

## QUARRY DISTURBANCE & RESTORATION SCENARIOS: THE PROSOTSANI (GREECE) QUARRY CASE

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**Abstract:** *Aim of this research is to present a quantitative analysis of population attitudes toward quarry impacts and restoration scenarios of Prosotsani quarry, Drama, Northern Greece. The results have been derived by statistical analysis of standardized questionnaires. The dominant attitude toward quarries is that they are characterized by bad aesthetics. The feeling that they constitute an environmental disaster comes at second position, their consideration as hazardous for health at third position and the opinion that they have negative impact on tourism at fourth. However, the positive attitude that the disturbance of an area by quarry activity offers a chance for creating a new landscape appears also at fourth position. The most desirable restoration alternative is the green slope re-vegetation (with tree planting), second comes the green slope without trees (only with low vegetation), third the building of a theatre place, and fourth the creation of ethno-botanic garden. The least desirable alternatives proved to be the stadium, the exhibition of monuments and sculptures, the factory, the game park, the commercial centre, and the zoo. The quarries are regarded as hazardous for health by married people as they worry about the safety of their family. People who believe that the quarries are hazardous are reluctant to pay for their restoration. The quarries are perceived as a nice landscape element by observers originating from urban areas. Attitudes are not dependent on whether the observers have actually seen the quarries or not, while the willingness to pay for their restoration does depend on their personal attitudes. Thus, the attitudes seem to be mainly influenced by other factors, such as rumors or media, rather than empirical data, while the willingness to pay is not necessarily driven by rational motives. Preferences for restoration scenarios (e.g. green slope, theatre, ethno-botanic garden, monuments exhibition, stadium) and willingness to pay and visit as well as visit socializing patterns (with partners, friends etc) seem to be dependent on perceptions of disturbed area, educational level, employment, economic and family status, age, rural/urban origin and gender.*

**Key words:** *landscape restoration, regional and rural development, spatial planning, land use, willingness to pay*

## 1. Introduction

To what extent the representatives of organized groups and authorities really represent the interests and opinions of the local populations concerning environmental management? How the restoration of disturbed area can sustainably contribute to the regional and rural development as well as to an acceptable environmental policy?

This is a basic question in landscape management which still remains unanswered (Larson & Lach 2008). Bryan & Crossman (2008) have emphasized the importance of a decision making system which should integrate multiple objective in natural resource management. This paper presents the attitudes of the town of Drama population or visitors towards possible restoration scenarios of Prosotsani quarry and tries to find out determinants of preferences.

## 2. Literature review

Barry & Smith (2008) have researched the influence of landscape on the identity building but not restoration alternatives. Fitzsimons & Wescott (2007) have analyzed the case of land management in the light of nature conservation policy, but not the attitudes and acceptance determinants nor the regional or rural development dimension. Schneeberger et al. (2007) recognized various driving forces in landscape policy (e.g. political, economic, cultural, technical etc) focused on qualitative data (in-depth interviews, documents). Schenk et al. (2007) have tried to find out determinants of the acceptance of landscape policy such as perception, communication, participation, and incentives. However, they did not examine particular restoration scenarios. They also used a qualitative approach, while personal determinants of policy addressees have not been examined.

Hasanagas et al. (2009) and Hasanagas et al. (2010) have tried to explore attitudes and their determinants at personal level, implementing quantitative empirical analysis. The present paper is an additional contribution, further building on this positivist approach.

## 3. Method & Area of Study

Descriptive and analytical statistics' results have been produced by data analysis collected from standardized questionnaire answered by 156 residents and/or visitors of the town of Drama, regarding their attitudes towards Prosotsani quarry (Picture 1). The analytic statistics has been conducted by Pearson test ( $p \leq 0.05$ ). In addition, in-depth interviews have also been conducted for deepening the understanding of the quantitative results.

The questionnaires have been answered by people passing through a central point in the town of Drama which is a popular processing for going either to entertainment or to work during a week. Thereby, the sample was independent of the subjective judgment of the researchers and characterized by a great variety of people characteristics such as income variation, or age distribution. Groups which may be excluded or under-represented in the sample are relatively old people of who do not walk often on the streets or few inhabitants of relatively “isolated” areas far away from the town of Drama. The sampling method is by definition therefore not a purely random sample but is rather a sample, which tries to approach the properties of a random sample, and includes the main part of the landscape policy addressees.

The particular quarry is located 17 Km north from Drama and quite close to the Prosotsani village. It has been selected as research area because it interests quite a large part of population. It is characterized by spatial heterogeneity such as various slopes and rocky surfaces, which allows for a variety of restoration scenarios. It has also the research advantage

that it is visible by the road to many travelers (residents of Drama and villages nearby as well as to many tourist visitors of Drama and the nearby region).



Picture 1. The Prosotsani quarry: 17 Km away from Drama, North Greece

## **4. Results**

### **4.1 Descriptive statistics**

The main finding (Diagram 1) is that the dominant attitude towards quarries is that they are characterized by bad aesthetics, followed by the feeling that they constitute an environmental disaster. Quarries considered as hazardous for health places is ranked at the third position, while the opinion that they have negative impact on tourism at fourth.

However, the positive attitude that the disturbance of an area by quarry activity offers a chance for creating a new landscape appears also ranked at the fourth place. The possible connection of quarries with workers strain seems to be quite unimportant for the interviewees. In addition, a small percentage only present no feeling at all or feel that there is no problem with the quarries or that the quarries are nice landscape.

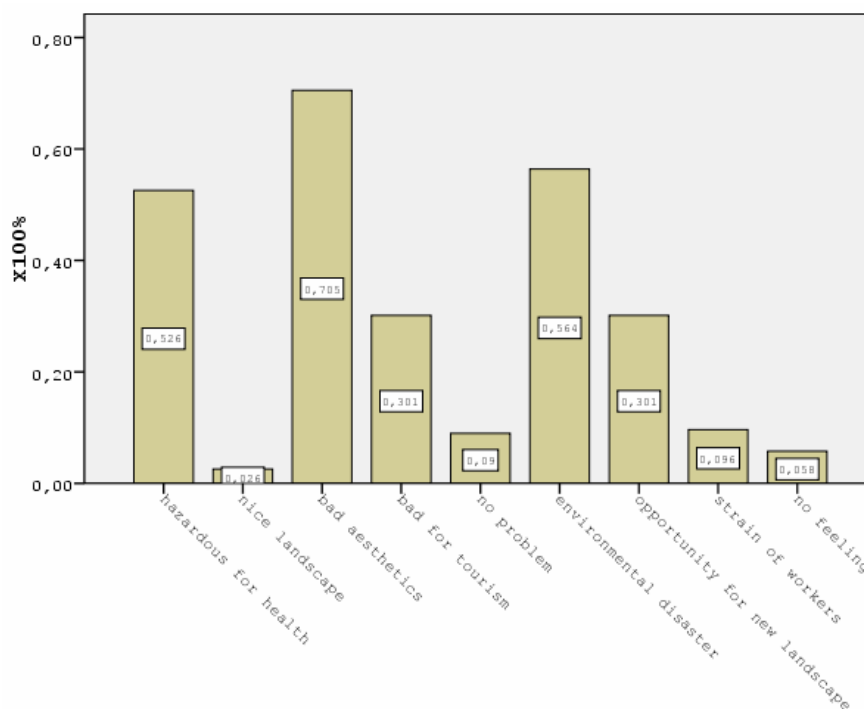


Diagram 1. Attitude toward quarries

In Diagram 2, the most desirable restoration alternative is the greening of slopes with tree planting, second appears the slope greening only with low vegetation (without trees), third the building of a theatre place, and fourth the creation of ethno-botanic garden. The least desirable alternatives proved to be the stadium development, the exhibition place of monuments and sculptures, the factory, the fun park, the commercial centre, and the zoo. It is also remarkable, that almost no one appears to be indifferent to restoration scenarios.

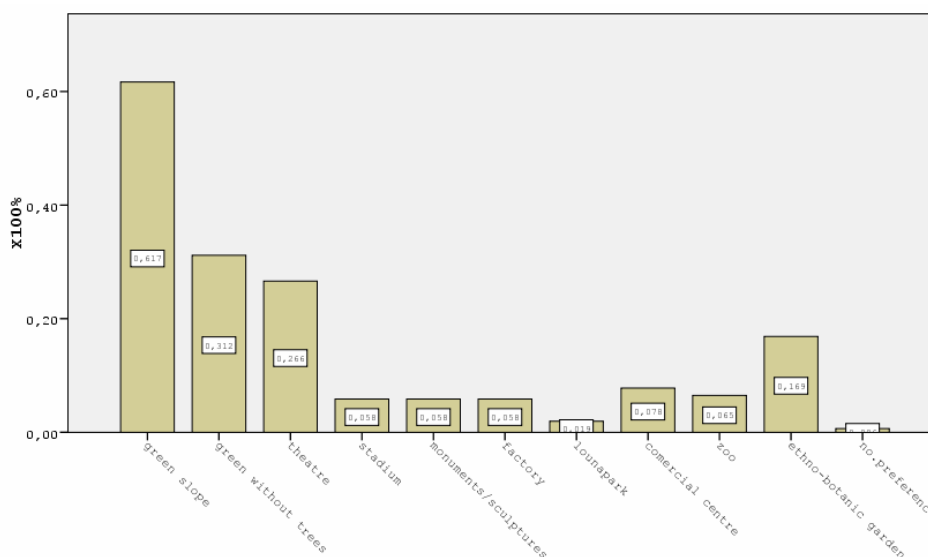


Diagram 2. Preference for restoration alternatives

#### 4.2 Determinants Analysis

Data analysis suggest that (Table 1) there is tendency quarries to be regarded as hazardous for health by married people as they worry about the safety of their family. It is

also remarkable that people who believe that the quarries are hazardous are not willing to pay for their restoration. The quarries are perceived as a nice landscape by observers originating from urban areas as they feel the disturbance as a factor of breaking the green monotony of the grasslands landscape.

It is also remarkable that the attitudes do not depend on whether the observers have actually seen the quarries and the willingness to pay for their restoration does not depend on their attitudes. Thus, the attitudes seem to be mainly determined by other factors than empirical data (e.g. rumors, media etc) and the willingness to pay is not necessarily driven by rational motives.

Table 1. Determinants of attitudes

	Hazardous for health	Nice landscape	No problem	No feeling
Married	<b>0.160(*)</b>	-0.036	-0.070	0.029
	<b>0.047</b>	0.653	0.384	0.717
Rural origin	0.037	<b>-0.169(*)</b>	-0.102	0.018
	0.650	<b>0.035</b>	0.206	0.824
Have seen quarries	0.022	-0.013	0.021	0.008
	0.787	0.877	0.797	0.916
Willingness to pay for restoration	-0.001	0.097	0.003	0.076
	0.990	0.230	0.970	0.347

In Table 2, we see that the slope greening is considered to be a clear solution by those who characterize the quarries as a landscape of bad aesthetics, while the theatre is more attractive for people of higher education level. Women and those who regard a quarry disturbance as an opportunity for new landscape development see the ethno-botanic garden as a desirable alternative. This is also the only alternative scenario which stimulates willingness to pay. In contrary, stadium development is rather unattractive as a possible new landscape. A permanent exhibition of monuments/ sculptures is rather attractive for rentiers who have enough free time, while factory is regarded as a continuity of bad aesthetics. A commercial centre is a solution attractive for female observers, parents, students and rentiers. The zoo is desirable by parents who consider it as a solution with pedagogic and recreational function. Zoo is also a practical free-time behavior for people with lower education level.

Table 2. Determinants of restoration preferences

	Green slope	Theatre	Ethno-botanic garden	Stadium	Monuments/ sculptures	Factory	Commercial centre	Zoo
Gender (male=1, female=2)	-0.144	0.075	<b>0.199(*)</b>	-0.032	0.078	-0.088	<b>0.236(**)</b>	-0.005
	0.075	0.352	<b>0.013</b>	0.689	0.335	0.279	<b>0.003</b>	0.950
Have children	0.119	0.045	0.079	-0.082	-0.026	-0.026	<b>-0.162(*)</b>	<b>0.158(*)</b>
	0.140	0.575	0.329	0.308	0.749	0.749	<b>0.044</b>	<b>0.050</b>
Education	-0.085	<b>0.166(*)</b>	-0.044	0.081	0.081	0.064	0.060	<b>0.165(*)</b>
	0.290	<b>0.038</b>	0.587	0.317	0.317	0.427	0.456	<b>0.040</b>

Student	-0.142	-0.069	0.116	-0.023	-0.023	-0.023	<b>0.253(**)</b>	-0.033
	0.087	0.405	0.160	0.781	0.781	0.781	<b>0.002</b>	0.691
Rentier	-0.024	-0.071	-0.054	-0.030	<b>0.215(**)</b>	-0.030	<b>0.190(*)</b>	-0.032
	0.776	0.396	0.513	0.718	<b>0.009</b>	0.718	<b>0.021</b>	0.703
Nice landscape	<b>-0.205(*)</b>	0.084	0.145	-0.040	-0.040	-0.040	<b>0.257(**)</b>	-0.043
	<b>0.011</b>	0.299	0.072	0.618	0.618	0.618	<b>0.001</b>	0.597
Bad aesthetics	<b>0.180(*)</b>	<b>0.174(*)</b>	0.027	-0.080	-0.080	<b>0.201(*)</b>	-0.023	-0.117
	<b>0.025</b>	<b>0.031</b>	0.738	0.321	0.321	<b>0.012</b>	0.775	0.148
Bad for tourism	0.139	0.017	-0.065	-0.101	-0.041	-0.101	-0.083	0.002
	0.084	0.834	0.423	0.212	0.617	0.212	0.307	0.982
Opportun. for new landscape	0.023	-0.015	<b>0.238(**)</b>	<b>0.161(*)</b>	0.080	0.020	-0.030	0.059
	0.773	0.855	<b>0.003</b>	<b>0.045</b>	0.321	0.806	0.714	0.463
No feeling	-0.086	0.035	-0.038	-0.062	-0.062	0.056	0.135	0.047
	0.288	0.667	0.642	0.446	0.446	0.486	0.095	0.561
Willingness to pay for restoration	-0.086	0.079	<b>0.308(**)</b>	-0.048	-0.089	-0.048	-0.008	0.137
	0.289	0.327	<b>0.000</b>	0.556	0.272	0.556	0.926	0.089

In Table 3, the intention of high visit frequency is a characteristic of male observers, employed people who are not anxious about finding a job, and of those who desire to have a stadium at this place. Younger people, unmarried and without children, originating from urban areas, and earning a low income tend to pay a visit with companion. These people are usually students. Older, married people, with children and relatively high income or retired people, desire to pay a visit with their lifepartner. People of rural origin tend to avoid any visit at a restored quarry area as they are already quite familiar with rural-natural areas.

Table 3. Determinants of Visit frequency and socialization pattern

	Visit frequency	Visit with companion	Visit with lifepartner	No visit
Gender (male=1, female=2)	<b>-0.246(**)</b>	0.042	-0.085	-0.036
	<b>0.002</b>	0.604	0.295	0.662
Birthyear	-0.008	<b>0.256(**)</b>	<b>-0.209(*)</b>	-0.052
	0.919	<b>0.002</b>	<b>0.010</b>	0.528
Married	0.014	<b>-0.407(**)</b>	<b>0.272(**)</b>	-0.016
	0.861	<b>0.000</b>	<b>0.001</b>	0.841
Rural origin	-0.108	<b>-0.163(*)</b>	0.143	<b>0.212(**)</b>
	0.184	<b>0.044</b>	0.079	<b>0.009</b>
Have children	-0.028	<b>-0.379(**)</b>	<b>0.232(**)</b>	-0.016
	0.730	<b>0.000</b>	<b>0.004</b>	0.841
Income	0.019	<b>-0.299(**)</b>	<b>0.196(*)</b>	0.148
	0.814	<b>0.000</b>	<b>0.015</b>	0.067
Retired	0.078	-0.098	<b>0.177(*)</b>	-0.019
	0.338	0.230	<b>0.029</b>	0.813

Unemployed	<b>-0.215(**)</b>	0.107	-0.096	0.003
	<b>0.009</b>	0.202	0.250	0.969
Student	0.066	<b>0.271(**)</b>	-0.155	-0.090
	0.427	<b>0.001</b>	0.062	0.281
Stadium	<b>0.179(*)</b>	0.081	0.068	-0.055
	<b>0.026</b>	0.321	0.405	0.502

In Table 4, the profile of those who are most willing to pay is depicted. These are people of high social class feeling and high income. They are people normally employed as civil servants and not as freelancers, because the former job leaves enough free time for enjoying an investment on a landscape development. Willing to pay are people who intend to visit the restored place alone and to be concentrated on their desirable landscape or parents who are going to visit the restored area with their children and thus they desire a landscape with the best possible aesthetic, recreational or pedagogic function.

Table 4. Profile of willingness to pay

	Willingness to pay
Social class feeling	<b>0.193(*)</b>
	<b>0.017</b>
Income	<b>0.224(**)</b>
	<b>0.005</b>
Unemployed	<b>-0.205(*)</b>
	<b>0.013</b>
Civil servant	<b>0.278(**)</b>
	<b>0.001</b>
Freelancer	<b>-0.174(*)</b>
	<b>0.036</b>
Visit frequency	<b>0.263(**)</b>
	<b>0.001</b>
Visit alone	<b>0.183(*)</b>
	<b>0.024</b>
Visit with children	<b>0.161(*)</b>
	<b>0.047</b>

## 5. Conclusions

Quarries are mainly regarded as a place of bad aesthetics or as an environmental disaster or hazard. However, it is not self-evident that they have negative impact on tourism as this attitude is not one of the high-ranked ones. There appears also, even low-ranked, the positive attitude that an area disturbed by quarry activity offers a chance for creating a new landscape or that the quarry is a nice landscape.

The most desirable restoration alternative is the greening of slopes with tree planting. Neutral attitudes appear only at a low percentage. Thus, the quarry management constitutes a serious policy issue. The preference for restoration scenarios (e.g. green slope, ethno-botanic garden etc), the expected visit frequency, the social pattern of visit (e.g. with lifepartner, companion or alone) and the willingness to pay seem to depend on various personal features such as education level, age, gender, professional and economic status, family status, urban or rural origin.

It is evident that there is a tendency quarries to be regarded as hazardous for health by married people as they worry about the safety of their family. It is also remarkable that people who believe that the quarries are hazardous are not willing to pay for their restoration. Moreover, their attitudes either positive or negative, toward to the aesthetic impact of the quarry area do not depend on whether they have actually seen it or not and their willingness to pay do not depend on these attitudes. Thereby, it seems that the public opinion is influenced by an environmental propaganda/ideology and not by knowledge based on empirical data.

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