

# Application of the National Environmental Assessment in Korea

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## ABSTRACT:

This study was performed for developing the National Environmental Assessment Map (NEAM) in Korea and presenting the application method of NEAM. This NEAM adopted the least indicator method and uses ArcGIS 9.0. This map is made through evaluation of 67 items. As a result, the construction of NEAM was defined as a process of identifying land use to scientifically assess the physical and environmental value of land and classify conservation value into several grades for the sustainable management of environmental resources. After applying NEAM criteria of five degrees to the whole of Korea, Grade I, showing the highest conservation value, accounted for 44.6 percent by land area of NEAM. Grades II, III, IV and V likewise accounted for, respectively, 23.4 percent, 19.1 percent, 4.2 percent and the lowest conservation value of 8.7 percent. This map can be widely used in urban and regional planning, development planning and environment impact assessment.

KEY WORDS: Environment, GIS, National Environmental Assessment Map (NEAM)

## 1. INTRODUCTION

National planning and utilization have progressed to focus on ways of supporting economic growth efficiently since the 1970s. Because of this social phenomenon, specific systems and policies for systematic and territorial environment management were not prepared, and the difficulties of efficient territorial conservation and management bring about many social conflicts. So there is a need to evaluate environmental values efficiently through integrated environmental information, and, on the basis of this evaluation, preventative and environmentally-friendly territorial environment management policy is required for unique land utilization and management. This is the reason for creating the National Environmental Assessment Map (NEAM),

with national integrated environment information and environmental value, evaluated objectively and able to be used by everyone. National Environmental Assessment (NEA) is a process of scientifically assessing physical and environmental features of land, and grading conservation suitability.

## 2. STUDY AREA AND DATA DESCRIPTION

This study is making steady progress from having formulated the concept of environmental assessment in 2001 and producing a NEAM of a metropolitan area in 2002, to constructing a NEAM of South Korea. The study area is defined by the borders of South Korea. The 1:25,000 scale had application for producing the NEAM. Thematic environmental information data were collected and mapped in scale and format. NEAM is a raster-based map of 30m resolution based on digital topographic maps. Minimal expression areas are over 62,500m<sup>2</sup> at 1:25,000 scale, but distinguishing regions with lesser areas was necessary at the boundary, as it were.

## 3. METHODOLOGY

### 3.1 Assessment Items

NEA items are composed of legal assessment items including specific use of the district and greenbelt legal status, and environmental/ecological assessment items such as biodiversity. The map is built up through evaluation of 67 items, comprising 56 legal assessment items and 11 environmental/ecological assessment items.

The mapping of assessment items used the following primitive data <table 1>.

### 3.2 Assessment Methods and Grading

An assessment method applied to NEAM is basically an overlay method using the Boolean principle, and applies a minimal indicator approach in considering environmental values of greatest importance and in reflecting land environmental characteristics well. A minimal indicator approach is a union operation (Union: A or B), which is indicated as a conservation area if it has just one item requiring conservation. For unifying assessment items this study used a functional formula, which includes the following:

$$I = \max \{ I_1, I_2, \dots, I_j, \dots, I_n \}$$

where, I: Unified values, I<sub>i</sub>: Each item's values

An assessment standard of NEAM is based on an expert survey by a Delphi method, twice repeated. Through this, assessment grades, and legal and environment/ecological standards are decided. NEAM is classified into five grades. Each assessment value is graded by regionalization maps representing forested, agricultural, and built-up areas, which are reclassified land cover maps.

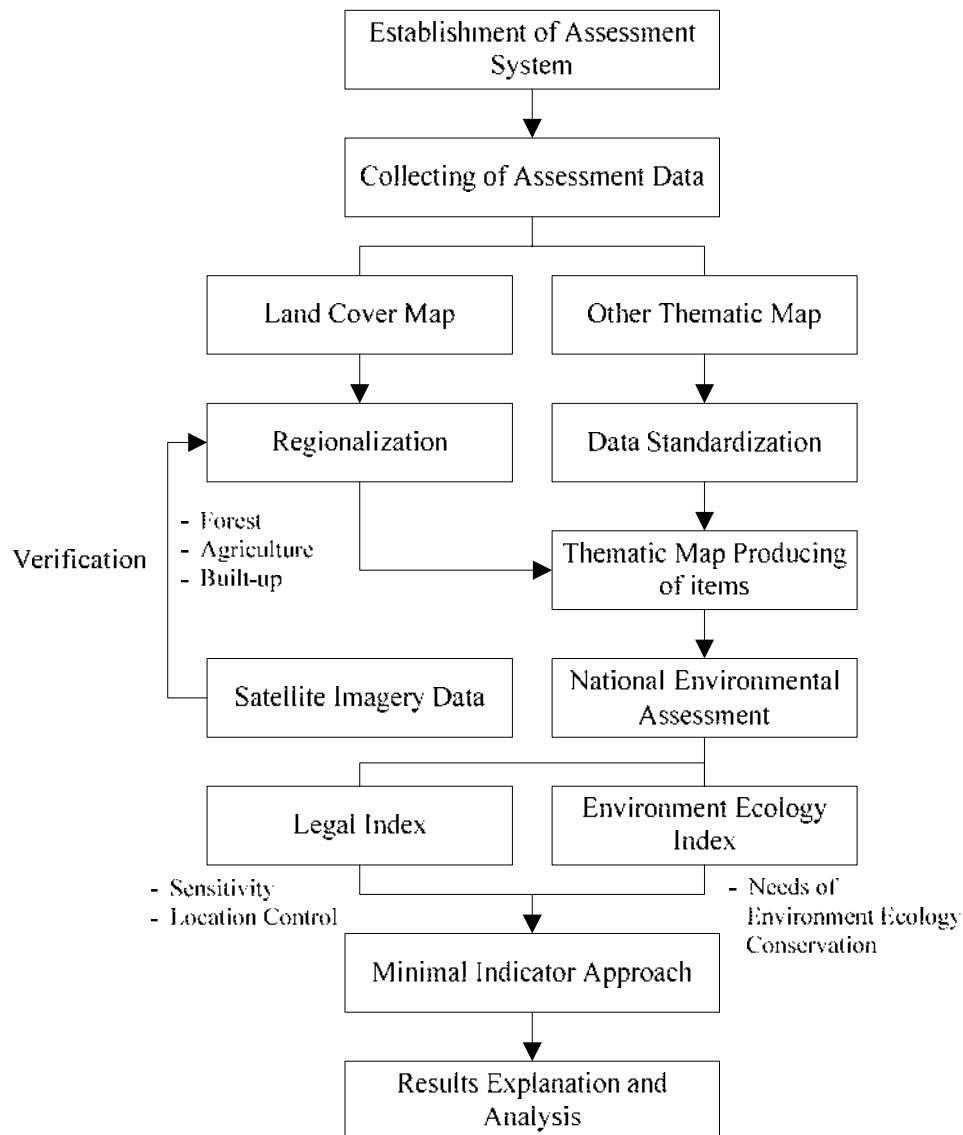


Figure 1. Flow chart of methodology

**Table 1. Primitive Data of Assessment**

Data	Evaluation Item	Data Type	Scale
Ecosystem Conservation Area Map	Ecology And Landscape Core Conservation Area City/Do Ecosystem Conservation Area	Polygon	1:25000
The Status Of The DMZ Map	Natural Retention Area	Polygon	1:25000
Wetland Protection Area Map	Wetland Protection Area	Polygon	1:25000
Wild Fauna And Flora Protection Area Map	Wild Fauna And Flora Protection Area	Polygon	1:25000
Ecological Park Zone Map	Natural Conservation District Natural Environmental District Settlement District Collectivized Facilities District Park Protection Area	Polygon	1:25000
The Status Of Uninhabited Islands Map	Uninhabited Islands	Polygon	1:25000
River Riparian Buffer Zone Map	River Riparian Zone	Polygon	1:25000
River Work	River Zone, Small River Zone	Polygon	1:25000
The Quality Of Water Preservation Area Map	Water Quality Degree I , II , III	Polygon	1:25000
Waterhead Protection Map	Waterhead Conservation Area Of Metro And Local Water Supply	Polygon	1:25000
National Land Utilization And Planning Map	Natural Environment Conservation Area	Polygon	1:25000
Development Restriction Zone Map	Development Restriction Zone	Polygon	1:1200 ~ 1:25000
Forest Utilization Map	Preservation Forest(Forestry, Public Benefit) Forest Genetic Resources	Polygon	1:25000
Rural Development Area Map	Agricultural Land Zone Agricultural Protection Zone Abandoned Agricultural Fields	Polygon	1:25000
The Status Of Land Readjustment Map	Large Scale Land Readjustment Normal Land Readjustment Simplicity Land Readjustment	Polygon	1:25000

Urban Planning Map	Green Area For Conservation Productive Green Area, Natural Green Area Landscape District, Ecosystem Preservation District Cultural Properties Preservation District, Children's Park Neighborhood Park Urban Natural Park Cemetery Park Sports Park Buffer Green Area Landscape Green Area	Polygon	1:1200 ~ 1:25000
Land Cover Map	Abandoned Agricultural Fields	Polygon	1:25000
The Status Of Nature Environmental Map	Species Diversity Grade Vegetation Grade Find Point Of Endangered And Rare Species	Point	1:25,000
Degree Of Precision Green Naturality Map	8th Degree Of Green Naturality	Polygon	1:25,000
Degree Of Green Naturality Map	6, 7th Degree Of Green Naturality	Polygon	1:25,000
Ecological Change Observation Area Map	Ecological Change Observation Area	Polygon	1:25,000
Forest Map	Wood Age Diameter Moderate	Polygon	1:25,000
Topographic Map	Built-Up Areas And Highway	Polygon	1:25,000
Land Cover Map	Built-Up Areas And Highway	Polygon	1:25,000
Forest Patch Map	Forest Continuances	Polygon	1:25,000

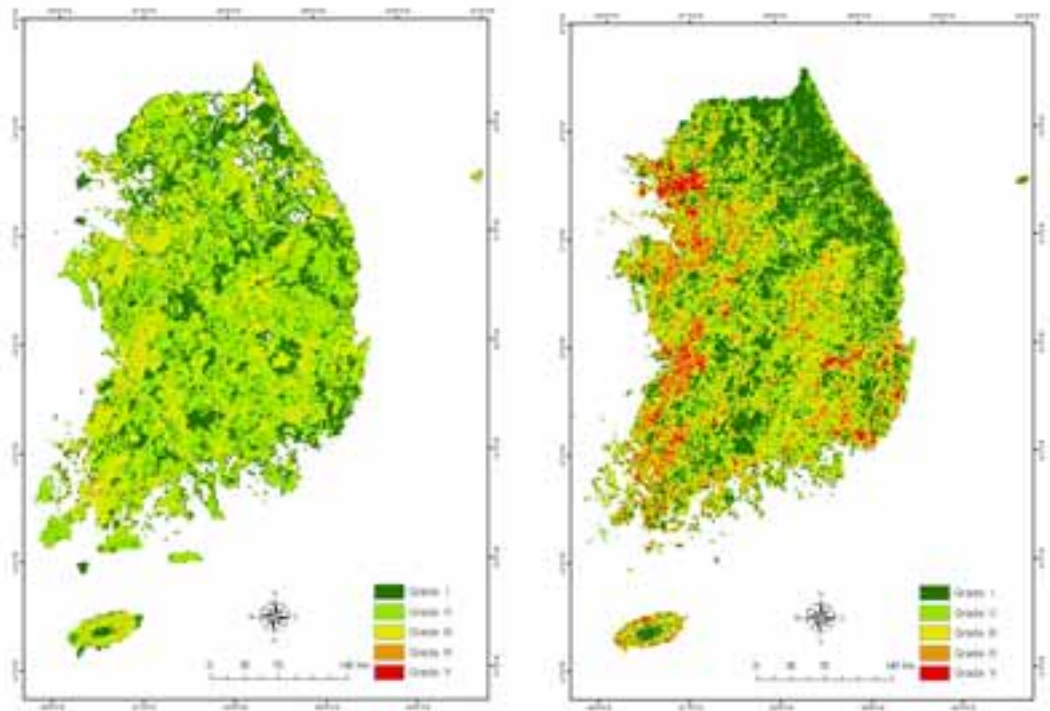
#### 4. RESULTS AND DISCUSSIONS

NEAM can be classified into five grades: Grade I is "as a fundamental rule, to be preserved"; Grade II is "to be preserved, but with exceptional allowances made for small development projects"; Grade III is "a buffer zone, which is the focus of preservation, but environmental evaluation of proviso with development"; Grade IV is "to be developed, but restricted to eco-friendly development"; and Grade V refers to "developed areas, but it use environmental care plan"

As the result, NEAM has composed two types of map. One map takes into account only

legal assessments, and the other represents only environment and ecology assessments, the results of which are shown in Figures 2 and 3, respectively.

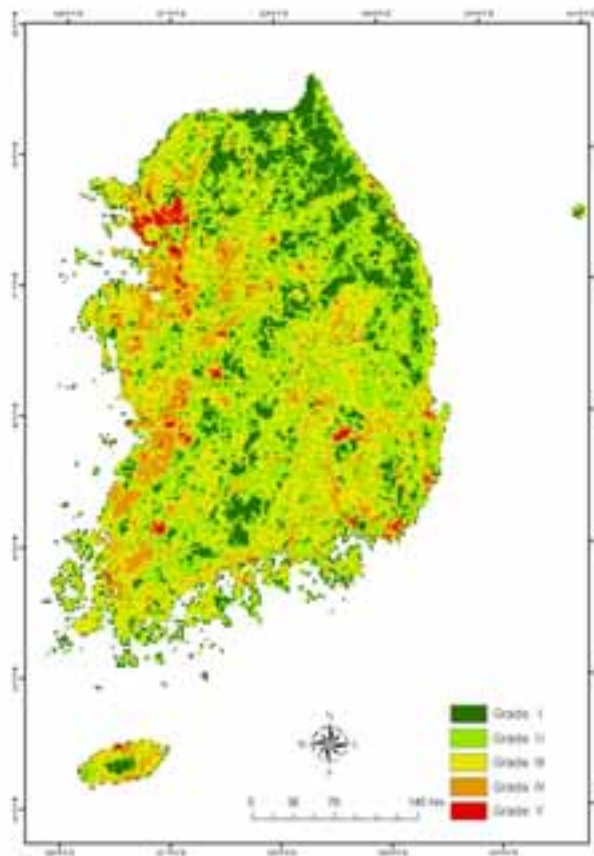
The map which took into account only legal factors reveals that Grade I accounted for 20.3% of NEAM, Grade II reached up to 33.2%, Grade III 25.7%, Grade IV 7.1%, and Grade V 0.2%.



**Figure 2. Assessment Result of Legal and Environment/Ecology Items**

The other map, which considered only environment and ecology factors indicates that Grade I accounted for 36.2% of NEAM, Grade II reached up to 21.5%, Grade III 7.0%, Grade IV 14.6%, and Grade V 5.8%.

NEAM, shown in Figure 4, reveals that Grade I, with the highest preservation value, contains 44.6%, Grade II contains 23.4%, Grade III contains 19.1%, Grade IV contains 4.1%, and Grade V contains 8.8% of Korea.



**Figure 3. Result of NEAM**

**Table 2, Results of NEAM**

Grade	Area(km <sup>2</sup> )	Ratio (%)
1	44,643.04	44.6
2	23,409.77	23.38
3	19,105.20	19.08
4	4,133.00	4.13
5	8,838.75	8.83
Total	100,129.76	100.00

The results of the nationwide NEAM suggest significant application measures. Firstly, the land area of Korea can be classified into five environmental management regions based on the environmental assessment estimation. Moreover, national environmental management measures can be derived based on 'environmentally-friendly' development scenarios. Furthermore, these NEAM results are expected to play an important role in

establishing environmental management measures, and as high-level GIS data to deal with nationwide environmental information.

## 5. APPLICATION USE OF NEAM

### 5.1 DMZ of Management Area and Protection Zone

NEAM finds application in efficient management of preservation areas and protection zones in the DMZ. The results from the relevant area of NEAM, shown in Figure 5, revealed Grade I, with the highest environmental value, contains 58.7%, Grade II contains 17.2%, Grade III contains 13.7%, Grade IV contains 2.7%, and Grade V contains 6.7%.



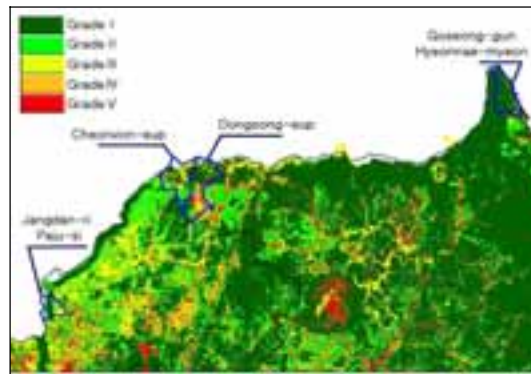
**Figure 4. NEAM of DMZ of management area and protection zone**

### 5.2 Environmentally-friendly Peace City of Land Suitability

Peace city select the location around the DMZ, and this city consider environmental information and valuation. The result of land suitability for the existing city was overlaid NEAM, Goseong-gun Hyeonnae-myeon is most of Grade I and Cheorwon-eup, Dongsong-eup and Jangdan-ri Paju-si contains about 80% of Grade I and Grade II (these grades are to be preserved). NEAM is use to DMZ of efficient management for preservation area, and protection zone

The results of the relevant area of NEAM are shown in Figure 5.

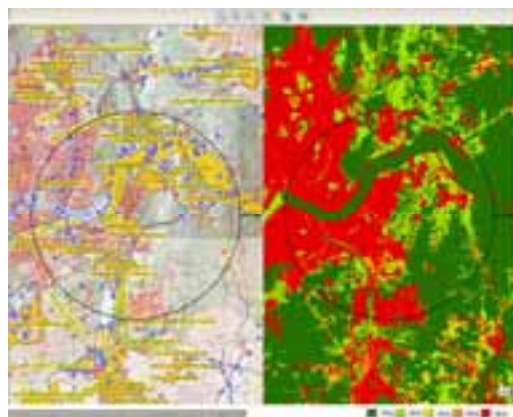




**Figure 5. Environmentally-friendly peace city of Land suitability using NEAM**

### 5.3 Prior Environmental Review Support System(PERSS)

Online WEB-GIS of PERSS is linked NEAM to search environmental constraint factor of project. On-line NEAM system is offered a function and DB(Data Base) connection of location limitation element and Environment • Ecology Items. Thus developers can check out land use suitability by themselves and easily identify an environmental constraint factor.



**Figure 6. PERSS and MEAN link**

## 6. CONCLUSIONS

The objectives of this study are to compile and a complete map of environmental information and evaluation of the National Environmental Assessment Map (NEAM) in Korea. The results can find use in anything from generalized planning and national land use planning, to eco-friendly development and the policy of environmentally-friendly land-use planning. This map was drawn from a comprehensive evaluation of all national environmental values (a total of 67 items) including legal factors (e.g., Ecosystem

Conservation Area, greenbelt, etc.) and environment and ecology factors (e.g., Forest, Degree of Green Naturality, etc.). After applying NEAM criteria of five degrees to the whole of Korea, Grade I, showing the highest conservation value, accounted for 45.6% by land area of NEAM. Grades II, III, IV, and V likewise accounted for, respectively, 23.6%, 17.9%, 6.3%, and the lowest conservation value of 6.6%. This map is composed of evaluations of all national, universal environment values and it is of great help to a variety of planners and engineers when choosing a suitable location for development.

Land resources are to be managed not only for human utilization, but also for environmental preservation. In this context, an estimation of the environmental capacity ought to incorporate both environmental and development considerations. Also, using a NEAM helps to predict the possibility of a development location, saving unnecessary costs such as purchasing a site when the location is not appropriate and saving time in avoiding formal consultations of environmental assessments like a pre-environmental review system and environmental impact assessments.

This map can be widely used in urban and regional development planning and in environmental impact assessment. It is expected that NEAM will serve in deciding in advance the location of development projects, and that the rate of suspension of active projects due to environmental issues and conflicts will be minimized.

## 7. Acknowledgements

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