

Full Length Research Paper

Determining visual beauties of natural waterscapes: A case study for Tortum Valley (Erzurum/Turkey)

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Accepted 9 November, 2009

Water is one of the most important landscape element of urban and rural ecosystem. Water included in natural and cultural elements of the landscape, attracts and bewitches humans together with meeting their basic needs. The purpose of this study is to reveal the visual quality of diverse water landscapes in a valley by displaying different water forms. In this study, visual quality assessment method was used and six waterscapes were assessed by 120 University Students were included in a visual quality survey. As researches demonstrates, in Tortum Valley (an important waterscape diversity) the most preferred waterscape is Waterfall Scenery 5 (WS5 VQP Mean = 6.5333) (Mean is the mean of visual quality points of scene). It is respectively followed by Lake Scenery 2 (LS2 VQP Mean = 6.1000), Mountain Lakes Scenery 3 (MLS3 VQP Mean = 5.6583), Landslide Lakes Scenery 5 (LLS5 VQP Mean = 5.083) and River Scenery 2 (RS2 VQP Mean = 4.8500). In line with the relationship between landscape parameters and visual quality of waterscapes, it is seen that parameters of fascinaty, being interesting and vividness have highly significant effect upon preference. It is also determined that all waterscapes in the valley have very important visual value. Some suggestions were made regarding the use of waterscapes' visual value for landscape planning and designing in the valley and protection of waterscape diversity.

Key words: Visual quality assessment, valley waterscapes, waterscape diversity, Tortum, Turkey.

INTRODUCTION

According to McGarigal and Marks, landscape is an area or areas that falls within the heterogeneous structure of the system. In this system, landscape is a mosaic that reveals various structures of areas and mutual relations (McGarigal and McComb, 1995).

Natural and cultural resource values in this mosaic create a holistic composition that is sometimes dominated by "natural" elements and sometimes by "cultural" ones. Landscape is also an ecosystem pattern and describes integrity of an ecosystem. According to Saltzman, landscape is considered as a whole with its inseparable links in social sciences in holistic sense. Natural elements, cultural elements and other elements such as traditions and knowledge that create culture and

cultural values take place in abstract concepts. In this context, diversity of landscape elements and different kinds of models that are built up to support each other were bunched together in order to constitute main lines of the landscape (Lindborg et al., 2008). This collection of valuable resources of the landscape diversity brings into natural heritage of the countries.

One of the most important steps at this point is to identify natural heritage for protection and management studies. Water forms are one of the most important resources of landscape. Both surface water and under-ground water resources are components for water cycle system in the world. In recent years, studies for water resources within the landscape are carried out from the point of various research dimensions. One of these approaches is to reveal the value of visual resources for the water.

Visual landscapes should be considered as being important natural resources just like water, soil, mines and fossil fuels (Kane, 1981). The visible landscape is

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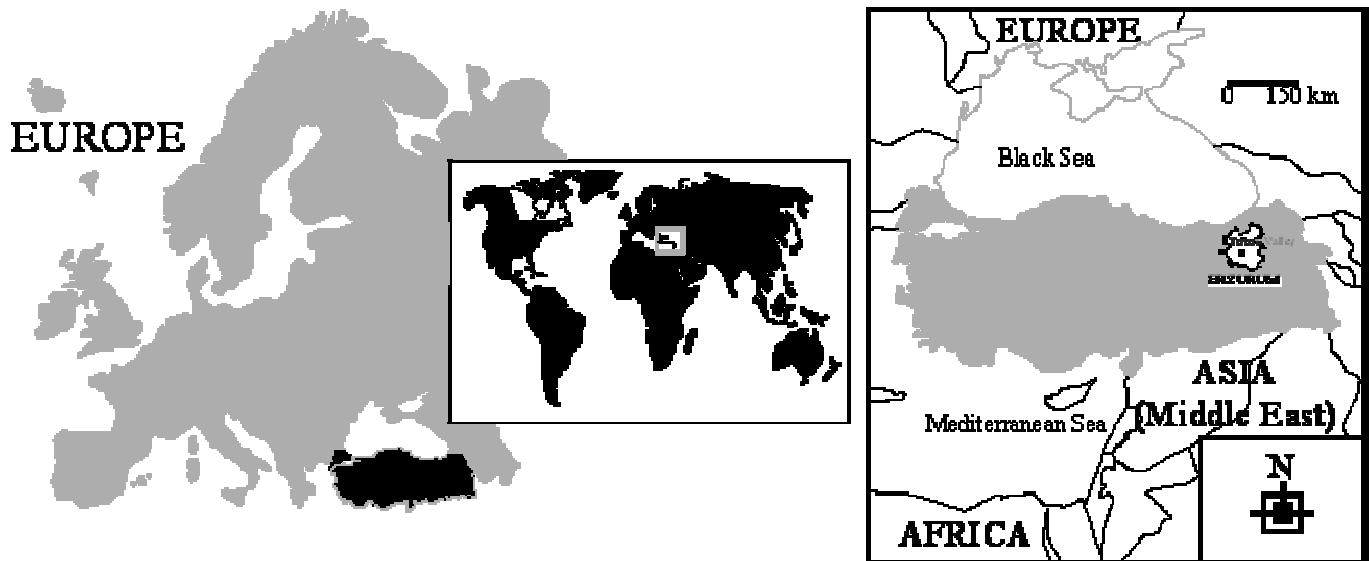


Figure 1. The location of study area.

believed to affect human beings by satisfying their motives such as aesthetic appreciation and health and well-being (Velarde et al., 2007). Today, visual quality assessment has become more important than gathering data to be used in designing and planning landscapes and landscapes elements such as water, plants etc. In 1976, Daniel and Boster developed the Scenic Beauty Assessment in landscapes (Krause, 2001).

Visual quality assessment, in which landscapes were evaluated by the participants, were applied for different types of natural landscapes in the following studies; rural landscapes (Arriaza et al., 2004), scenic byways (Karahan, 2003; Karahan, 2004; Karahan and Yilmaz, 2008) forests (Hammit et al., 1994; Bergen, 1995; Sheppard and Picard, 2005; Ribe, 2005; Ribe, 2006) protected areas and national parks (Yu, 1995; Acar et al., 2006; Bienabe and Hearne, 2006), World Heritage areas (Kaltenborn and Bjerke, 2002), ecological rehabilitation areas (Hands and Brown, 2002), vegetation types (Ulrich, 1986; Tzolova, 1995; Misgav, 2000), agricultural landscapes (Tahvanainen et al., 2002), rural-urban fringes (Sullivan and Lovell, 2006), river views (Meitner, 2004), forested lands (Ribe, 2005; Ribe, 2006), forests, deserts and large waterscapes (Herzog, 1985), fresh-water harbors and contiguous wetlands (Wilson et al., 1995), riverscapes (Piegay et al., 2005, Mutz et al., 2006, Chin et al., 2008) and waterscapes (Herzog, 1985; Bulut and Yilmaz, 2008).

Several similar studies on visual quality assessments related to landscapes of rural-urban fringes (Kaplan et al., 2006) and rural-urban landscapes (Bulut, 2006; Bulut and Yilmaz, 2007), urban fruit trees and shrubs (Bulut et al., 2010), have been made by some Turkish researchers in Turkey. The studies main purpose was, the natural

cultural components of the landscape elements are also visual researches and they have visual quality. The studies were assessed the visual quality and perception surveys in different landscapes.

The profiles and preferences of recreationalists play an extremely important role for landscape planning and design by using water elements. Studies (Herzog, 1985; Krause, 2001; Bulut and Yilmaz, 2007) carried out for visual quality analysis cover why water is preferred for recreational objectives and what kind of water forms are attractive.

The main objectives of this study are to answer 'Which waterscapes in Tortum Valley have much visual quality? Is vividness, harmony, fascinaty, naturalness and being interesting affect the visual quality?' and determine the visual quality degrees of some waterscape types in the landscape of a valley and to make suggestions for future planning and protection studies by providing data related to visual potential of water resources throughout the valley.

MATERIALS AND METHODS

In this study, photographs of different waterscapes in Tortum Valley located in Erzurum, Turkey (Figure 1) were used. Twenty-five photographs were selected among approximately 1000 photographs taken by professional photograph artists between years 2003–2009. One of these artists is Mr. Cüneyt Oğuztüzün is professional photographer who generally takes photos for the magazine named Atlas in Turkey. These randomly selected photographs were grouped according to the waterscape types as follows:

- i. River scenes.
- ii. Mountain Lakes scenes.

Table 1. Demographic characteristics of the participants.

Demographic factors	Participants	Frequency	Percentage (%)
Gender	Male	62	51.7
	Female	58	48.3
Distribution for age	15 - 24	118	98.3
	25 - 39	2	1.7
Distribution for education levels	University students (not graduated)	120	100
Distribution for occupational groups	Student	120	100

iii. Waterfall scenes.

iv. Lake scenes .

v. Landslide Lakes scenes .

The above arrayed 5 different photo groups related to water landscapes in Tortum Valley was used for visual quality assessment analysis.

Visual quality analyses were performed to investigate the visual preferences of 120 participants from the Department of Landscape Architecture for six different types of water landscapes. The most common method used for visual quality assessment is the Scenic Beauty Estimation Method (SBE), developed by Daniel and Boster (1976) (Bergen et al., 1995). Visual quality assessment applied in this study is based on the studies (Kane, 1981; Bergen et al., 1995; Daniel, 2001; Hands and Brown, 2002; Karahan, 2003; Clay and Smidt, 2004; Meitner, 2004; Acar and Kurdoglu, 2005; Bulut, 2006; Bulut and Yilmaz, 2007) who were taking photographs from landscape and the participants rated the visual quality with 1-7 or 1-10 points. In this 1-7 or 1-10 point scale 1 point was assigned to be the lowest and 7 or 10 to be the highest.

The following procedure was applied as the visual quality method used in this study:

The participants of the analysis: First class (n = 37), second class (n = 35), third class (n = 29) and fourth class (n = 19) students from the Faculty of Agriculture, the Department of Landscape Architecture, participated in the evaluation in Atatürk University. A presentation on all waterscapes shown participations before the evaluation. This presentation aimed at introducing various waterscapes to the participants and assisting them to determine their own criteria before the evaluation process. Later on, the photographs were shown to the participants as a slide preservation. There were photos were rated. The participants view each photo three minutes. In the questionnaire, the participants were asked to evaluate the photographs with respect to their preferences. The participants record their preference on assessment paper.

The participants were informed about landscape parameters. The evaluation was made on the scale of 7 points for each photograph for each of the following features: visual preference and 5 descriptor variables (vividness, harmony, fascinaty, naturalness, being interesting). Vividness was described as, vividness of the water-scape with light and colors. Harmony was described as, rhythm between natural and cultural landscape elements. Fascinaty was described as fascination of landscape elements. Naturalness was described as, being natural of the landscape (lake of cultural). Being interesting was described as, challenging of the landscape. The descriptor variables have selected in other researches (Meitner, 2004; Acar and Kurdoglu, 2005; Bulut, 2006; Bulut and Yilmaz, 2007) to describe the water landscapes. In this 7-point scale 1 point was assigned to be the lowest and 7 to be the highest. The participants were asked to focus on the landscape rather than on the quality of the photograph.

The SPSS 13.0 statistics program was used for statistical analyses. The averages were calculated and correlations were

performed using the non-parametric rank test.

RESULTS

Demographic characteristics of the participants in visual quality assessment

Table 1 presents the demographic characteristics of 120 participants who completed the questionnaire of visual quality assessment.

The analysis of visual values of the natural waterscapes in the valley

Table 2 shows the averages of Visual Quality Points (VQP) for each natural waterscape view.

Among the River Scenes the one with the highest score is River Scene 2 Visual Quality Point (RS2 VQP Mean = 4.8500; among the Mountain Lakes Scene the one with the highest score is Mountain Lakes Scene 3 Visual Quality Point (MLS3 Mean VQP Mean = 5.6583); among the Waterfall Scenes, that is Waterfall Scene 5 Visual Quality Point (WS5 VQP Mean = 6.5333); among the Lakes Scenes, that is Lake Scene 2 Visual Quality Point (LS2 VQP Mean = 6.1000) and among the Landslide Lake Scenes, that is Landslide Lakes Scene 5 Visual Quality Point (LLS5 VQP Mean = 5.6083).

Table 3 shows the averages of visual preference grades for each natural waterscape in an order from the highest to the lowest. Among those, the one with the highest score is Waterfall Scene 5 Visual Quality Point (WS5 VQP Mean = 6.5333), followed respectively by Lake Scene 2 Visual Quality Point (LS2 VQP Mean = 6.1000), Mountain Lakes Scene 3 Visual Quality Point (MLS3 VQP Mean = 5.6583), Landslide Lakes Scene 5 Visual Quality Point (LLS5 VQP Mean = 5.6083) and River Scene 2 Visual Quality Point (RS2 VQP Mean = 4.8500).

The relationship between parameters used in visual preference of waterscapes scenes

Participants also rated the semantic parameters (vividness, harmony, fascinaty, naturalness, being interesting)

Table 2. The averages of visual preferences grades for each landscape type (Figures 2 - 6).

Graduated of visual quality	Sceneries visual quality points in the scenes types	N	Average visual quality point(VQP)	Standard deviation
1	River scenes (RS)	120	RS1 VQP=4.1833	1.5228
			RS2 VQP=4.8500	1.3513
			RS3 VQP=4.2917	1.4690
			RS4 VQP=4.5750	1.3263
			RS5 VQP=4.3500	1.5753
2	Mountain Lakes scenes (MLS)	120	MLS1 VQP=5.4333	1.5159
			MLS2 VQP=4.6167	1.5349
			MLS3 VQP=5.6583	1.2468
			MLS4 VQP=5.0667	1.1934
			MLS5 VQP=4.8750	1.4699
3	Waterfall scenes (WS)	120	WS1 VQP=5.2917	1.5306
			WS2 VQP=4.9750	1.2994
			WS3 VQP=6.0083	1.1189
			WS4 VQP=5.8250	1.0975
			WS5 VQP=6.5333	0.8192
4	Lake scenes (LS)	120	LS1 VQP=6.0083	1.0651
			LS2 VQP=6.1000	1.1257
			LS3 VQP=5.1583	1.5394
			LS4 VQP=4.5833	1.5371
			LS5 VQP=5.3750	1.5178
5	Landslide Lakes scenes (LLS)	120	LLS1 VQP=5.3500	1.1714
			LLS2 VQP=5.4333	1.1503
			LLS3 VQP=5.4083	1.3316
			LLS4 VQP=4.7583	1.3962
			LLS5 VQP=5.6083	1.1832

Table 3. The averages of visual preferences grades for each landscape type (Figure 7).

Graduated of visual quality	Sceneries have the highest visual quality point in the scenes types	N	Average visual quality point (VQP)	Standard deviation
1	Waterfall scene 5 (WS5)	120	WS5 VQP=6.5333	0.8192
2	Lake scenery 2 (LS2)	120	LS2 VQP=6.1000	1.1257
3	Mountain Lake scene (MLS)3	120	MLS3 VQP=5.6583	1.2468
4	Landslide Lake scene 5 (LLS5)	120	LLS5 VQP=5.6083	1.1832
5	River scene 2 (RS2)	120	RS2 VQP=4.8500	1.3513

for each photo during the survey. The relationship between visual preference points and semantic parameters was examined by Spearman's correlation test.

Results of the analysis, carried out after evaluating the quality of the visual aspects in Tortum valley, related to the water landscapes are hereby separately presented.

Correlation for the best scene (Waterfall scene 5)

Waterfall Scene 5 (WS5 VQP = 6.5333) among waterfall scenes within the landscapes of Tortum Valley took the

highest points for visual quality (Table 4, Figure 7). The relationship between Visual Quality Point (WS5 VQP) and semantic parameters of the photo was statistically significant ($p < 0.01$). It is observed that the visual preference point (WS5VQP) increased with the increases in points of vividness (WS5VIVID) ($r = 0.548$), harmony (WS5HARMONY) ($r = 0.506$), fascinaty (WS5FASCINATION) ($r = 0.711$), naturalness (WS5NATURELNESS) ($r = 0.266$) and being interesting (WS5INTERESTING) ($r = 0.658$). Parameters of fascination ($r = 0.711$) and being interesting ($r = 0.658$) had the most significant effect on visual preferences in this water

Table 4. Correlation analysis of visual quality (VQ) of Waterfall Scene 5 (WS5) and semantic descriptors.

	WS5VQP	WS5VIVID	WS5HARMONY	WS5FASCINATION	WS5NATURELNESS
WS5VQP					
WS5VIVID	0.548**				
WS5HARMONY	0.506**	0.553**			
WS5FASCINATION	0.711**	0.556**	0.689**		
WS5NATURELNESS	0.266**	0.483**	0.532**	0.511**	
WS5INTERESTING	0.658**	0.457**	0.546**	0.710**	0.356**

** Correlation is significant at the 0.01 level (2-tailed).

Table 5. Correlation analysis of visual quality (VQ) of Lake Scene 2 (LS2) and semantic descriptors.

	LS2VQP	LS2VIVID	LS2HARMONY	LS2FASCINATION	LS2NATURELNESS
LS2VQP					
LS2VIVID	0.640**				
LS2HARMONY	0.507**	0.471**			
LS2FASCINATION	0.574**	0.415**	0.495**		
LS2NATURELNESS	0.400**	0.475**	0.592**	0.633**	
LS2INTERESTING	0.588**	0.532**	0.435**	0.636**	0.471**

** Correlation is significant at the 0.01 level (2-tailed).

Table 6. Correlation analysis of visual quality (VQ) of Mountain Lake Scene 3 (MLS3) and semantic descriptors.

	MLS3VQP	MLS3VIVID	MLS3HARMONY	MLS3FASCINATION	MLS3NATURELNESS
MLS3VQP					
MLS3VIVID	0.523**				
MLS3HARMONY	0.454**	0.660**			
MLS3FASCINATION	0.660**	0.553**	0.566**		
MLS3NATURELNESS	0.422**	0.434**	0.390**	0.465**	
MLS3INTERESTING	0.543**	0.388**	0.353**	0.673**	0.523**

** Correlation is significant at the 0.01 level (2-tailed).

landscape.

Correlation for the second scene (Lake scene 2)

Lake Scene 2 (LS2 VQP = 6.100) among lake scenes within the landscapes of Tortum Valley took the highest points for visual quality (Table 5, Figure 7). The relationship between Lake scene 2 visual quality point (LS2 VQP) and semantic parameters of the photo was statistically significant ($p < 0.01$). It is observed that the visual preference point (LS2VQP) increased with the increases in points of vividness (LS2VIVID) ($r = 0.640$), harmony (LS2HARMONY) ($r = 0.507$), fascinaty (LS2ATTRACTIVENESS) ($r = 0.574$), naturalness (LS2NATURELNESS) ($r = 0.400$), and being interesting (LS2INTERESTING) ($r = 0.588$). Parameters of vividness ($r = 0.640$) and being interesting ($r = 0.588$) mostly affected

the visual preferences in this water landscape.

Correlation for the third scene (Mountain Lake scene 3)

Mountain Lake Scene 3 (MLS3 VQP = 5.6583) among mountain lake sceneries within the landscapes of Tortum Valley took the highest points for visual quality (Table 6, Figure 7). The relationship between visual quality point (MLS3 VQP) and semantic parameters (vividness, harmony, fascinaty, naturalness, being interesting) belonging to this photo was statistically significant ($p < 0.01$). It is observed that the visual preference point (MLS3VQP) increased with the increases in points of vividness (MLS3VIVID) ($r = 0.523$), harmony (MLS3HARMONY) ($r = 0.454$), fascinaty (MLS3FASCINATION) ($r = 0.660$), naturalness (MLS3NATURELNESS) ($r = 0.422$),

Table 7. Correlation analysis of visual quality (VQ) of Landslide Lake scene 5 (LLS5) and semantic descriptors.

	LLS5VQP	LLS5VIVID	LLS5HARMONY	LLS5FASCINATION	LLS5NATURELNESS
LLS5VQP					
LLS5VIVID	0.697**				
LLS5HARMONY	0.483**	0.534**			
LLS5FASCINATION	0.634**	0.650**	0.522**		
LLS5NATURELNESS	0.385**	0.473**	0.562**	0.610**	
LLS5INTERESTING	0.536**	0.559**	0.353**	0.672**	0.469**

** Correlation is significant at the 0.01 level (2-tailed).

Table 8. Correlation analysis of visual quality (VQ) of River scene 2 (RS2) and semantic descriptors.

	RS2VQP	RS2VIVID	RS2HARMONY	RS2FASCINATION	RS2NATURELNESS
RS2VQP					
RS2VIVID	0.476**				
RS2HARMONY	0.202**	0.366*			
RS2FASCINATION	0.494**	0.480**	0.352**		
RS2NATURELNESS	0.239**	0.205**	0.395**	0.345**	
RS2INTERESTING	0.314**	0.211**	0.208**	0.385**	0.195**

** Correlation is significant at the 0.01 level (2-tailed).

and being interesting (MLS3INTERESTING) ($r = 0.543$). Parameters of fascinat (r = 0.660) and being interesting ($r = 0.543$) mostly affected the visual preferences in this water landscape.

Correlation for the fourth scene (Landslide Lake scene 5)

Landslide Lake scene 5 (LLS5 VQP = 5.6083) among landslide lake scenes within the landscapes of Tortum Valley took the highest points for visual quality (Table 7, Figure 7). The relationship between visual quality point (LLS5 VQP) and semantic parameters (vividness, harmony, fascinat, naturalness, being interesting) belonging to this photo was statistically significant ($p < 0.01$). It is observed that the visual preference point (LLS5VQP) increased with the increases in points of vividness (LLS5VIVID) ($r = 0.697$), harmony (LLS5HARMONY) ($r = 0.483$), fascinat (LLS5FASCINATION) ($r = 0.634$), naturalness (LLS5NATURELNESS) ($r = 0.385$), and being interesting (LLS5INTERESTING) ($r = 0.536$). Parameters of vividness ($r = 0.697$) and being interesting ($r = 0.536$) mostly affected the visual preferences in this water landscape.

Correlation for the fifth scene (River scene 2)

River Scene 2 (RS2 VQP = 4.8500) among river scene-

ries within the landscapes of Tortum Valley took the highest points for visual quality (Table 8, Figure 7). The relationship between River scene 2 Visual Quality Point (RS2VQP) and semantic parameters (vividness, harmony, fascinat, naturalness, being interesting) belonging to this photo was statistically significant ($p < 0.01$). It is observed that the visual preference point (RS2VQP) increased with the increases in points of vividness (RS2VIVID) ($r = 0.476$), harmony (RS2HARMONY) ($r = 0.202$), fascinat (RS2FASCINATION) ($r = 0.494$), naturalness (RS2NATURELNESS) ($r = 0.239$), and being interesting (RS2INTERESTING) ($r = 0.314$). Parameters of fascinat ($r = 0.494$) and vividness ($r = 0.476$) mostly affected the visual preferences in this water landscape.

In general, the parameters that mostly affect visual quality preferences in a positive manner are fascinat, being interesting and vividness. The visual resource value of the water landscape forms associated fascinat, being interesting and vividness for participants has also high quality value.

DISCUSSION AND CONCLUSION

Landscape resources provide a base for this mosaic of natural and cultural values. The structure of the landscape also includes the potential of biological diversity (Rocchini et al., 2006). Besides, landscape reveals natural and cultural wealth of the area concerned. In this context, various waterscapes in Tortum Valley,

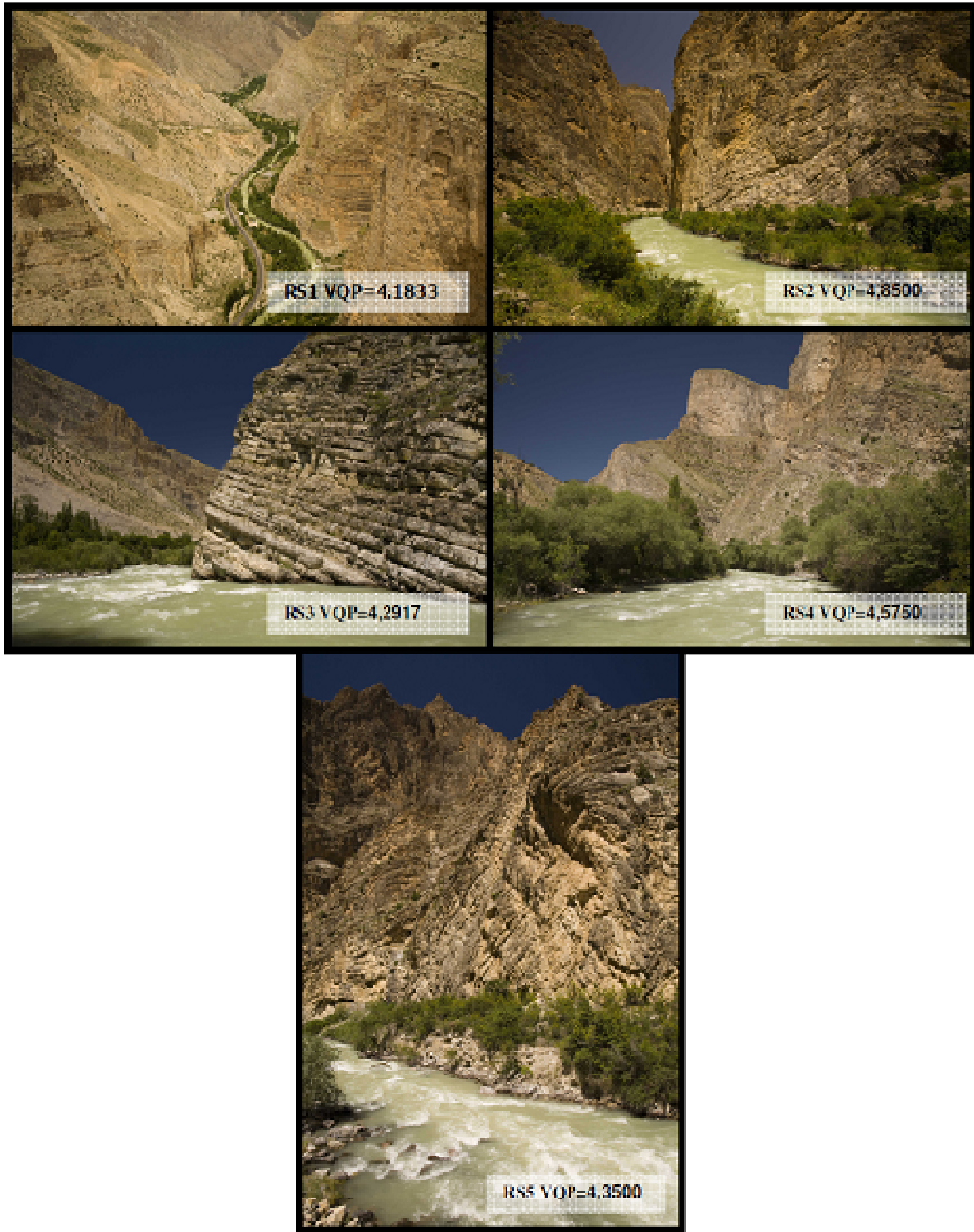


Figure 2. The averages of visual preferences grades for river sceneries.

which is one of the scarce valleys with respect to land-landscape values in Turkey, are demonstrated (Figures 2, 3, 4, 5 and 6).

This study assessing the visual quality of waterscapes

in the Tortum valley by trying to find answers; 'Which waterscapes in Tortum Valley have much visual quality? Are vividness, harmony, fascinaty, naturalness and being interesting affect the visual quality?'

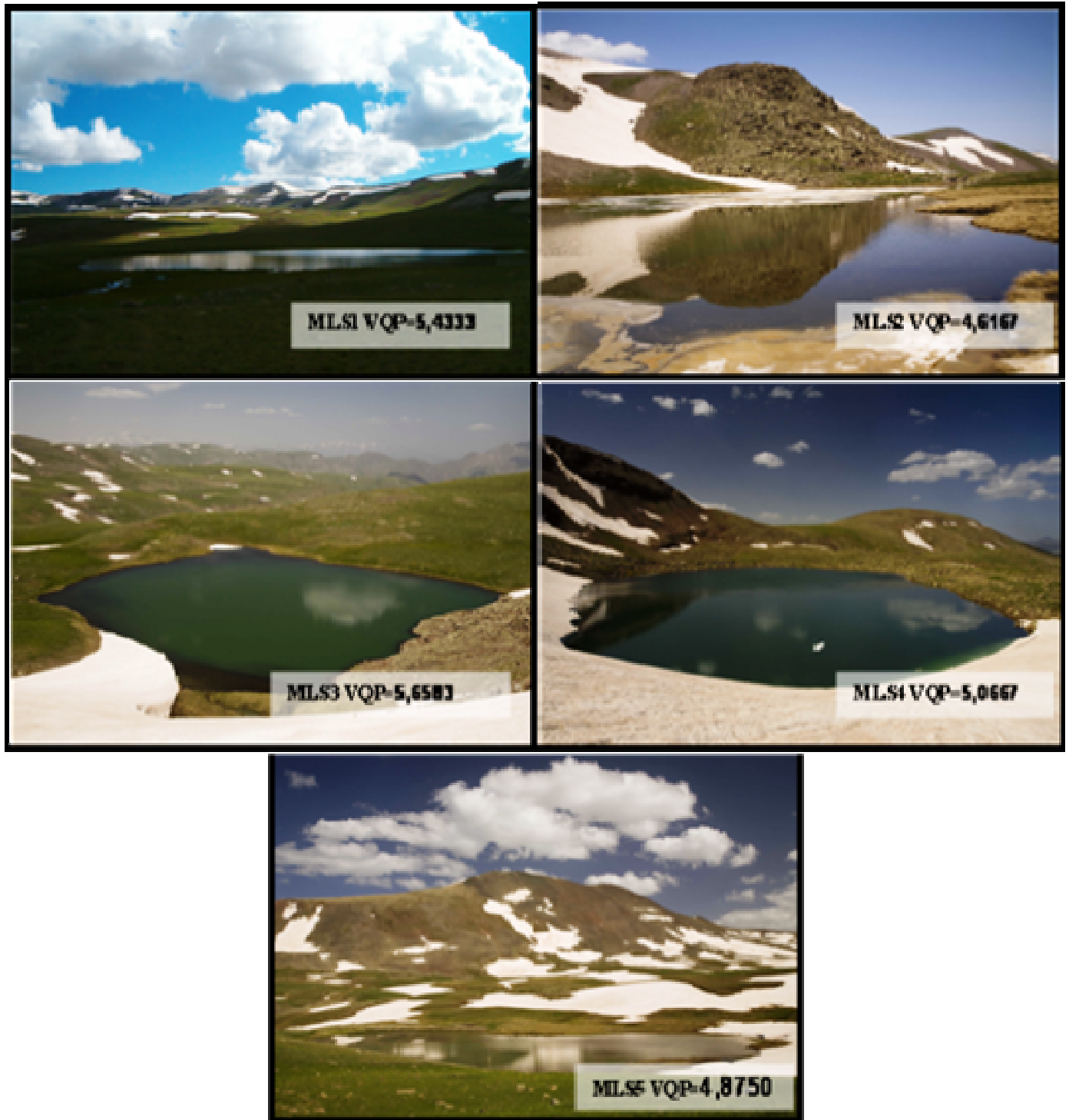


Figure 3. The averages of visual preferences grades for mountain lakes sceneries.

The results show that, in Tortum Valley (which has an important waterscape diversity), the most preferred waterscape is Waterfall scene 5 (WS5 VQP Mean = 6.5333), followed by Lake scene 2 (LS2 VQP Mean = 6.1000), Mountain Lakes scene 3 (MLS3 VQP Mean =

5.6583), Landslide lakes scene 5 (LLS5 VQP Mean = 5.6083), River scene 2 (RS2 VQP Mean = 4.8500). The relationships between landscape parameters and visual quality of waterscape indicated that parameters of fascinaty, being interesting and vividness had

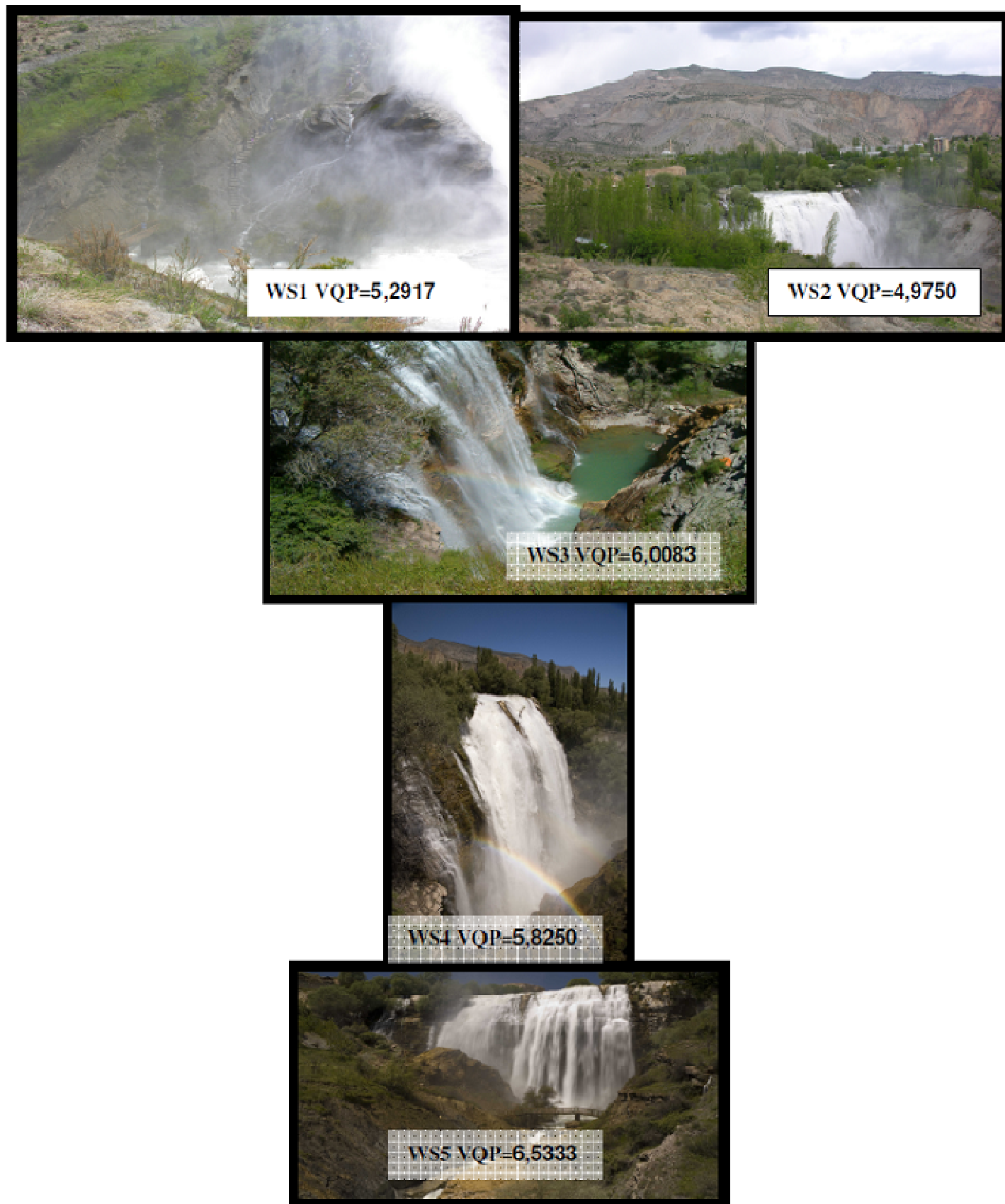


Figure 4. The averages of visual preferences grades for waterfall sceneries.



Figure 5. The averages of visual preferences grades for lake sceneries.

significant relationship with preference as some previous studies discussed (Herzog, 1985; Herzog and Barnes, 1999; Arriaza et al., 2004; Clay and Smidt, 2004; Acar et al., 2006; Acar and Sakici, 2008; Bulut and Yilmaz, 2008). The study contributed that waterscapes are also visual researches especially Waterfalls in Tortum valley.

It is determined that that water is one of the significant landscape components in rural landscape with respect to criteria of vividness, harmony, fascinaty and being interesting. Participants mostly have focused on Waterfall, Lake and Mountain Lake scenes. Moreover, it has also been determined that each water landscape in the

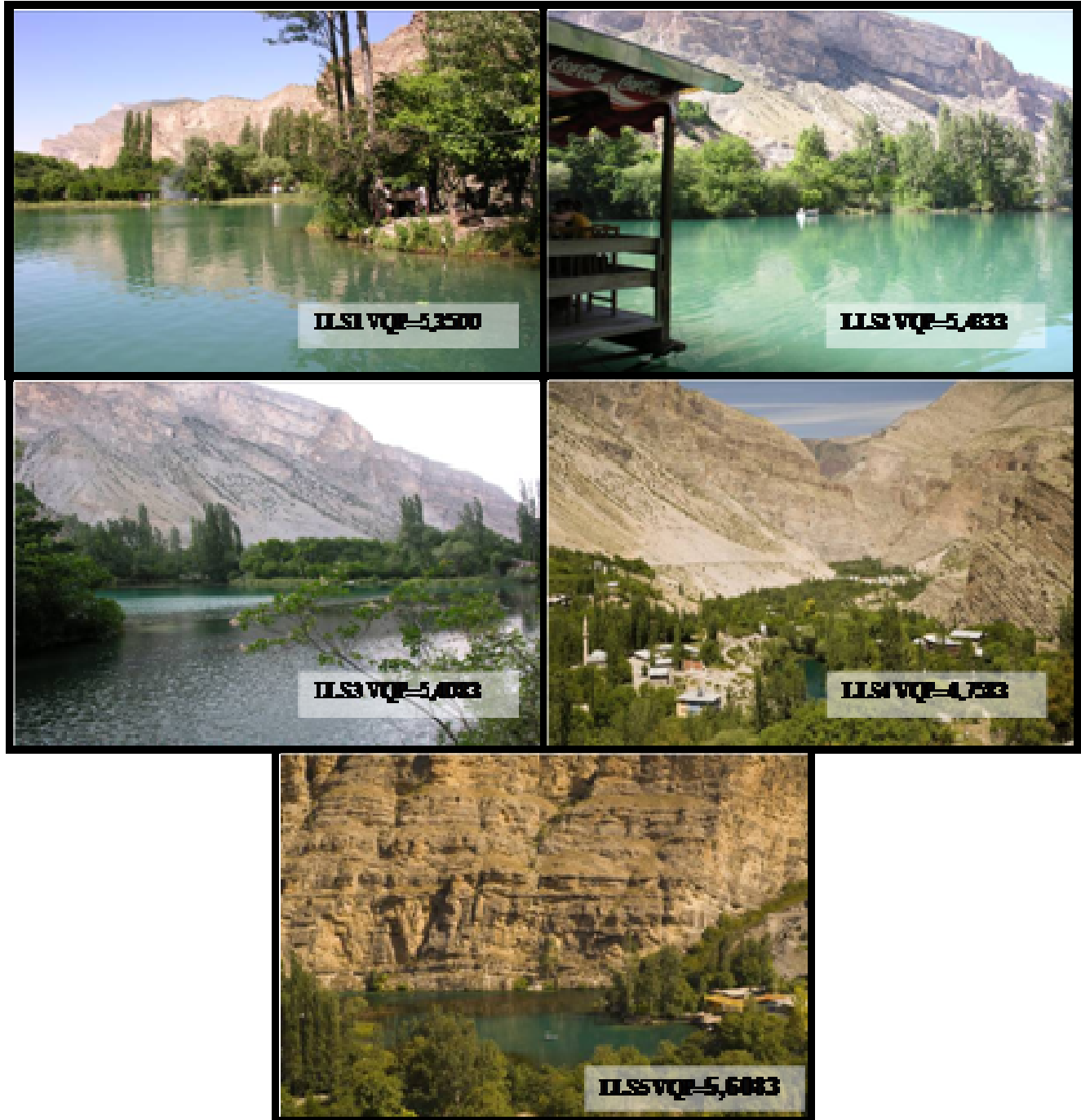


Figure 6. The averages of visual preferences grades for landslide lakes sceneries.

valley has highly important visual value.

Protecting and managing of a landscape require noticing, conserving and leading each landscape component. Water resources are the most important natural values that complement the landscape and provide ecological cycle. In this context:

i. Recognition of the diversity of water resources to

include aesthetics and its inclusion in water resource design and planning will contribute sustainability.

ii. Water resources should be considered as a whole and all cultural studies related should be planned and managed by focusing on these natural values.

iii. The water should be able to be used as a visual resource value for planning at macro level and design studies at micro level.



Figure 7. Sceneries have the highest visual quality point in the scenery types.

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