

Expectation-performance Analysis on Natural Landscape Review Program in Korea

Lee, Gwan-Gyu¹⁾ and Hong, Jeong-Kee²⁾

¹⁾ College of Forest Environment & Science, Kangwon National University,

²⁾ Policy Coordination Division, Ministry of Environment.

자연경관심의제 도입의 기대-성과 분석

이관규¹⁾ · 홍정기²⁾

¹⁾ 강원대학교 산림환경과학대학 · ²⁾ 환경부 정책총괄과

국문요약

본 연구는 환경부 주관으로 2006년부터 시행되어 온 자연경관심의제도의 제도 도입 당시의 기대수준과 현재의 성과수준을 분석함으로써 발전방향을 모색하고자 진행되었다. 동 제도를 도입함으로써 얻고자 하였던 목표와 효과를 분석변수로 설정하고 당시의 기대수준과 제도도입 약 4년이 지난 2010년도 시점의 기대치 달성 성과수준을 비교하였다. 자연경관심의위원 전원을 대상으로 설문조사를 시행하여 분석하였으며, 비교결과 도출된 기대와 성과의 불일치 수준을 분석하고 그 원인을 고찰하였다. 그 결과, 제도 도입시 기대수준은 3.79, 성과수준은 3.09으로 나타나 당초 기대에 비해 그 성과가 다소 낮은 것으로 평가되었다. 성과가 기대에 미치지 못한 주요 항목은 자연경관을 고려한 개발사업계획 수준 제고(-2.91), 경관개선 실천성 제고(-2.97), 자연경관자원 주변경관의 개선(-3.00)으로 나타났다. 이와 같은 결과를 고찰하여 동 제도의 발전방향으로 심의절차개선과 홍보강화, 자연경관심의위원 전문성 확보, 심의내용과 범위 개선, 심의기준 객관화, 전문가 참여 의무화를 단기적 발전과제로 도출하였다. 중장기적으로는 계획적 접근에 의한 경관관리 및 심의와 자연경관보전자원의 대상과 개념을 시각적 자원 뿐만 아니라 생태적 자원으로도 확장시켜야 함을 제안하였다.

Key Words : 경관, 환경계획, 경관관리, 경관평가, 경관영향

Corresponding author : Hong, Jung-Kee, Policy Coordination Division, Ministry of Environment,
Tel : +82-2-2110-6670, E-mail : jkhong@me.go.kr

Received : 24 May, 2010. **Accepted** : 14 June, 2010.

I. Introduction

As natural landscapes have multi-functions and multi-effects including economic and eco-environmental values as well as psychological and physiological treatment (Parsons, 1991), a need to conserve, restore and manage natural landscape resources have emerged (Dearden, 1985; Japanese Natural Environment Research Center, 1995; Byeon et al., 2000; Yoo et al., 2002). Since it requires a lot of time and money to restore, if at all possible, once the natural landscape is destroyed, it is important to minimize the destruction and maximize conservation and preservation by assessing and analysing beforehand rather than end-of-pipe measures (Choi et al., 2004; Song et al., 2007). Therefore, Ministry of Environment has introduced the Natural Landscape Review Program in order to analyse and predict in advance, and to reduce impact from all kinds of development plans and projects on landscapes.

The Natural Landscape Review Program (NLRP) is enforced by Ministry of Environment in accordance with Natural Environment Conservation Act. After the revision of the Act in 2004, the program has been in operation since January 1, 2006. The Program reviews the development projects within a certain distance from protected areas, e.g. natural parks, ecology and landscape conservation areas, and protected swamp areas, which are subject to Prior Environmental Review System (PERS) and Environmental Impact Assessment (EIA).¹⁾ NLRP also controls the development projects in the areas other than the protected areas which are designated by a Presidential Decree out of those which are subject to the

review of PERS and EIA. It is stipulated that the Program should review mainly on whether the natural landscapes are destroyed, whether the sites, types, colors, heights and scales are harmonious, and the possibility of whether a landscape might change from the project when seen from major observatories.

According to the statistics since its launch in 2006 to May 2007, among a total of 6,290 environmental review cases, 414 have undergone NLRP (Ministry of Environment, 2007c), which implies that the number of NLRP cases increases in proportion to the number of PERS and EIA cases. Currently, duplication with existing PERS, professional capacity of the landscape review committee, relations with similar systems conducted by other departments, and the scope of projects subject to NLRP are under debate.

At this point of the first half of 2010, where three years have passed since its outset, this study aims to provide directions for improvement by examining problems of NLRP and quantitatively analyzing the initial expectations and performances of the system.

II. Methods and materials

In order to analyze the initial expectation level and the current performance level, variables were set for this purpose and a survey was conducted to NLRP commissioners. Then, expectation and performance values by each variable were quantitatively analyzed, and the interpretation was made on the cause of disconfirmation (Figure 1). The specific methodology for the research is as follows :

1) Article 28, Natural Environment Conservation Act.

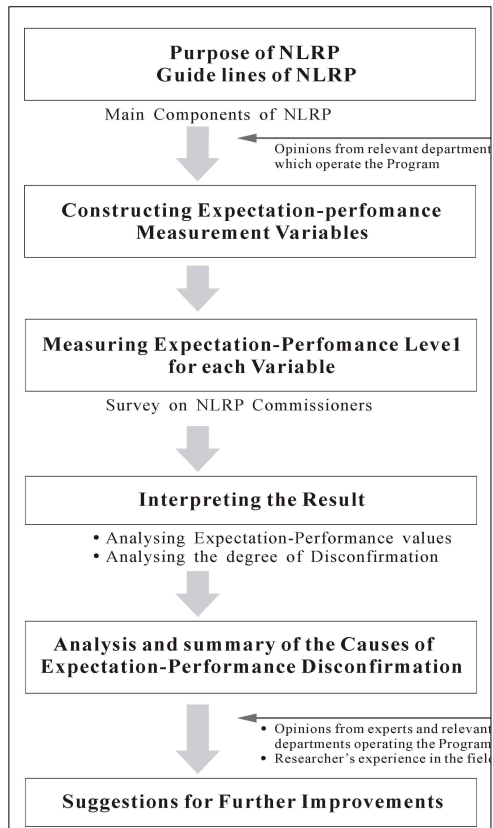


Figure 1. Research process.

1. Expectation and performance variable

In order to set the variables to measure initial expectations of the NLRP, main components of NLRP guidelines of both past and present were examined (Ministry of Environment, 2005; 2007a; 2007b). This is because the main components of NLRP presented in the guidelines are deemed to be expectations of NLRP, hence they can be used as variables for assessing expectation-performance assessment. Main components of NLRP guidelines and the purposes of introducing the Program lie in conserving natural landscapes effectively, reducing the impact of development projects which affect the surrounding landscapes that require conservation, and improving professional capacity of landscape plans. There was improving objec-

tivity of landscape plans. This was summarized as raising the objectivity of NLRP, increasing practicality of landscape improvement, strengthening the function of collecting opinions and the role of landscape experts (Ministry of Environment, 2005; 2007a; 2007b). By compiling opinions of relevant departments of Ministry of Environment, initial expectations on the Program-clarifying the scope, reducing practical impact on natural landscape, taking natural landscape into consideration when planning a development project, and practically improving the surroundings of landscapes that require conservation-are organized as 15 expectation-performance level measurement variables, which are laid out in Table 1 :

2. Expert survey

A survey was conducted to experts who take an active part as NLRP commissioners, to public servants in Ministry of Environment and its regional environmental offices, and to EIA agencies. Questionnaires were distributed in May 2008 and May 2009, and 32 responses from NLR commissioners, 18 from Ministry of Environment and its regional offices, 17 from EIA agencies were collected, and three responses could not be analyzed, hence a total of 66 were used for analysis. The rationale for the selection was for their nation-wide location and their long experience with various types of projects, and thus they were considered as experts who can present practical and valuable opinions on the expectations and performances of the Program.

3. Methods of Measurement and Survey

Five-step Likert scale for expectation and performance of NLRP constructed for each variable so as to compare expectations and performances. In addition, the causes of disconfirmation between

Table 1. The outcome of setting variables for expectation-performance measurement.

No.	Measurement Variables
X01	Conserving effectively natural landscapes that highly require conservation
X02	Improving the level of landscape plans of development project for surroundings of natural landscapes that highly require conservation
X03	Raising professional capacity of landscape plans
X04	Improving the objectivity of review criteria
X05	Increasing practicality of landscape improvement
X06	Improving the level of decision-making related to landscapes
X07	Improving the role of environmental assessment in landscapes
X08	Improving specialized professionalism in the field of natural landscape management
X09	Strengthening the role of landscape experts
X10	Strengthening the function of collecting opinions related to landscape
X11	Providing practical support for the planning in order to improve the landscape
X12	Clarifying the scope of projects
X13	Effectively reducing impact on natural landscape
X14	Improving the quality of development project considering natural landscapes
X15	Improving the surrounding landscapes of natural landscape resources

sSource : Ministry of Environment, 2005; 2007a; 2007b; The compilation of opinions from Ministry of Environment and regional offices were organized according to the purpose of this study.

initial expectations and performances for each variable, if found, were to be explained in qualitative manner by the experts (Table 2). Moreover,

the field “others” was included in order to accommodate their own assessments other than the ones suggested by the questionnaire.

Table 2. Standards and the main method of the survey.

Please assess the initial expectations and the present performances with regard to Natural Landscape Committee Program	Initial Expectation					Current Performances					If the performance fail to meet the expectation, please briefly describe the causes
	The effects of the Program will be :					The effects of the Program are :					
	very high	high	average	low	none	very high	high	average	low	none	
1. Conserving effectively natural landscapes that highly require conservation											
2. Improving the level of landscape plans of development project for surroundings of natural landscapes that highly require conservation											
...											
16. others											

4. Interpretation of the result

After comparing average values between expectations and performances for each variable, the differences between them were interpreted as expectation-performance disconfirmation. By ordering the scale of differences, the ranks of expectation-performance disconfirmation for each variable was evaluated and the causes of disconfirmation were interpreted. The causes of disconfirmation were compiled and analyzed from qualitative responses. The test for significance regarding the differences of the values between expectations and performances was made with t-test of significance level 0.05. To analyze and verify whether there are differences depending on different group of respondents, ANOVA of significance level 0.05 was conducted. Microsoft Excel 2003 was used for the compilation and analysis of the data, and SPSS ver.11 was used for statistical analysis.

5. Expectation-performance disconfirmation analysis and suggestions for future improvements

For each variable which had higher expectation-performance disconfirmation, all the explanations were taken into account, and common factors were induced so as to analyze the causes of expectation-performance disconfirmation. Measures to solve the common issues were sorted by causes, and they were divided into short- and mid/long-term objectives as suggestions for future improvements.

III. Result and discussion

1. Expectation level

The expectation level of the total variables recorded mean 3.79 within a range of the highest value 5 to the lowest 1. This implies that in terms

of expectation level at its outset, experts mostly perceived that the effects of NLRP would generally be "high". In particular, they expected : natural landscapes which highly require conservation can be effectively conserved (X01, 4.22), the role of environmental assessment in landscapes can be increased (X07, 4.09), role of landscape experts would be strengthened (X09, 4.00), and level of landscape plans of development projects for surroundings of natural landscapes that highly require conservation would be raised (X03, 3.91). All the variables were distributed among "very high (5)", "high (4)", "average (3)", with the lowest being 3.50 and the highest 4.22, which can be inferred that all the respondents judged that the expected effects of introducing NLRP was positive (Table 3).

2. Performance level

The performance level of all the variables recorded an average of 3.09. This implies that the performance of NLRP about two and a half years after its launch was assessed at average. In particular, increasing the role of environmental assessment in landscapes (X07, 3.41), increasing specialized professionalism in the field of natural landscape management (X08, 3.26), and collecting opinions related to landscape (X10, 3) are the performance level in descending order. No performance level was higher than that of the expectation. The lowest was improving the quality of development project considering natural landscapes (X14) which recorded 2.91, and increasing practicality of landscape improvement (X05, 2.97). These recorded below average. Majority of experts did not consider that the level of development project plans did not improve even though NLRP was implemented, and further, they believe the Program

Table 3. Result of analysis on responses from the survey.

Variables		Expectation		Result		Discon- firmation	Rank of Discon- firmation	t-test (significance level : 0.50)
		level	rank	level	rank			
X01	Conserving effectively natural landscapes that highly require conservation	4.22	1	3.16	4	▽ 1.06	1	t statistics : 6.1225 t rejection value : 1.6955 p value : 0.0000
X02	Improving the level of landscape plans of development project for surroundings of natural landscapes that highly require conservation	3.91	4	3.03	9	▽ 0.88	3	t statistics : 4.9103 t rejection value : 1.6955 p value : 0.0000
X03	Raising professional capacity of landscape plans	3.72	9	3.00	10	▽ 0.72	6	t statistics : 3.6499 t rejection value : 1.6955 p value : 0.0005
X04	Improving the objectivity of review criteria	3.50	15	3.16	5	▽ 0.34	15	t statistics : 1.8785 t rejection value : 0.0349 p value : 0.0000
X05	Increasing practicality of landscape improvement	3.66	11	2.97	14	▽ 0.69	7	t statistics : 3.4729 t rejection value : 1.6955 p value : 0.0008
X06	Improving the level of decision-making related to landscapes	3.53	13	3.09	7	▽ 0.44	14	t statistics : 2.6099 t rejection value : 1.6955 p value : 0.0069
X07	Improving the role of environmental assessment in landscapes	4.09	2	3.41	1	▽ 0.69	8	t statistics : 3.4729 t rejection value : 1.6955 p value : 0.0008
X08	Improving specialized professionalism in the field of natural landscape management	3.91	5	3.26	2	▽ 0.63	11	t statistics : 2.9846 t rejection value : 1.6955 p value : 0.0027
X09	Strengthening the role of landscape experts	4.00	3	3.00	11	▽ 1.00	2	t statistics : 4.7482 t rejection value : 1.6955 p value : 0.0000
X10	Strengthening the function of collecting opinions related to landscape	3.84	6	3.16	3	▽ 0.68	10	t statistics : 4.5274 t rejection value : 1.6955 p value : 0.0000
X11	Providing practical support for the planning in order to improve the landscape	3.81	7	3.00	12	▽ 0.81	4	t statistics : 4.3333 t rejection value : 1.6955 p value : 0.0001
X12	Clarifying the scope of projects	3.63	12	3.13	6	▽ 0.50	13	t statistics : 3.0884 t rejection value : 1.6955 p value : 0.0021
X13	Effectively reducing impact on natural landscape	3.78	8	3.03	8	▽ 0.75	5	t statistics : 3.9370 t rejection value : 1.6955 p value : 0.0002
X14	Improving the quality of development project considering natural landscapes	3.53	14	2.91	15	▽ 0.63	12	t statistics : 2.9846 t rejection value : 1.6955 p value : 0.0027
X15	Improving the surrounding landscapes of natural landscape resources	3.69	10	3.00	13	▽ 0.69	9	t statistics : 3.8970 t rejection value : 1.6955 p value : 0.0002
Mean		3.79		3.09		▽ 0.70		

was not linked to actions for landscape improvement (Table 3).

3. Degree of Expectation-Performance Disconfirmation

Analyzing the degree of expectation-performance disconfirmation in all the variables, there was not a single variable that recorded higher performance than what was expected, and the mean value was recorded at 0.70, meaning that they are under-evaluated as less than the expectation level. In particular, conserving effectively natural landscapes that highly require conservation (X01), strengthening the role of landscape experts (X09), improving the level of landscape plans of development project for surroundings of natural landscapes that highly require conservation (X02), providing practical support for the planning in order to improve the landscape (X11) recorded -1.06, -1.00, -0.88, -0.81 of the highest disconfirmation level, respectively.

It was highly expected that the Program would be able to conserve the natural landscape resources that highly require conservation, but the actual performance of NLRP at an early stage was under-evaluated at an average. The surrounding landscapes of development project which have high value of conservation were expected to be controlled very effectively, but the performance was also under-evaluated at an average. It was expected that establishment of plans for improvement of the level of landscapes would improve in qualitative terms, but the performance was evaluated at an average (Table 3).

4. Causes of Disconfirmation

The expert opinions on the causes of disconfirmation with regard to main variables were

analyzed and common issues were induced from the process. Despite operation of NLRP, the main causes of not having the performance than expected in effectively conserving landscapes that highly require conservation are : first, perfunctory assessment reports; second, the limited scope covering only the area within the project and the lack of ability to control the surroundings; third, difficulty in judging the conservation effects only with a report; and fourth, difficulty in planning a practical alternative.

The roles of actual landscape experts were not strengthened and the level of their participation was low, because : first, lack of experts; second, lack of public relations of NLRP. In particular, it was frequently criticized the incapacity or inappropriateness of the experts who nevertheless participated in drafting landscape review report. The causes of the performance lower than the expectation level with regard to improving the level of landscape plans of development project for surroundings of natural landscapes that highly require conservation were : first, the limited scope covering only the area within the project; second, difficulty in judging the local landscape deterioration only with a report; third, lack of practical measures to improve landscapes; and fourth, insufficient understanding at the early stage of landscape plan on ways to reflect landscape resources which require conservation. The causes of not meeting the expectation that practical support for the planning in order to improve the landscape would be provided were : first, lack of understanding of reviewers on guidelines and passive reviews; second, lack of public relations and lack of connection with land use and landscape plan.

5. Suggestions for Further Improvements

By analyzing experts' qualitative responses as to the causes of expectation-performance disconfirmation, common causes were induced, and then short- and mid/long-term measures were sorted out and organized as follows :

1) Short-term measures

In short term, it is assumed that practical improvements can be achieved through amending the current system.

Firstly, the process of reviews should be improved and public relations should be strengthened. When it is assumed that the impact on landscape is insignificant, the process of natural landscape review should be simplified. In this case, a method to judge the significance of the impact on landscape is required, and alternatives are the scoping method and positive-list screening method. In the case of scoping, whether or not the review should be applied can be decided by hearing the opinions of the Environmental Review Council (when a project is subject to prior environmental review) or the those of the Scoping Committee (when subject to EIA), which will be made obligatory. In this case, cooperation and inter-linked operation would be necessary due to the difference between the related law and the department who management the system. In the case of positive-list screening, since currently the scope for the review is fairly extensive, it is a procedural method to, on the one hand, strengthen the review for the projects subject to NLRP, and on the other hand, simplify or omit the process for those that are not or those that are listed. The period of review is also important for the improvement of the process. The procedure and institutional tools should be improved so that NLRP would be made at the

stage of location and land use planning, and suggestions for landscape impact reduction should also be reflected in real terms. The current procedure already provides for such measures, but it is hardly conducted at the appropriate time, and many are deemed perfunctory. Therefore, it is necessary to introduce the public relations method as an alternative.

Secondly, professionalism of NLRP Committee needs to be secured. By amending the requisites for the committee could help secure professionalism as a preliminary measure. In particular, we need an institutional mechanism that would take into account the experiences, knowledge and researches with respect to landscape review for the committee composition.

Thirdly, the components and the scope of review should be improved. Currently, the main contents of review are landscape axis, whether landscapes are destroyed, harmony with the surroundings, impact reduction measures, change prediction and assessment, whereas the results of review that are to be reflected into the project are usually "location adjustment", "density adjustment", "color adjustment", "utilization of plant materials", "afforestation of surroundings", "afforestation of buildings", etc. "within the site", which seem rather limited and passive. It is worth considering the introduction of measures such as landscape agreement, landscape restoration system, to reduce the landscape impact to areas other than the project side. Unnecessary reviews and procedures can be reduced by distributing impact reduction manuals for linear and area projects and by providing measures for consideration in advance to reflect the usual comments. The effect of impact reduction measures for each cases is expected to be doubled when it is analyzed in conjunction with

PERS by comparing at the review stage the opinions for landscape impact reduction with landscape impact and impact reduction measures and their expected results for each case.

Fourthly, the criteria should be more scientific and it needs to be improved. The key criteria for the landscape impact assessment, alternatives comparison, impact reduction effect analysis, etc. is the "viewpoint", and hence it is imperative to provide for more objective viewpoint selection criteria and procedure. The standard and methodologies for selecting viewpoint, view lines, and view areas, and the distinction between linear and area projects needs to be made. In addition, objective methodologies are required for view landscape simulation from viewpoint. A subtle change in angle, camera height, balanced, etc. can result in huge differences in the landscape simulation, consequently there is a need to establish a standardized methodologies. With current guidelines, the objectiveness is yet to be attained.

Fifthly, landscape simulation and its analysis and interpretation should be conducted by experts or competent institutions. As alternatives, requirements for natural landscape impact assessment review drafting agencies under the Natural Environment Conservation Act can be established, or requirements for natural landscape impact assessment review or landscape review drafting can be established among EIA report drafting agencies.

2) Mid-and long-term measures

Firstly, the extent of resources that are subject to natural landscape conservation should be enlarged. For this, we need to update the definition of natural landscape, which in the past the review was focused on the visual side of landscape. Now the ecological resources inherent in natural land-

scape should also be the subject of conservation. Re-establishing the date for landscape conservation and restoration should also be improved. It is more than necessary to strengthen the past viewpoint decision-making process of view point within the site or in the order of viewpoint, project site, and natural landscape and its analysis and interpretation. It is also necessary to broaden the landscapes subject to landscape management, from the site that needs landscape conservation over to landscape-viewing areas.

Secondly, the conversion to pre-planning landscape management system is required. It is necessary to establish measures to include landscape planning and management or to prepare a separate plan for natural parks, swamp conservation areas, ecological landscape conservation areas. Within the protected areas and within certain distance from the boundary, it is necessary to adopt measures to establish landscape management plans. Regarding the contents of landscape plan, internal and external viewpoints, view lines, view areas, open space for viewing, guidelines for building landscape design, guidelines for road-side landscape need to be taken into account. A separate plan needs to be established for each locality, measures should be provided to allow for the plan needs to be periodically reviewed for amendments, and measures to secure local participation at the planning stage should be adopted.

Thirdly, systematic approach needs to be adopted. When development projects are under way near the conservation areas, establishment of landscape plans should be mandatory. The landscape plan should include the following : review of landscape management plan for conservation areas and its incorporations; establishment of viewpoints, view lines, view areas; open space for

viewing; plan to secure skyline, building landscape plan (color, structure, density, land use and location relations), landscape agreement, local participation, etc.

IV. Conclusion

In order to provide directions for further improvements of NLRP, this study conducted measurement and comparative analyses of the level of initial expectations and performances through experts survey, and reached the following conclusions :

1. The expectation level for the development on the field of natural landscape through NLRP was high with 3.79 on average. In particular, it was expected that natural landscapes that highly require conservation could be effectively conserved, the role of environmental assessment in the field of landscape would be improved, the role of landscape experts would be strengthened, and the level of landscape plans of development project for surroundings of natural landscapes that highly require conservation would also be improved.

2. The performances level of the Program, however, was recorded at an average level of mean 3.09, which failed to meet the expectations. The performances did not live up to the expectations for all the variables. The lowest performance level was 2.91 for "Improving the quality of development project considering natural landscapes" and "Increasing practicality of landscape improvement". Most experts did not consider the level of development project plan to be raised through the introduction of NLRP.

3. Expectation-performance disconfirmation was recorded at more than 0.70 on average, which implies that it was valued below expectation level. Although natural landscape resources that highly

require conservation were expected to be effectively conserved, the performance of actual early operation of the system was valued lower at an average level. In addition, the role of landscape experts was expected to be strengthened, but the performance was at an average level. It was expected that the level of landscape plans of development project for surroundings of natural landscapes that highly require conservation would be controlled very effectively, but the performance was valued lower at an average level. It was also expected that plan to improve the landscape would be improved in qualitative terms, but the performance of the Program was valued at an average level.

4. The causes for expectation-performance disconfirmation for key variables include : perfunctory assessment report; limitation of scope within the project site and the actual lack of capacity to control the surroundings; difficulty in judging only with the report on whether the resources have high conservation effects; difficulty in providing practical alternatives; lack of experts; lack of public relations of the Program; unqualified experts or non-experts in the field of landscape; lack of actual landscape improvement measures; reviewers' low understanding on guidelines and their passive reviews; lack of connection between the land use and the landscape plan.

5. For future improvements of the Program, the following were suggested : in short term, improving review procedures and strengthening public relations, securing professionalism of NLRP committee, improving the contents and scope of the review, more scientific review criteria, mandatory participation of competent institutions and experts in the field of landscape; and in mid- and long-term, re-establishing subject-matter and concept

of natural landscape conservation resources; transition to pre-planning landscape management system; measures to improve NLRP through systematic approach. Landscape experts need to understand the unique nature of the complex and multilateral field of landscape, and have a keen insight to view development projects in an integrated and holistic manner. This study requires further research in order to complement the limitations of not including the opinions of those that are subject of the natural landscape review.

Acknowledgement

I would like to convey my deepest appreciation to NLRP commissioners who, despite their tight schedule, have actively and voluntarily responded to the survey. This study was fulfilled by the support of the Institute of Forest Science, Kangwon National University.

Reference

- Byeon, Byeong-seol et al. 2000. A study on development of landscape evaluation skills. Research report of Korea Environment Institute.
- Choi, Jae-yong et al. 2004. A study on system management measures for natural landscape conservation and management. Report of Ministry of Environment. Japan Natural Environment Research Center, 1995. Technical manual for natural environment impact assessment (translation : Ministry of Environment).
- Dearden, P. 1985. Philosophy, theory, and method in landscape evaluation. *Canadian Geographer*, 29 : 263-265.
- Ministry of Environment. 2005. Local government's guidelines for the natural landscape review. Ministry of Environment Regulation No. 271.
- Ministry of Environment. 2007a. Guidelines for natural landscape review on development projects. Regulation of Ministry of Environment Number 309.
- Ministry of Environment. 2007b. Collection of Natural Landscape Impact Committee cases.
- Ministry of Environment. 2007c. Internal Statistics of Nature Policy Division, Ministry of Environment.
- Parsons, R. 1991. The potential influences on environmental perception on human health. *Journal of Environmental Psychology*, 11 : 1-23.
- Song, In-joo et al. 2007. Development of evaluation skills of natural landscape impact and natural landscape review system. Report of Ministry of Environment.
- Yoo, Heon-seok et al. 2002. A study on natural environment management policy. Research report of Korea Environment Institute.