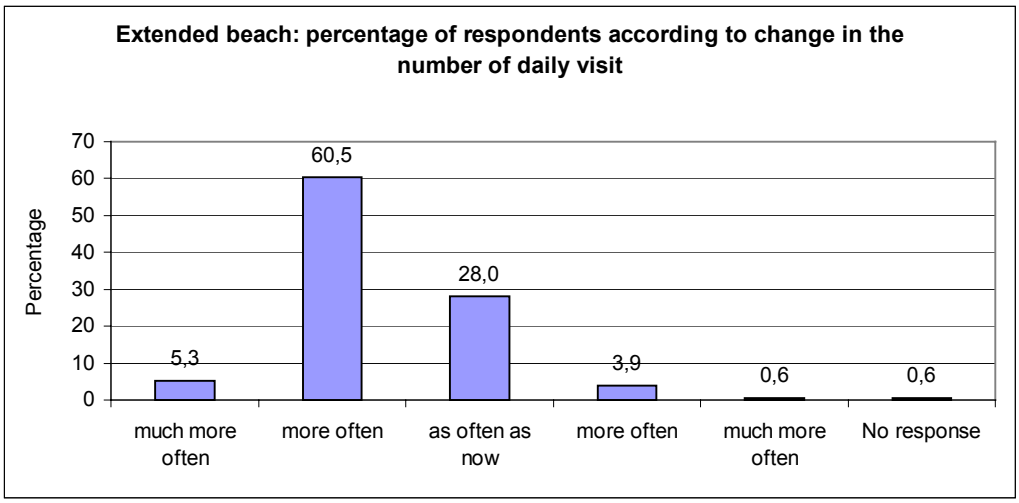


Figure III.2. 20

Finally, to the question "Would you be in favour of or against the implementation of this project of the Barcola beach?", considering the whole sample, the majority of respondents

are in favour of the implementation of the expansion project. Only 7.0% of respondents are not in favour (figure III.2. 21).

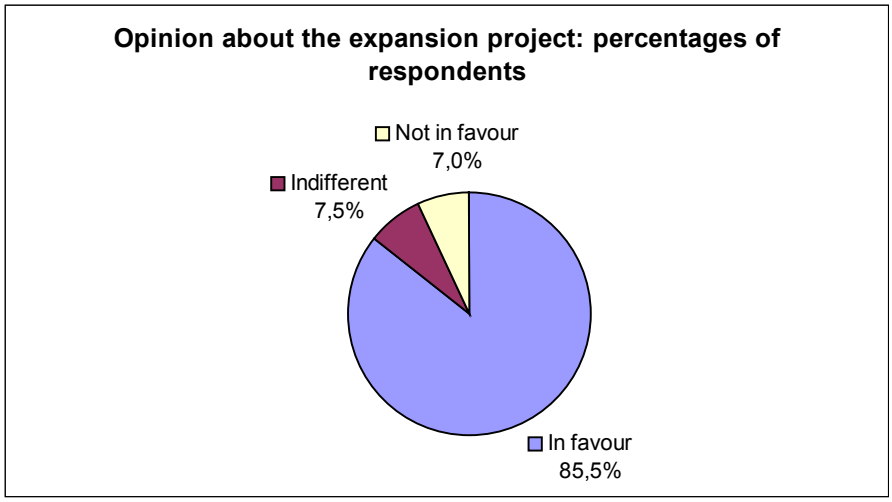


Figure III.2. 21

Table III.2.2 highlights respondents' preference about the implementation of the project according to age. Young residents are more in favour than older residents. As regards occupation, the smallest percentage (68.8%) of respondents in favour are unemployed, while the highest (90.4%) are employees and office workers.

Table III.2. 2 : Preference about the project implementation

Age brackets	**In favour**	**Indifferent**	**Not in favour**
20-30	93,9	2,4	3,7
31-40	86,9	8,0	5,2
41-50	87,0	2,9	10,1
Over 50	80,9	10,2	8,9

III.2.5.3. Mean gain of enjoyment for the project of the new artificial beach

Table III.2.1 summarizes the daily use values of the Barcola seafront in different scenarios and seasons.

Table III.2.1: Mean use values (Euros) according to different scenarios and seasons

Mean values (median)	**Present state**	**Situation of new beach**
Spring/summer	**5.24 (2.00)**	**8.32 (5.00)**
Autumn/winter	**5.25 (2.00)**	**6.45 (3.00)**

The mean gain of enjoyment for the project of building a new artificial beach on the Barcola seafront has been computed according to the 'Yellow Manual' procedure explained in Section II of this DELOS report. Table III.2.2 shows that, considering the whole sample, if the new beach project is implemented, respondents would have a mean gain in both seasons; while those who would go to an alternative beach in the vicinity of Barcola seafront would

have a daily mean loss of enjoyment. The reason is that the majority of people who would not visit the new beach evaluate a daily visit to the alternative beach as equal to that of the Barcola seafront in the present state, but they would pay more for the transport; nevertheless going to an alternative beach would permit them to reduce their loss compared with the situation where they would not substitute the new Barcola beach with an alternative beach. People who would not go to an alternative beach, if the new beach is built, would have a mean gain of 3.40 € in spring/summer and 1.56 € in autumn/winter; in particular, of these respondents, potential visitors (respondents who do not visit the Barcola seafront in the status quo, but would visit it if the new beach is built - 18.67% of the whole sample in spring/summer and 12.5% in autumn/winter) would have a mean gain of 6.04 € in spring/summer and 3.60 € in autumn/winter.

Table III.2.2**:** Daily mean gain of enjoyment (Euros) according to seasons

Mean value (median)	Spring/summer	Autumn/winter
Whole sample	**3.07 (1.00)**	**1.39 (0.00)**
Visit to an alternative beach *	**- 2.60**	**- 2.044**
Same beach *	**3.40**	**1.56**
Potential visitors	**6.04**	**3.60**

[* 'Visit to an alternative beach' means that people would go to another beach, and 'same beach' that they would not go]

We highlight that the mean daily gain of enjoyment is not the same as the difference between the mean daily use value in the new beach scenario and that in the present state. The reason is that the mean gain computation also has to consider losses of people who would go to an alternative beach if the new beach is built. Irrational respondents were excluded from the computation.

III.1.4. Regression Analysis

If we want to know the determinants of the beach use value, the data obtained by this survey must be modelled parametrically, to find a causal relationship amongst the individual value of enjoyment expressed in monetary terms and its explanatory variables. A certain number of attempts were made to test validity and reliability of the economic results of this survey. The recreational use value model, described in Section II (par. II.3.4, equation (18)) of this DELOS report, was estimated for the Barcola seafront use value using linear regression, probit and tobit functional forms. The results obtained by these parametric models confirm that the use value of the status quo is positively related to that of the new artificial beach scenario and the alternative beach (see also Whitmarsh et al., 1999).

In the following table III.2.3, we present the results obtained by the linear regression as regards the daily use value of the Barcola seafront in the status quo in spring/summer, without income as regressor: number of observations = 523; R^2 = 0. 7390; P = 0.05 cut-off value.

Table III.2.3: regression coefficients of the value of enjoyment model

Explanatory variables	Coefficient	P-value
Use value in condition of new beach	0.4853	0.000
Use value of alternative beach	0.3106	0.000
Civil status: not married	- 1,0546	0.043
Not go to an alternative beach	1.1714	0.000
Go to the beach in groups	2.4028	0.000

A significant positive relationship also exists between the recreational use value and the fact of going to the beach in groups, confirming that several respondents, mainly young people, appreciate the opportunity to stay on the Barcola seafront in groups. In addition, the daily use value is positively related to the fact of not visiting an alternative beach. Finally, the use value is negatively related to the condition of being unmarried.

III.2.6. Conclusions

According to the DELOS bibliographical research (Palomè, van der Veen and Marzetti, 2001) the CVM survey on the project of the new artificial beach on the Barcola seafront (Trieste) is the first research to distinguish the estimate of the beach use value in two different scenarios according to different seasons. The results of this survey mainly show not only that it is useful to distinguish the beach use value according to seasons, but also that the use value according to seasons changes for different scenarios. As regards the Barcola seafront, the daily use value in spring/summer and autumn/winter is almost equal for the present state, while it is different for the hypothetical new beach: considerably higher in spring/summer than in autumn/winter.

The results described above permit to compute the aggregate beach use value per year. Because the Barcola beach is exclusively visited by residents, we cautiously suppose that the number of visits to the seafront would not change for the new beach (even if the majority of respondents say they would increase the number of visits), the aggregate use value of the change in spring/summer is just over 721,450 € and in autumn/winter 326,650 €; therefore, according to these data and hypothesis, the total annual aggregate value of the change to the Barcola seafront is estimated as 1,048,100 €.

III.3. THE EXPERIMENTAL CVM SURVEY OF OSTIA (ROME)

III.3.1. Introduction

The experimental CVM survey about Ostia beach, by evaluating the recreational use value of the beach, aims: i) to see if Italian respondents properly understood the unusual valuation question on the beach use explained in section I of this DELOS report; ii) to see whether respondents on the well-developed area would find it more difficult to reply to this question than respondents on the undeveloped area of Ostia beach; iii) to obtain use value data useful for a possible future main surveys in this site.

The questionnaire was created following the recommendation of the *Yellow Manual* briefly described in the Section I of this report. Leopoldo Franco (UR3) provided the technical information on the defence structures of the Ostia seafront and the beach photographs.

III.3. 2. Ostia beach

Ostia is an Italian town, 25 km from Rome. It has a wide sandy beach 17 km long defended from erosion by LCS. A great part of the beach is well developed, as shown in photograph III.3.1; the rest is completely free.

Photograph III.3.1: Ostia beach in the present state - developed area

In the 1970-80s the beach was mainly defended by emerged detached rock breakwaters, a few wood-pile screens and groynes. In 1990 a central beach area 3 km long was protected with a submerged barrier and a fill made of mixed yellowish sands and gravel from land quarries. Later other northern beach areas were protected with a mixed “box” type system made of groynes and submerged sill containing similar fill. Finally in 1999 the southern shore was simply replenished with brown-grey sands from offshore quarries without structures. The beach is visited by residents and day-visitors, who are mainly from Rome.

III.3. 3. The results of the Ostia CVM survey: descriptive statistics

An on-site survey of a random sample of 100 beach visitors was carried out, because

Ostia beach is visited not only by residents but also day-visitors. The interviews were done in the period June-September 2002 by one undergraduate student of the UR3, well briefed on the questionnaire. The Ostia CVM survey aims to evaluate non-marketable recreational use of the beach in two scenarios: its present state and a hypothetical situation of erosion. The beach recreational use value is referred only to spring/summer period.

In its wording the CVM section of the questionnaire was divided into parts: i) to collect information about the kind of visitors (resident or day-visitor); ii) to collect information on the type of beach use, and number of visits in spring/summer and autumn/winter; iii) to evaluate the enjoyment of a daily visit to the seafront in its current condition in spring/summer; iv) to evaluate the change of enjoyment after the possible erosion of the beach in spring/summer, and the change in number of visits; v) to collect data about the social characteristics of respondents; vii) to obtain information about respondents' comprehension of the questionnaire from interviewers.

The majority of respondents came from Rome (67%) and residents are 27%, as shown in figure III.3.1. At the time of interview 70% of respondents were in sunbathing buildings, and the rest on the free beach.

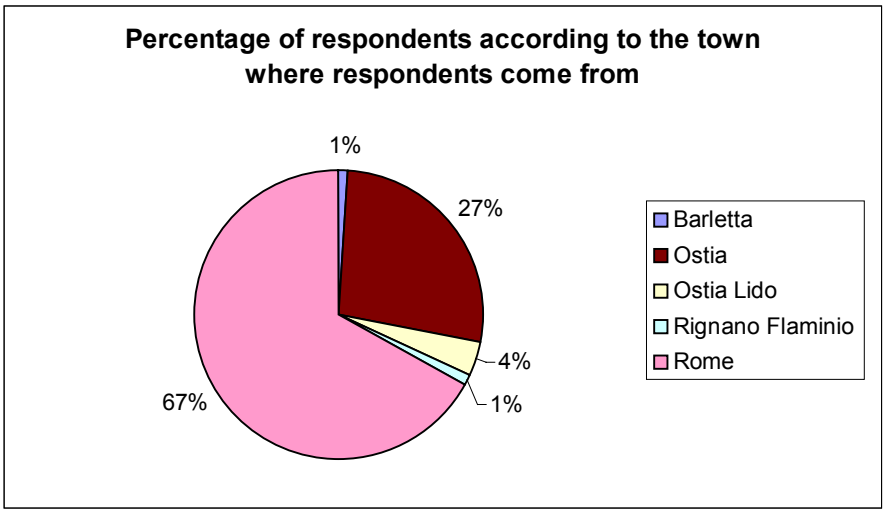


Figure III.3. 1

As regards the time spent on the beach in the present state, the mean number of days spent on Ostia beach is 88.93 days; 37% of respondents go to the beach every day. Respondents on the free beach visit it about 51 days, while people on the developed beach 105 days; 13% of respondents usually go to the beach more than once per day. Figure III.3. 2 shows that 69% of respondents stay on the beach at least 3 hours per day. The mean daily hours of stay in spring/summer are about 4.

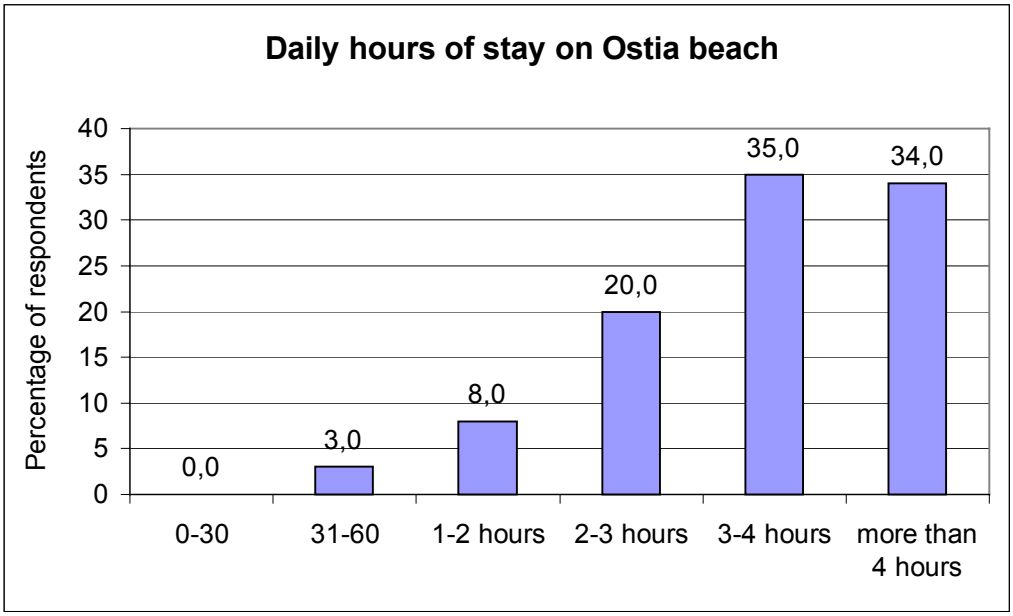


Figure III.3. 2: Daily hours of stay on the beach

In autumn/winter 44% of respondents go to the beach, and these respondents spent almost 12 days on the beach.

As regards the informal recreational activities done on the beach, the majority of respondents go to the beach mainly to sunbathe, relax and swim. Nobody fishes. Figure III.3. 3 shows the percentage of respondents according to the main activities (as first choice) done on the beach in spring/summer.

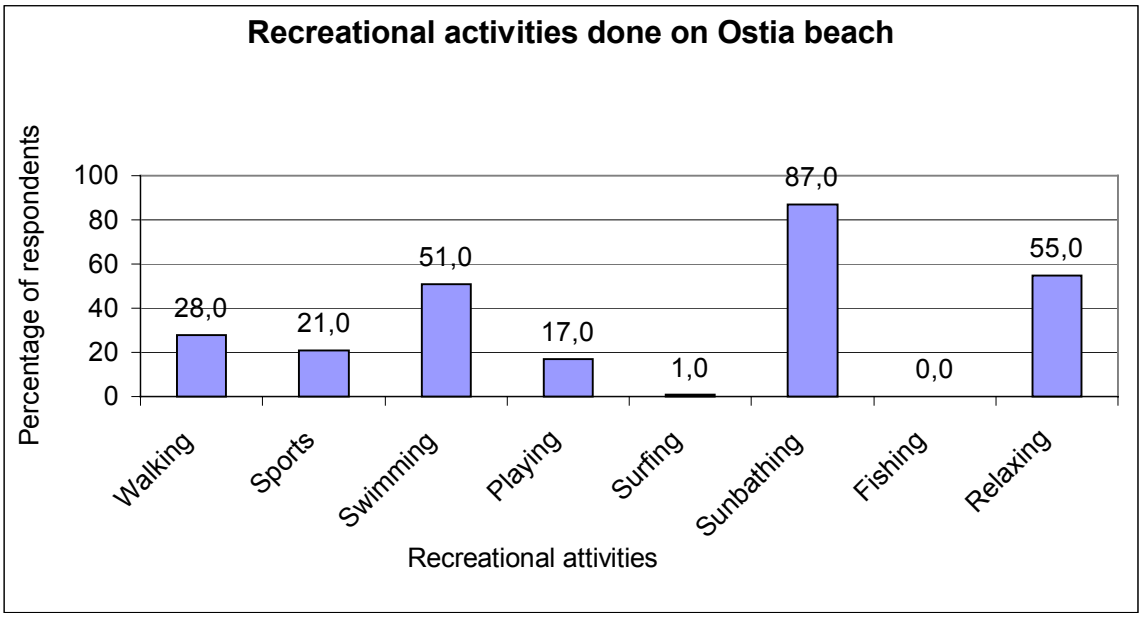


Figure III.3. 3: Activities done on Ostia beach

III.3.3.1 *The recreational use value of Ostia beach in spring/summer*

In the case of the Ostia survey respondents have use experience of the beach; in

addition, to limit the risk of respondents giving an incorrect interpretation of the hypothetical situation of beach erosion, photograph III.3.2 was presented to respondents.

Photograph III.3.2: Ostia beach in a situation of erosion - developed area

In the Ostia application of the CVM in the VOE version 11% of respondents was unable to elicit a value for the daily beach use, and they were excluded from the mean value computation. Only 3% of interviewees elicited very high values (100 Euros).

In spring/summer, table III.3. 1 shows the mean daily use value in Euros according to the present state and the hypothetical scenario of erosion. Compared with the mean economic value of the present beach state, the change in the mean value of enjoyment due to erosion is considerable (from 17.91/15.05 € to 2.05 €).

Table III.3. 1: Spring/summer - Mean use values (Euros) according to different scenarios

Mean values (median)	Present state	Situation of erosion
Without extreme values	**17.91 (10)**	**2.05 (0.00)**
With extreme values	**15.05 (10)**	**2.05 (0.00)**

More specifically, in spring/summer 20.0% of respondents elicited 10 €, and 50% of respondents between 10 and 25 € for the use of the beach in the present state (figure III.3. 4); while for a daily use value in condition of erosion 51% of respondents elicited 0.00 €, and 30% elicited a value between 1 and 5 € (see figure III.3. 5).

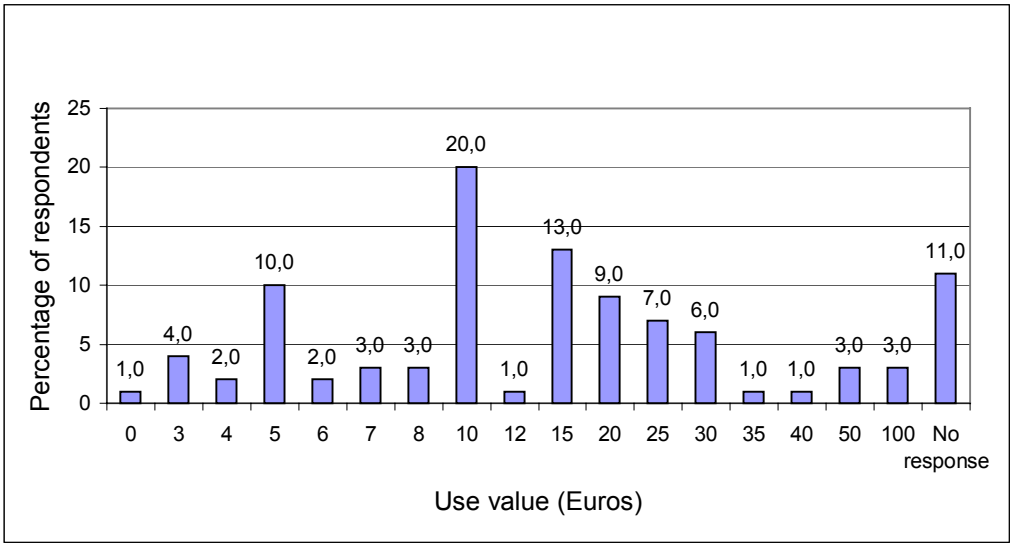


Figure III.3. 4: Use value for the present state of Ostia beach - percentage of respondents

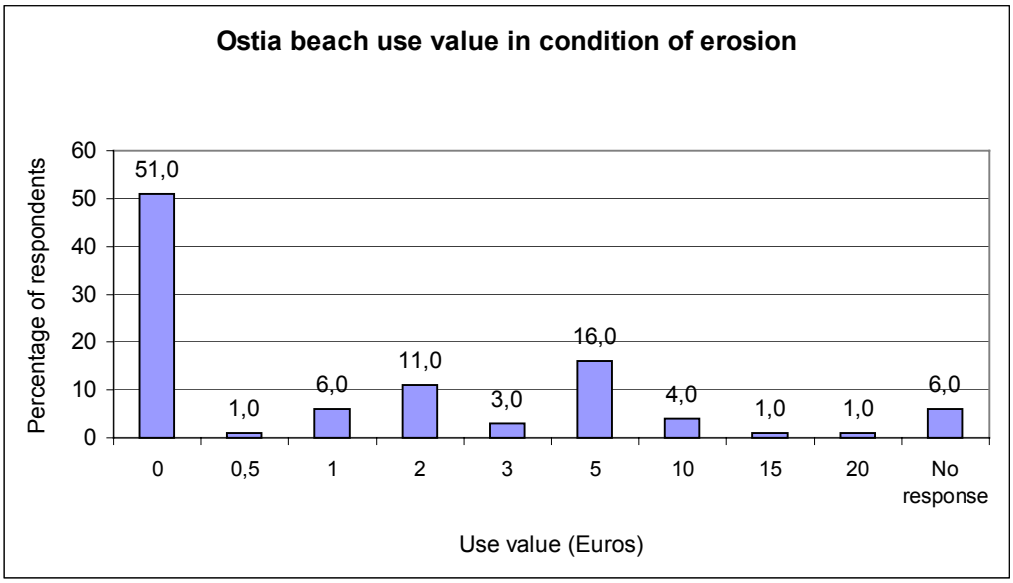


Figure III.3. 5: Situation of erosion - beach use value in spring/summer

If we distinguish the mean use value according to the different areas of Ostia beach (see table III.3. 2), the developed area is evaluated much higher than the free beach, even if extreme values are excluded (WEV) from the mean computation, because the free beach is not in a good state: it is dirty and not well organized from the facilities point of view.

Table III.3. 2: Spring/summer - Mean use values (Euros) according to different scenarios and beach areas (*EV means 'with extreme values', WEV 'without extreme values', no EV 'no extreme value')

Mean values (median)	Present state	Situation of erosion
Developed area (EV)*	**23.8 (15)**	**2.47 (0.00)**
Developed area (WEV)*	**19.31 (15)**	**2.47 (0.00)**
Free beach (no EV)*	**6.21 (5.5)**	**1.15 (1.00)**

III.3.3.2. *Mean loss of enjoyment because of beach erosion*

In spring/summer in condition of erosion only 3% of respondents would have the same enjoyment from the beach use, while 91% would have a loss; 6% did not reply to the question about the reduction in enjoyment due to erosion. Computing the individual differences between the use values in the present state and in the hypothetical situation of erosion, the mean loss of enjoyment of Ostia beach in condition of erosion is 15.39 € (median 10 €); if extreme values are excluded, the mean loss is 13.02 (median 10 €). For the different beach areas, table III.3. 3 shows that the mean loss is much higher in the developed beach.

Table III.3. 3 : Mean loss of enjoyment on Ostia beach areas

Free beach		Developed beach	
Mean	**4.98**	**Mean**	**21.03**
Median	**5.00**	**Median**	**15.00**
Mode	**3.00**	**Mode**	**10.00**

Excluding the extreme values, in the developed area the mean loss is 16.95 € (median 15); in the free beach the mean loss is unchanged because no extreme values were elicited.

If we consider the change in the number of beach visits because of erosion, figure III.3. 6 shows that 75% of respondents would reduce the number of visits to Ostia beach, in particular 36% of respondents would never visit the beach (code 1 in figure III.3. 6), 25% would visit much less often (code 2), 14% would visit less often (code 3), 19% would visit as before the change (code 4), 0.00% would visit more often (code 5), and 1.00% 'I do not know' (code 6).

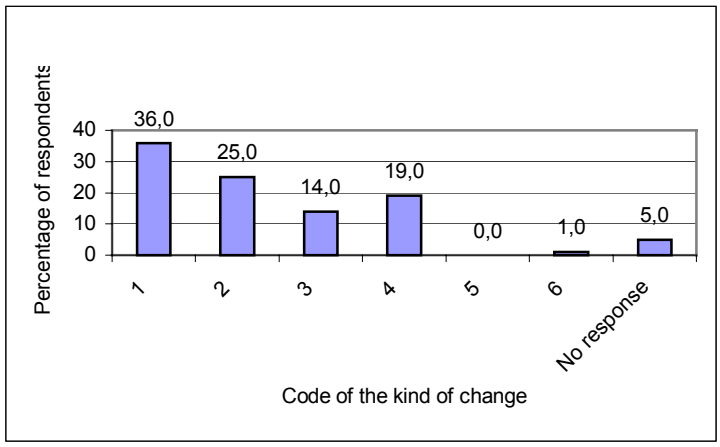


Figure III.3.6: Change in the number of visits in condition of beach erosion

According to the different areas of Ostia beach, and considering the same codes of figure III.3. 6, figures III.3.7 and 8 highlight the change in the number of beach visits.

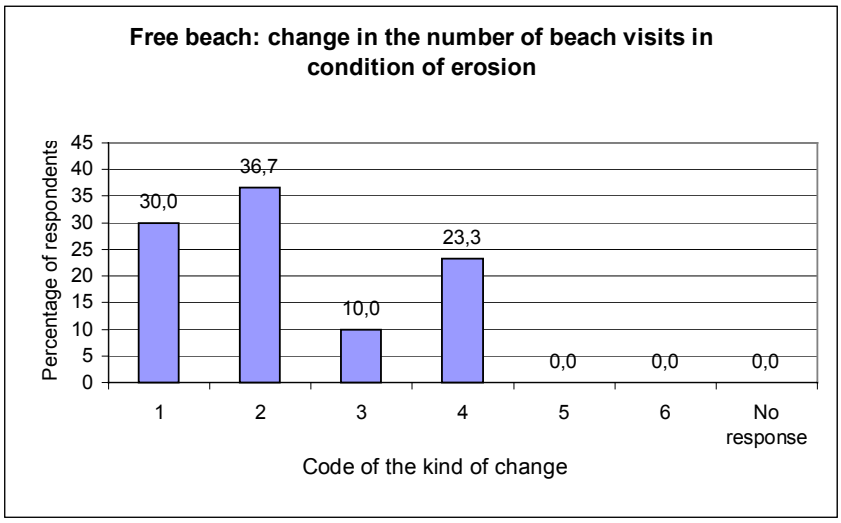


Figure III.3.7: Free beach - change in the number of visits in condition of erosion

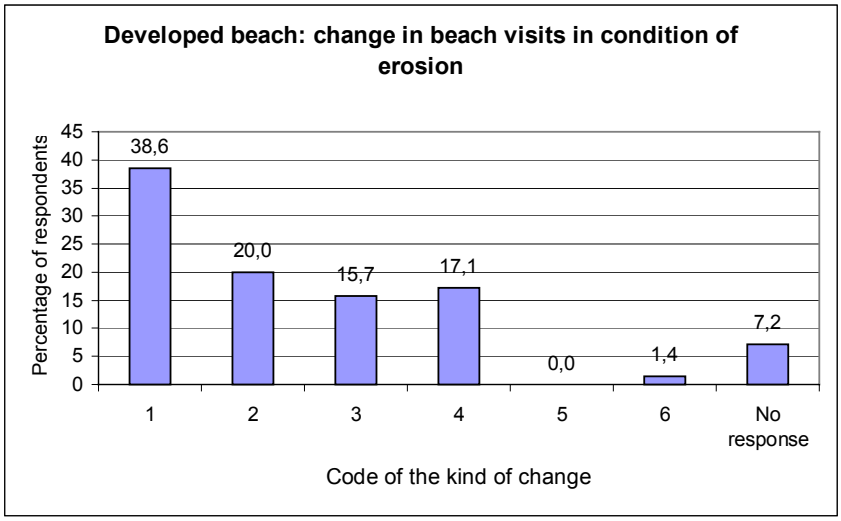


Figure III.3.8: Developed beach - change in the number of visits in condition of erosion

Finally, Ostia beach has alternative beaches in the vicinity, therefore to the question 'In the hypothetical situation of erosion, would you go to an alternative beach?' 75% of respondents would reduce the number of visits to the Ostia beach, and 60% of these respondents would go to another beach.

The computation of the aggregate value or total recreational net benefit per year about the hypothetical change to Ostia beach is not the task of this research. No official data about the total number of visits per annum to the beach are available. Nevertheless, the CVM survey is a good occasion to obtain this information: data show that the mean number of visits to the beach in spring/summer is just under 89 days.

III.3. 4. Conclusion

The number of interviews about Ostia beach is too small to consider the results of this survey reliable. Nevertheless, it has been shown that according to the Ostia survey the majority of respondents understood the valuation question, and respondents in sunbathing buildings had no difficulty in replying compared with those on the undeveloped beach. In particular, the more aware residents generally showed great interest.

III. 4. THE EXPERIMENTAL CVM SURVEY OF PELLESTRINA ISLAND (VENICE)

Pellestrina island is the southern coastal strip protecting the Venice lagoon. It has 4425 inhabitants (2002). The Pellestrina high water defence system shown in photograph III.4.1, given by nourishment and emerged groynes connected to a submerged breakwater, was built in the Nineties. The result of this defence system was an artificial beach, 8 km long, which is the source of economic benefits because it defends Venice and its lagoon from flooding, and it is also used for informal recreational activities such as sunbathing, walking, relaxing, swimming and so on. It is an undeveloped beach mainly used by residents and day-visitors.

Photograph III.4.1: Pellestrina Island beach

The Pellestrina island experimental survey was carried out in summer 2002 by one undergraduate student of the University of Bologna, well briefed on the questionnaire. It has been distinguished into two parts. The first part consists of a CVM survey whose purpose is to evaluate non-marketable. recreational benefits of the artificial beach of Pellestrina in its present state; while the second part of the survey aims to estimate damage before and after the defence system, and to obtain information useful for project researchers about the preferences on the design of different defence structures, and beach materials. The results of the preferences on the different defence structures are presented in Marzetti, Franco, Lamberti, Zanuttigh, 2003, DELOS final report D28/C.

III. 4. 1. CVM Survey Design

The VOE version of the CVM was used for estimating the recreational value of Pellestrina beach. Given the characteristics of this site, two questionnaires were used: i) a 'residents questionnaire' for residents interviewed at home; and ii) an 'on-site questionnaire' for day-visitors interviewed on the beach. The Pellestrina questionnaires were built adapting the questionnaires published in the 'Yellow Manual' (Penning-Rowsell et al.,1992, appendices 4.2 (a) and (b)) to the characteristics of Pellestrina Island. In particular only the use value of the present state of the beach was considered because this artificial beach was built in the Nineties, and before its building no beach existed.

The survey design was done according to the *Yellow Manual* guidelines, briefly described in section II. 4.1 of this DELOS report. The evaluation question of the VOE for beach use is asked in the open-ended format. In addition interviewees are asked about the beach recreational activities, number of visits to the beach and daily time spent on the beach in the different seasons, whether or not they are in favour of the beach protection, and their social characteristics. In the Pellestrina questionnaires, the innovation is that the valuation question is asked not only about the recreational use of the present state in spring/summer but also in autumn/winter.

A random sample of 80 residents and 75 day-visitors on the beach were interviewed in July 2002. It was presumed that on Pellestrina Island respondents had use experience of the beach since interviewees were residents of this coastal site and non-resident beach visitors.

III.4.2 Results of the CVM Survey

As regards the existing artificial beach, 61.2% of residents declared they were favourable to its building mainly because it can be used for recreational activities and it protects the Pellestrina island resorts from flooding; while 97.3% of day-visitors are favourable to the defence of the existent beach mainly because they will be able to use the beach in the future, and for future generations' needs.

The great majority of respondents understood the valuation question; as regards the use value in spring/summer only 2.5% of residents and 5.3% of day-visitors were unable to elicit a value for the recreational beach use and were excluded from the computation of the mean values. No protest bids and no extreme values were obtained.

As regards residents, 90% of interviewees use the beach in spring/summer and 48.8% in autumn/winter; while only 36.0% of day-visitors go to the beach in autumn/winter. In spring/summer the beach activity most preferred by interviewed residents is walking (22.5%), while for day-visitors it is relaxing (66.7%). Table III.4.1 shows the figures for use of Pellestrina beach by residents and day-visitors according to the different seasons. In particular, in spring/summer day-visitors stay on the beach longer than residents, while residents make a higher number of visits.

Table III.4.1: Average daily stay and number of visits according to seasons

Residents	Spring/Summer	Autumn/Winter
Daily average stay (hrs)	3.21	1.12
Number of visits (days)	70.88	21.48
Day-visitors		
Daily average stay (hrs)	4.12	1.04
Number of visits (days)	46.77	6.36

Pellestrina beach is evaluated higher by residents than by day-visitors, whether in spring/summer or in autumn/winter. In table III.4.2 the daily use values in Euros according to the different seasons is shown. In autumn/winter the median of 0.00 Euro is justified by the fact that 69.4% of day-visitors and 51.2% of residents do not visit the beach.

Table III.4.2: Mean use values (Euros) of Pellestrina beach in the present state

Mean values (Median)	**Spring/Summer**	**Autumn/Winter**
Residents	**9.69 (8.75)**	**5.01 (0.00)**
Day-visitors	**8.72 (8.00)**	**2.11 (0.00)**

The distribution of frequencies is shown in the following figures III.4.1-4.

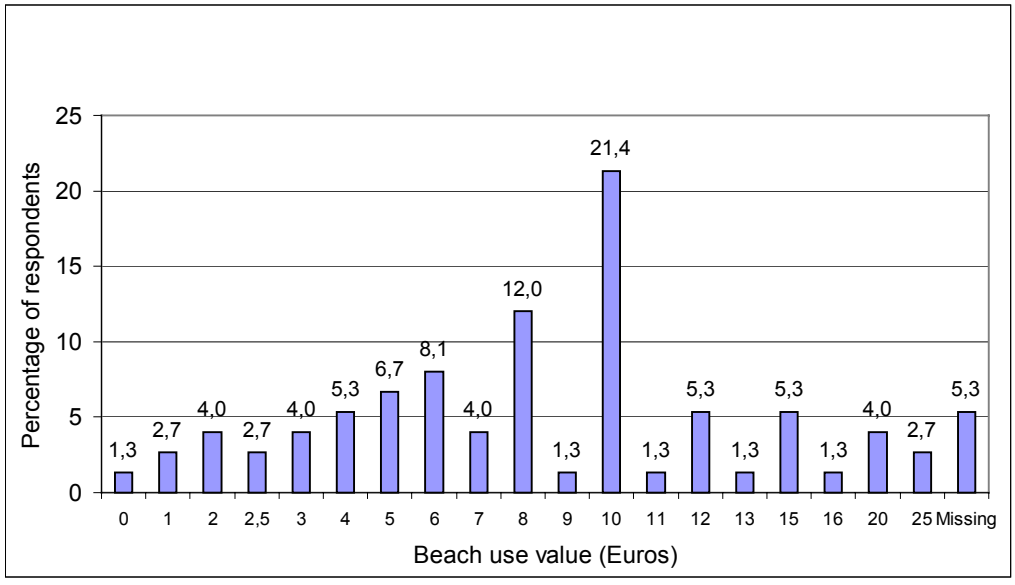


Figure III.4.1: Day-visitors - Daily use value of Pellestrina beach in spring/summer

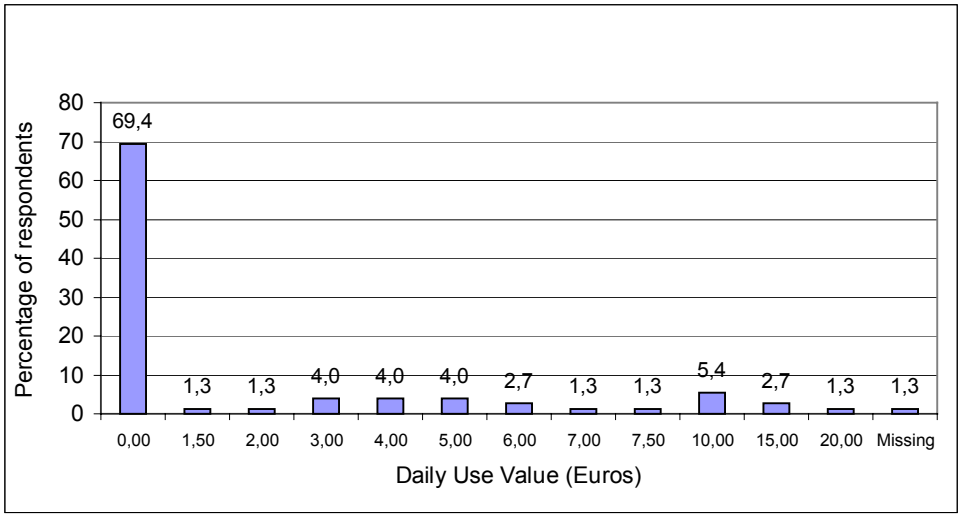


Figure III.4.2: Pellestrina day-visitors – Daily use values in autumn/winter (whole sample)

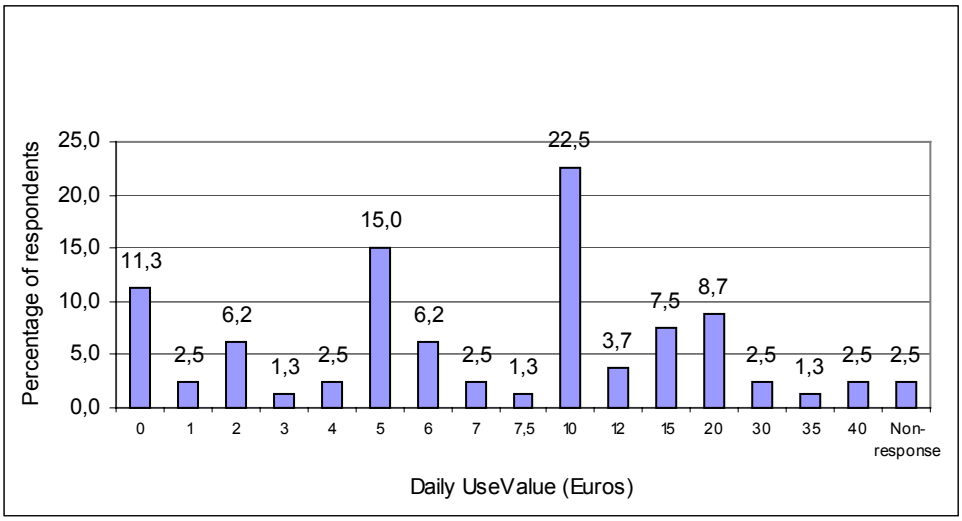


Figure III.4.3: Pellestrina residents – beach daily use value in spring/summer

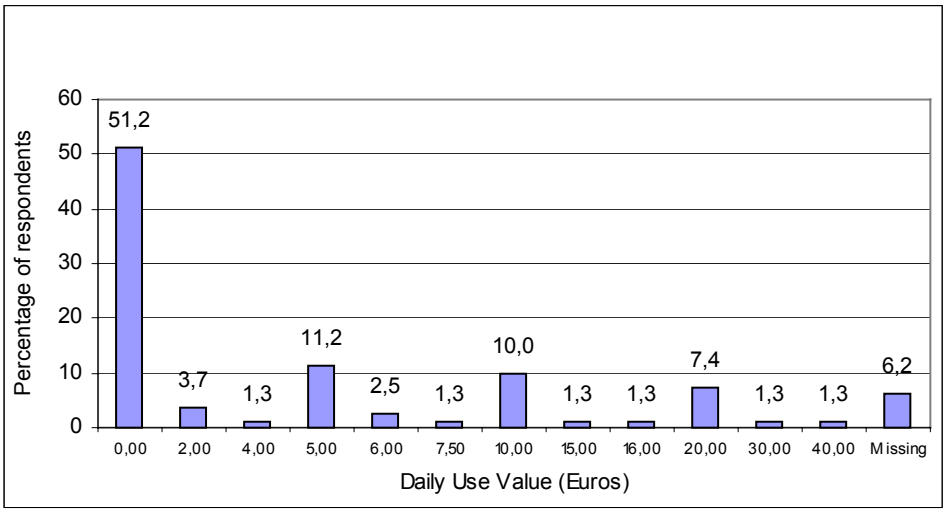


Figure III.4.4: Pellestrina Residents – Daily use value in autumn/winter (whole sample)

The total aggregate value per year of the use of Pellestrina beach in its present state cannot be computed, because data about the total number of beach visits per year are not available, particularly as regards day-visitors. Only the aggregate use value about Pellestrina

residents can be computed. According to the results of this experimental CVM survey and considering 4425 inhabitants, in 2002 the residents' aggregate use value of Pellestrina beach in both seasons is just over 3,515,400 Euros. This amount is obtained by multiplying the number of residents by the number of beach days and the mean daily use value of the beach for each season, and then summing these values.

Finally, to the question "Are you in favour or against the protection of this beach from erosion?", 97.3 % of interviewees were in favour of beach protection from erosion on Pellestrina Island (see figure III.4.5). The main motives of this preference are shown in table III.4.3. The majority of respondents are in favour for their own future use (58.67%) and future generations (56%).

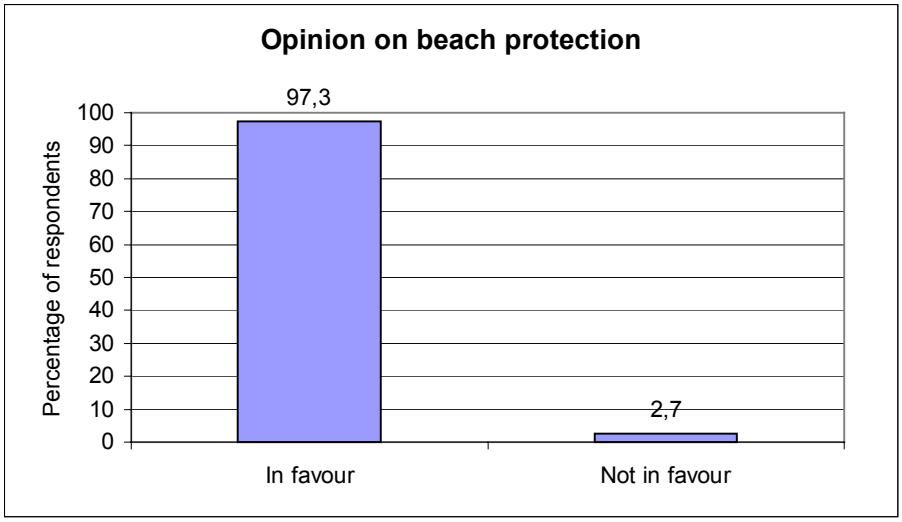


Figure III.4.5: Opinion on the beach protection – percentage of respondents

Table III.4.3: Motives for beach protection

	Frequency	%
To use the beach in the future	44	58.67
For future generations	42	56.00
Because it exists	3	4.00
Other motives	5	6.67
No response	2	2.67

III.4.3 Damages before and after the building of the new Pellestrina beach

The CVM survey was considered a good occasion for collecting other economic information. Some questions were included in the resident questionnaire about the characteristics and amount of past damages from flooding, and the actual damages suffered because of the new artificial beach on Pellestrina Island.

In the past 40 years 28.7% of residents interviewed suffered damages from flooding before the building of the new beach. In particular, 74% of these respondents suffered damages to houses, 61% furniture, 48% garden, and 17% car. According to this

experimental survey the mean damage of these respondents is just over € 10,000 and the total damage just under € 9,000,000. In addition, the existence of the new artificial beach creates some damages to residents. In 2002, 41.3% of interviewees suffered damages; more specifically, 72.7% of these interviewees had damages from sand in the air, 21.3% to laundry and other inconveniencies and 3.0% from salt corrosion. These damages were quite low; the mean damage value of these respondents was 193 Euros and the total damage was just over 185,000 Euros.

III. 4.4. Conclusion

As regards the Pellestrina Island survey, the number of interviews is too small to consider its results completely reliable from a statistical point of view. It was conceived mainly for the following purposes: i) to see if Italian respondents properly understood the unusual valuation question on beach use distinguished according to different seasons; and ii) to obtain data useful for possible future main surveys in this site.

The Pellestrina survey results show that the unusual evaluation question of the beach use was properly understood by interviewees in Pellestrina Island, and that in general it is right to distinguish the recreational value according to the different seasons for Italian beaches. In addition ‘to continue to use the beach in the future’ and ‘for future generations’ are the two main motives of the general agreement as regards the protection of the Pellestrina beach.

III.5 COMPARISONS OF THE MEAN USE VALUES OF THE DIFFERENT BEACH SCENARIOS

In the four Italian case-studies of DELOS the basic CVM structure of the *Yellow Manual* questionnaires were adapted to the specific situation of each site; therefore they are not identical. Nevertheless comparisons of some results are possible.

In the status quo scenario, the daily mean use values in spring/summer of the Lido di Dante, Trieste, Ostia and Pellestrina beaches according to different beach areas and population are presented in table III.5.1. This table shows that the the undeveloped (natural) beach of Lido di Dante is evaluated highest, while the undeveloped beach of Ostia (very dirty) is evaluated lowest. According to the population, residents evaluate the recreational beach use in Lido di Dante lower than day-visitors and tourists, while in Pellestrina they evaluate it higher. The Trieste beach, very small and crowded, is evaluated less.

Table III.5.1: Status quo - Mean use values in spring/summer (€)

LIDO DI DANTE	**27.67**	
North 1(developed)		25.41
North 2(developed)		27.21
South (undeveloped)		32.44
Residents		10.25
Day-visitors		23.21
Tourists		32.28
TRIESTE (residents)	**5.24**	
OSTIA	**17.91**	
Developed area		23.28
Undeveloped area		6.21
PELLESTRINA	**9.22**	
Residents		9.69
Non-residents		8.72

In autumn/winter the highest mean daily use value in the status quo is that of the Trieste seafront, while according to the different population groups the Lido di Dante residents elicited the highest value (table III.5.2).

Table III.5.2: Status quo – autumn/winter use values (Euros)

LIDO DI DANTE	**4.10**	
Residents		27.89
Day-visitors		4.32
Tourists		3.25
TRIESTE (residents)	**5.25**	
PELLESTRINA	**3.61**	
Residents		5.01
Day-visitors		2.11

As regards the hypothetical scenario of beach erosion in spring/summer, it is possible to compare the Lido di Dante and Ostia use values. Table III.5.3 shows that both beaches in the situation of erosion are evaluated lower than in the status quo. In particular, the lowest mean use value was elicited for Ostia beach.

Table III.5.3: Erosion scenario – mean use values (Euros)

LIDO DI DANTE	**13.26**	
North 1(developed)		11.47
North 2 (developed)		9.94
South (undeveloped)		21.49
OSTIA	**2.05**	
Undeveloped area		1.15
Developed area		2.47

Finally, with regards to the hypothetical scenario of artificially expanding the dimension of a beach, data about the Lido di Dante and Trieste beaches in spring/summer are available (see Table III.5.4).

Table III.5.4: Artificially expanded beach
Mean use value (Euro) – Spring/summer

	Status quo	Expanded beach
LIDO DI DANTE	**27.67**	**28.37**
TRIESTE	**5.24**	**8.32**

Comparing the mean daily use value of these two hypothetical scenarios of beach expansion with the mean use values of the status quo of the same sites, the different dimension of the beach expansion, given the status quo, justifies their difference: in Lido di Dante the mean use value of the protection scenario is only 2.53% higher than the status quo value; while in Trieste it is 58.78% higher.

To conclude, these comparisons show that the daily mean value of the beach recreational use changes according to site-specific natural characteristics, degree of development, relevant population, seasons and scenarios.

ACKNOWLEDGEMENT

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