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PREFERENCES ABOUT DIFFERENT KINDS OF DEFENCE STRUCTURES AND BEACH MATERIALS: THE ITALIAN CASE-STUDIES OF LIDO DI DANTE, OSTIA AND PELLESTRINA ISLAND

Final Report

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1. Introduction

To save time and money a contingent valuation method (CVM) questionnaire is a good opportunity to collect information other than the economic data. In order to design sustainable LCS to satisfy beach visitors' preferences, some specific questions about respondents' preferences for different kinds of beach defence structures were added to the CVM questionnaire of the Italian case-studies of Lido di Dante, Pellestrina and Ostia. This document describes the results of the specific questions on this topic included in these CVM questionnaires. The information collected is useful for the LCS design mainly on tourist sites because day-visitors and tourists seem very sensitive to the aesthetic characteristics and suitability for recreational activities.

2. Questions about visitors' preferences regarding different kinds of defence structures and beach materials

In Summer 2002, 600 interviews were done on the Lido di Dante beach, while two experimental surveys were done on the beaches of Pellestrina (150 interviews) and Ostia (100 interviews). The following questions were added to the Lido di Dante, Pellestrina and Ostia CVM questionnaires:

i) "*The beach can be protected from erosion with different techniques. Which of these techniques do you prefer?*" A photomontage of four kinds of LCS was created and shown to respondents: parallel breakwaters, nourishment, groynes, and composite intervention (nourishment, groynes and submerged breakwaters).

ii) "*Why did you choose this technique?*"

iii) "*How do you rate the presence of groynes on a beach?*"

In the Lido di Dante questionnaire a second-choice question was included:
vi) "*Could you indicate a second technique together with the first one?*"

In addition a question about beach materials was included in the Ostia and Pellestrina (non residents) questionnaires:

v) *Do you prefer a beach of fine sand, coarse sand or gravel?*

3. Results of the Lido di Dante Survey

Lido di Dante is a well developed Italian tourist resort on the North Adriatic Sea, 7 km from the town of Ravenna. 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; 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 area of the Lido di Dante beach.

The specific questions i)-iv) highlighted in paragraph 2 were included in the CVM survey questionnaire of Lido di Dante in order to design LCS projects which also satisfy beach visitors' preferences; question v) was not included because it is known that on the Lido di Dante beach visitors prefer fine light-coloured sand. Interviewed visitors expressed their preference on the different kinds of coastal defence structures shown in Photomontage 1: parallel breakwaters, nourishment, groynes, and composite intervention (nourishment, groynes and submerged breakwaters).

Photomontage 1: Four different kinds of defence structures

Amongst the defence techniques, as first choice, 32.5% of respondents prefer composite intervention (submerged breakwaters, groynes and nourishment), 23.7% emerged parallel breakwaters, 21.2% groynes and 19.8% nourishment (see Figure 1). Only 2.8% of respondents affirm they are not able to express a preference.

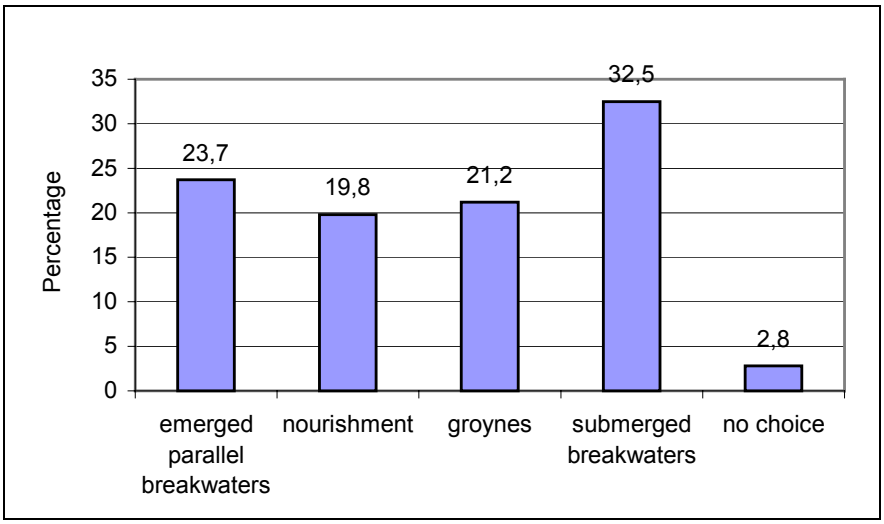

Figure 1 : Preference about beach defence techniques: percentage of respondents

As regards occupation,. we highlight some different groups of preferences: 35.7% of teachers prefer "nourishment", 29.8% of students "groynes", while 26.5% of employees and clerks prefer the "emerged parallel breakwaters" and the "submerged breakwaters" to the same extent.

As second choice, the majority (62.4%) of interviewees did not give a second preferred technique. As regards those who did, 13.4% prefer "submerged breakwaters" and 12.9% "groynes". "Emerged parallel breakwaters" and "groynes" each received 13.4% of preferences by teachers. We highlight that 25.4% of people preferring "nourishment" and 21.3% of people preferring "groynes" chose "submerged breakwaters" as second option.

Respondents were also asked the reason for their preference; aesthetic reasons (62.6% of respondents) mainly justify the preference for the composite intervention, while water quality and suitability for children are the main reasons for respondents preferring emerged breakwaters; groynes are preferred because of suitability for recreational activities and water quality; finally, the preference for nourishment is motivated by water quality and aesthetic reasons (see table 1). No respondents justified their choice as "the most ecological solution".

Table 1: Different defence structures and motive of preference

	Aesthetic reasons	Suitable for what I do	Water quality	Suitable for children	Best solution	Other reasons
Emerged breakwaters	71	12	32	13	27	2
Nourishment	82	7	23	7	7	11
Groynes	71	15	36	6	8	6
Submerged breakwaters	141	2	31	2	19	5

Figure 2 shows the different percentage of residents, tourists and day-visitors and their preferred protection technique for "aesthetic reasons" or "water quality" respectively. Residents are less interested in aesthetic characteristics than other groups of people and more interested in water quality. The majority of tourists (60.4%) and day-visitors (66.0%), instead, declared that their choice was made mainly for aesthetic reasons. As regards respondents' occupations, we highlight some differences: 47.6% of housewives declared aesthetic reasons, while 42.9% said "water quality would improve". Moreover, 11.7% of managers and office workers think that a beach "suitable for children" is important, but this reason is given by only 4.8% of respondents in the sample as a whole. If we consider the three sectors of the beach, there is no great difference in percentage between the reasons for choosing the different techniques.

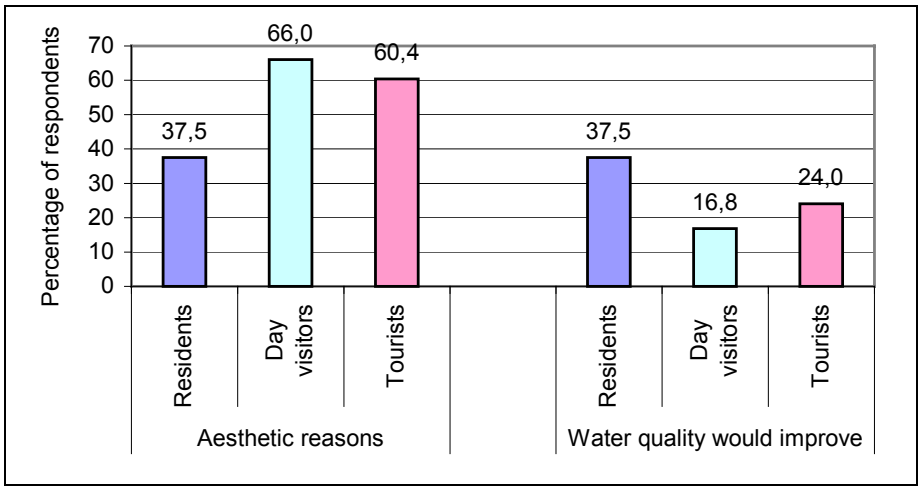

Figure 2 : Aesthetic reasons and water quality –
percentage of respondents distinguished into residents, day-visitors and tourists.

Finally, in this Lido di Dante survey, the mean rating is 5.91 on a scale from 1 to 10 to the question "How do you rate the presence of groynes on a beach?". More specifically, mean rating for residents is 5.30; for day-visitors 5.62 and for tourists 6.17 . Figure 3 shows that 64.0% of respondents expressed a rating equal to or higher than 6. In particular, foreign people rated 6.14, teachers 6.18, people with elementary education 6.37 and housewives 6.56.

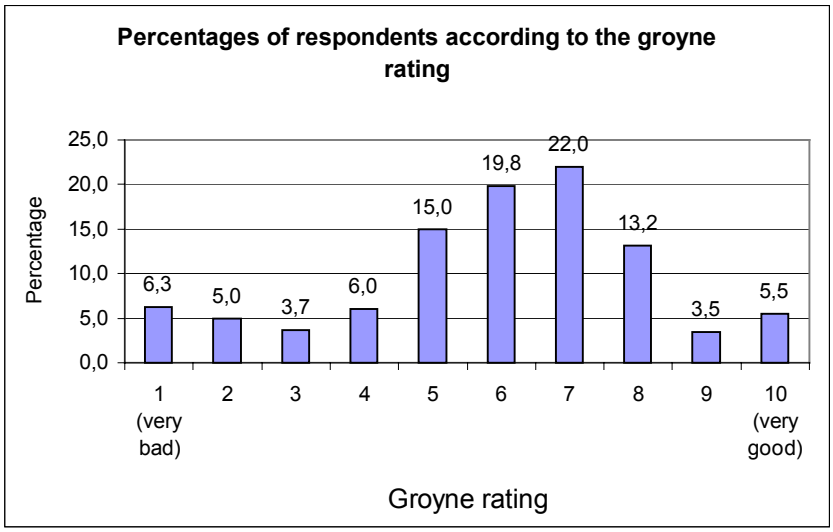

Figure 3: Percentage of respondents according to the groyne rating

To summarise, among the different defence techniques, respondents prefer the composite intervention already carried out on the beach of Lido di Dante, consisting of nourishment, groynes and submerged breakwaters; and their preference is mainly justifed by aesthetic reasons. The mean groyne rating is just under 6.

4. Results of the Ostia Survey

Ostia is an Italian town, 25 km near Rome. It has a long and wide sandy beach 17 km long defended from erosion by LCS. In a great part of the beach there are sunbathing

buildings; the rest of the beach is completely free. The beach is visited by residents and day-visitors, who are mainly from Rome.

In order to design LCS, which possibly satisfy the beach visitors' preferences, questions about respondents' preferences for defence project characteristics, beach materials and groynes (see paragraph 2) were added to the CVM questionnaire of the Ostia case-study. In particular, with regard to the preferred type of beach protection structures, the following photomontage 2 was presented and explained to interviewees - parallel breakwaters (1), nourishment (2), groynes (3), and composite intervention or mixed system i.e. nourishment, groynes and submerged breakwaters (4).

Photomontage 2: Defence techniques

As shown in figure 4, 47% of respondents are in favour of the protection of Ostia beach with some kind of "rigid" structure (14% emerged detached breakwaters, 22% submerged barriers, 6% groynes, 5% a mixed "box"-type system) since they believe that they are more effective for beach defence. It is interesting to highlight that the expressed preference for submerged detached structures is mainly justified by improved water quality and "child-friendliness": in fact submerged LCS produces calm, clearer and cleaner waters. Finally a number of personal comments were added to justify this choice, among which we should highlight the focus on children's safety and water quality. Some respondents, instead, highlighted that they did not choose submerged barriers because they are invisible and therefore dangerous.

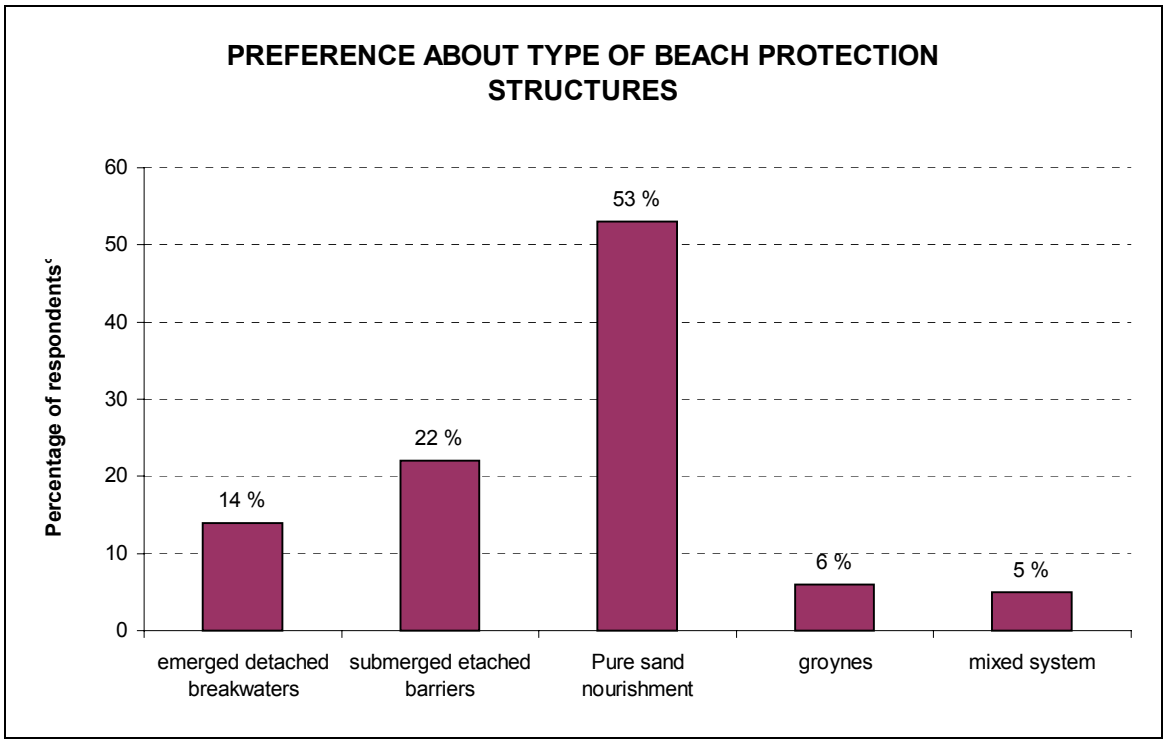

Figure 4: Preference about different kinds of defence structures

The other 53% of respondents prefer a pure "soft" sand nourishment. The main reason why they prefer pure sand nourishment is aesthetical reasons; in addition the second most important reason is that recreational activities are favoured.

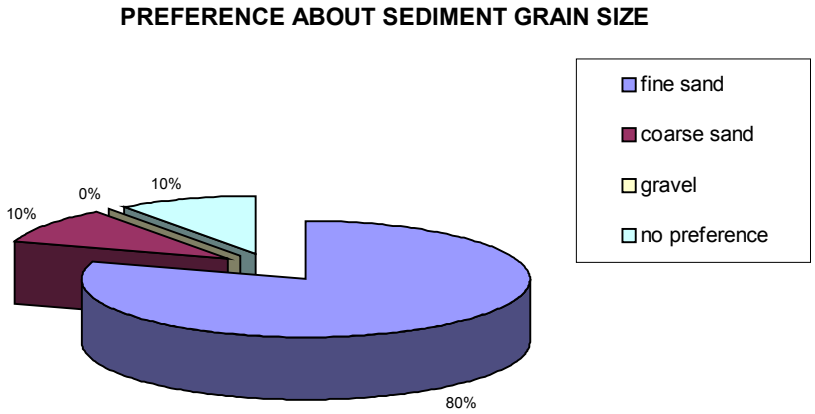

Figure 5

As regards the preference about sediment characteristics (figures 5 and 6), nearly 80% of beach users prefer fine light-coloured sands and just 14% like the dark sand which was the original material of Ostia beach. 10% of respondents prefer coarse sand and no one likes a gravel beach. This preference is useful for nourishment projects.

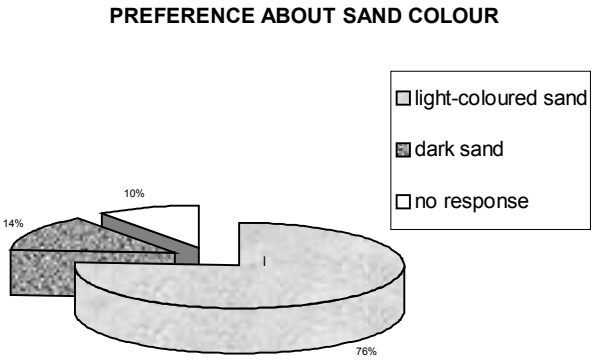

Figure 6

Finally, as regards the preferences about groynes, the majority of visitors to Ostia beach expressed a medium-high rating (from 1 to 10). Figure 7 shows that 59% of respondents established a value in the range of 5-8.

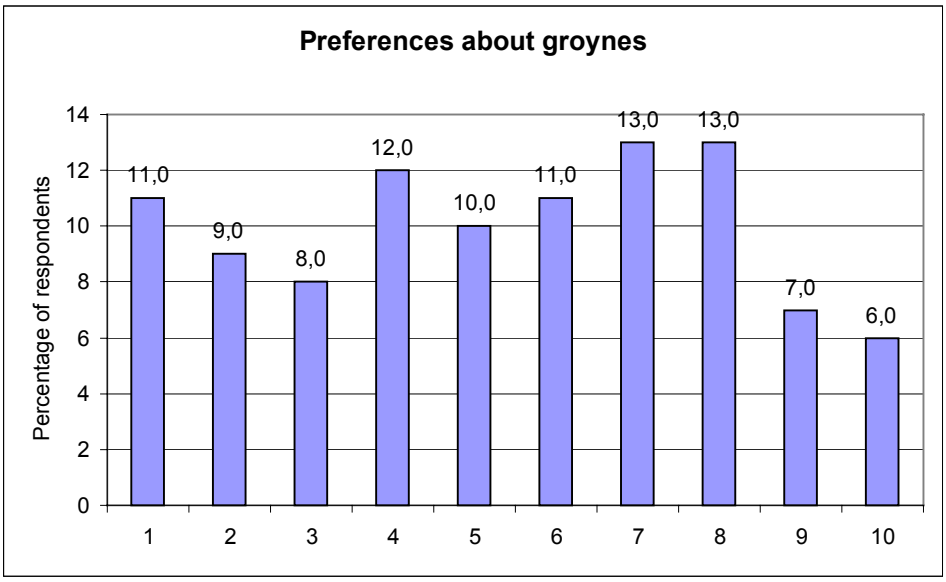

Figure 7: Preferences about groynes

To summarize, the majority of interviewed people showed great attention to the technical questions, probably because over the last few decades they have directly experienced the different coast protection works in Ostia for halting erosion processes. In general residents showed more care for the overall sea defence issue, while the summer visitors from Rome paid more attention to visual impacts and water quality.

5. Results of the Pellestrina Island survey

Pellestrina island is the southern coastal strip protecting the Venice lagoon. The Pellestrina high water defence system, given by nourishment and emerged groynes connected to a submerged breakwater, was built in the Nineties; it is an undeveloped beach used by

residents and day-visitors for informal recreational activities such as sunbathing, walking, relaxing, swimming and so on.

In order to collect information on preferences on four different kinds of coastal defence structures, different beach materials and also groynes, the specific questions described in paragraph 2 were also included in the CVM questionnaire for day-visitors to Pellestrina Island. Interviewed beach visitors were asked to express their preference about the different kinds of coastal defence structures shown in Photomontage 2 and the main reason for their preference. Figure 8 highlights that, of the four defence techniques presented and described to respondents, 34.7% of them prefer the composite intervention (4) (submerged breakwaters, groynes and nourishment), 24.0% groynes (3), 20.0% nourishment (2) and 14.7% emerged parallel breakwaters (1).

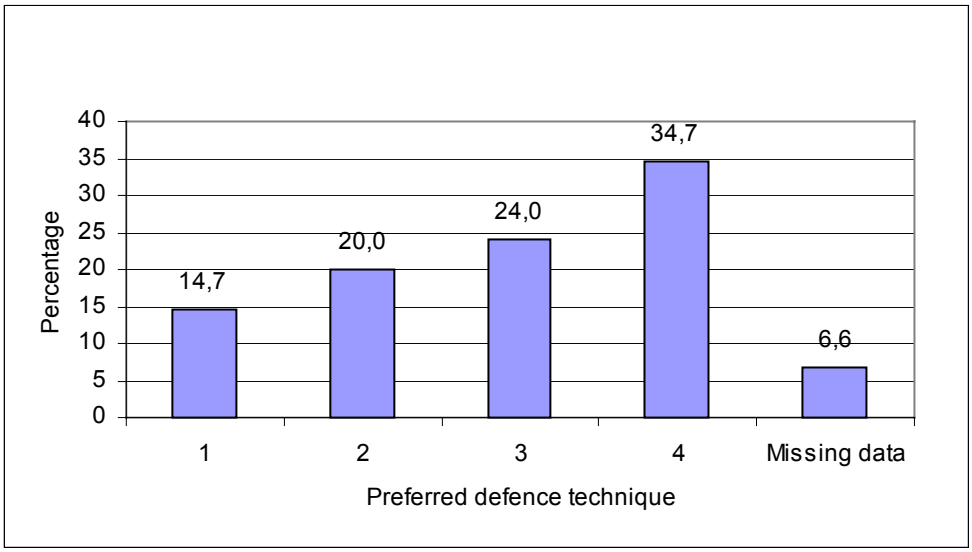

Figure 8: Preference about defence techniques - percentage of respondents

Table 2 shows that suitability for recreational activities and aestetic reasons mainly justifies the preference for the composite intervention, while groynes are mainly preferred for aesthetic reasons and suitability for recreational activities; aesthetic reasons also justify the preference for nourishment and emerged breakwaters. More specifically, considering all the four kinds of defence structures, aesthetic reasons mainly justify respondents'preference.

Table 2: Motives for preferences among defence techniques

	Preferred Technique			
	Emerged Breakwaters	Nourishment	Groynes	Submerged breakwaters
Aesthetic reasons	10	13	8	9
Suitability for recreational activities	1	1	7	14
Water quality	3	3	6	5
Suitability for children	0	0	0	0
Other reasons	5	1	1	3

As regards the preferences about groynes, day-visitors to Pellestrina Island expressed a medium-high rating (from 1 to 10). Figure 9 shows that the rating has a unimodal distribution and is essentially symmetrical around the value of 7; 80% of respondents established a value in the range of 5-8.

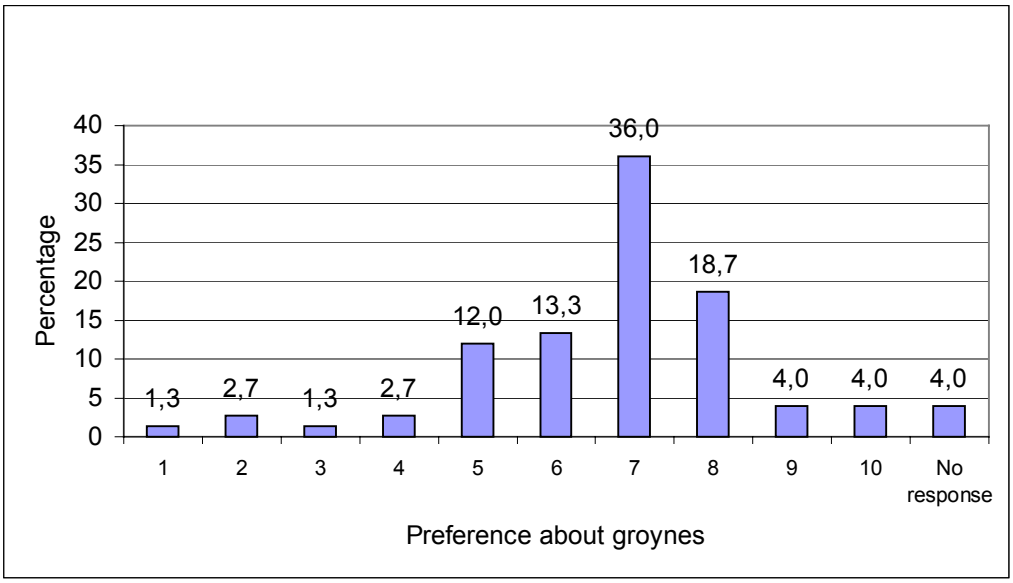

Figure 9: Percentage of respondents - preferences about groynes

The fine sandy beach too, such as the one constructed on Pellestrina Island, received a high level of preference, as can be seen in Figure 10, in which 68% of people declared they preferred it to a coarse sandy beach and a beach made of gravel.

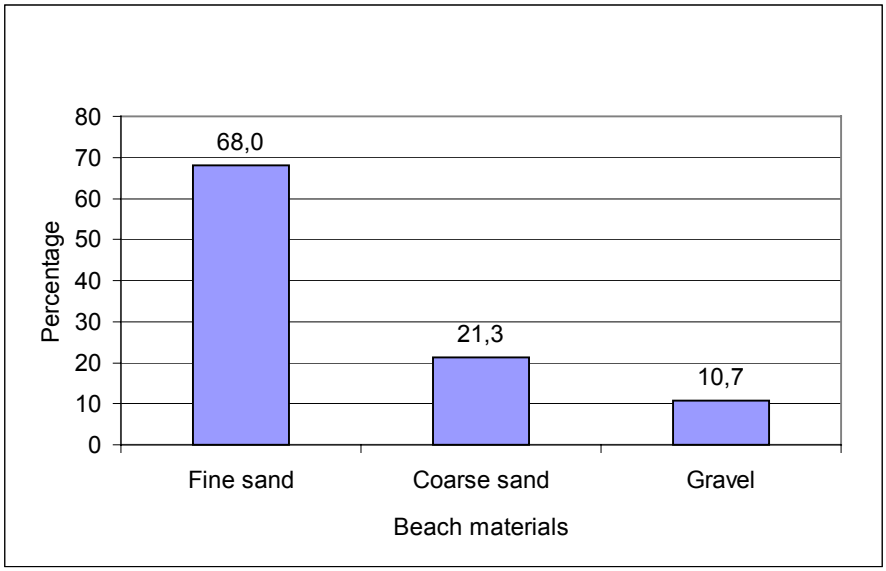

Figure 10: Preferred beach materials - percentage of respondents.

To conclude, interviewed visitors expressed their preference for a composite intervention (nourishment, groynes and submerged breakwaters), such as the defence works on Pellestrina Island; suitability for recreational activities and aesthetic reasons mainly justify their preference. In addition a medium-high level of preference was assigned to the fine sandy beach and groynes, as on the Island of Pellestrina.

5. Comparisons

It is interesting to make comparisons of the preferences about different defence techniques in the three Italian case-studies considered. Table 3 shows that in these sites the composite intervention is the preferred technique in Lido di Dante and in Pellestrina, while nourishment is the preferred technique in Ostia.

Table 3: Preferences about different defence techniques: percentage of respondents
(E/S parallel breakwaters are emerged/submerged parallel breakwaters.)

	Lido di Dante	Ostia	Pellestrina
E/S parallel breakwaters	23.7%	36%	15%
Nourishment	19.8%	53%	20%
Groynes	21.2%	6%	24%
Composite intervention	32.5%	5%	35%

As regards the two main motives of preference (in order of importance) according to the different defence structures, table 4 highlights that in all the case-studies aesthetic motives prevail. The second preferred motive differs according to the different sites: water quality is given in Lido di Dante for all the techniques, while in Ostia and Pellestrina it is the second preferred motive only in two out of four techniques.

Table 4: Defence structures – the two main motives of preferences

	Lido di Dante	Ostia	Pellestrina
E/S parallel breakwaters	Aesthetic motives Water quality	Water quality Aesthetic motives	Aesthetic motives Water quality
Nourishment	Aesthetic motives Water quality	Aesthetic motives Suitable for beach activities	Aesthetic motives Water quality
Groynes	Aesthetic motives Water quality	Aesthetic motives Water quality	Aesthetic motives Suitable for beach activities
Composite intervention	Aesthetic motives Water quality	Aesthetic motives Water quality	Suitable for beach activities Aesthetic motives

Finally, as regards beach materials in Ostia and Pellestrina, fine sand is the first preferred and coarse sand the second preferred.