Book of Abstract

I. SESSION DESCRIPTION

ID: T7

Title of session:

Integrated Assessment to the Valuation of Environmental and Ecosystem Service via Impact Pathway Analysis: Korean Experiences

Hosts:

	Title	Name	Organisation	E-mail
Host:	Dr.	SoEun Ahn	Korea Environment Institute(KEI)	seahn@kei.re.kr
Co-host:	Dr.	Hyun No Kim	Korea Environment Institute(KEI)	hnkim@kei.re.kr

Abstract:

The Korea Environment Institute (KEI) has developed an "integrated analytical framework" based on the impact pathway analysis (IPA) for the assessment of environmental policy or development project to provide comprehensive information for rational decision-making. This session plans to share the experiences from integrated assessment and primary research on the valuation of ecosystem services in Korea. In addition, we introduce the Environmental Valuation Information System (EVIS) which is an online-database operated by KEI which provides meta-information regarding the economic values of environmental goods and services collected from the valuation studies in Korea. This session begins with describing the integrated analytical framework and reporting main results from the case study of economic assessment for water provisioning service. Next, two original studies would be presented; one is associated with the economic valuation of change in the quality of aquatic ecosystem services using choice experiments and the other is related to the estimation of economic value of urban green space using hedonic price method. Finally we report the on-going effort for the economic assessment on the health effects, mortality of

respiratory diseases, of PM2.5 based on IPA framework.

Goals and objectives of the session:

Providing a place for sharing the experience of ES valuation and its use for policy assessment in Korea and exchanging the ideas between participants

Related to ESP Working Group/Natioanl Network:

TWG 7 – Economic & Monetary valuation

II. SESSION PROGRAM

Date of session: Wednesday, 10 October 2018

Time of session: 11:00 – 12:30

Time	First name	Surname	Organization	Title of presentation
11:00-11:15	SoEun Hyun No Choong-Ki	Ahn* Kim Kim	Korea Environment Institute	Introduction(host) An Integrated Analytical Framework using EVIS and Impact Pathway Analysis
11:15-11:30	Honglim SoEun Hyun No	Lee Ahn Kim*	Korea Environment Institute	Introduction of Korean environmental valuation database: Environmental Valuation Information System (EVIS)
11:30-11:45	Hyun No	Kim*	Korea Environment Institute	Analysis of Change in the Quality of Aquatic Ecosystem Services: Choice Experiment Approach
11:45-12:00	Jin Ok	Kim*	Korea Environment Institute	Estimation for Economic value of Urban Green Space Services Using Hedonic Price Method: the Case of the Apartment Complex in Jeonju
12:00-12:15	Yoon Rang SoEun	Cho Ahn*	Korea Environment Institute	Economic Assessment of Health Effects of PM2.5 based on Impact Pathway Analysis in Korea
12:15-12:30			Final discussion	

Note: All presentation includes brief Q&A (about 3~5 mins); * indicates the presenter

III. ABSTRACTS

Abstracts are clustered based on the last name of the authors. First authors are presenting authors unless indicated otherwise.

1. Type of submission: Abstract

T. Thematic Working Group sessions: Invited speaker abstract only : T7 - Integrated Assessment to the Valuation of Environmental and Ecosystem Service via Impact Pathway Analysis: Korean Experiences

An Integrated Analytical Framework using EVIS and Impact Pathway Analysis

Authors(s): SoEun Ahn, Hyun No Kim, Choong-Ki Kim
Affiliation: Korea Environment Institute Korea Environment Institute, Korea, Republic Of
Contact: seahn@kei.re.kr

Considering a complex pathway of impacts from environmental policy or development project through abiotic and biotic mediums and environmental services to the end-point receptors such as ecosystem services and human health, these linkages should be integrated and analyzed in an inclusive framework to provide comprehensive information. Since 2016, the Korea Environment Institute (KEI) has developed an 'integrated analytical framework' based on the impact pathway analysis (IPA) by linking the unit values of environmental goods and services to the quantified physical impact to support decision-making. The information on the unit values are mainly derived from Environmental Value Information System (EVIS) and the information on physical impacts to the end-point receptors are examined from the various case studies conducted in Korea. This presentation describes the integrated analytical framework developed and reports the main outcomes from the case study conducted in 2017 where the economic values of water provisioning services were estimated by the water basins in Korea.

The case study estimated the water yields from each ecosystem type in Korea, which are then aggregated into 4 main water basins using InVest water yield model. Next, we computed the water consumptions for different usages such as agricultural, industrial, household and ecological uses by water basins based on the proportion, in average, of each use to the total quantity of water yields between 2003 and 2010. The unit values for each use by water basins were estimated where the water prices were utilized for the industrial and household uses, the Residual Value Method (RVM) for the agricultural use and the meta-information from EVIS for ecological use. All unit-value information was converted to

KRW/m3 in 2010. Finally the estimated water quantities by water basins and usages were multiplied by corresponding unit values to compute the total economic values. The InVest water yield model found out that the forest and agricultural land contributed about 60.0 and 26.6% of total water yields in Korea, respectively. Summary of the main results from this case study is presented in Table below.

Table. Estimated Values of Water Provision Service by Water Basin and Usages in Korea

Water Bain	Estimated Water Yields (Mm^3/year)	Estimated Water Quantities by Usages (Mm^3/Year, 2009)			
		Agricultural	Industrial	Household	Ecological
Han	26,228,091	6,116,614	398,926	2,139,730	17,572,821
Geum	11,685,821	3,143,604	88,487	624,230	7,829,500
Nakdong	19,539,590	4,830,348	581,287	1,036,429	13,091,525
Yeongsan-Seomjin	12,222,918	3,559,805	101,019	372,739	8,189,355
total	69,676,420	17,650,371	1,169,719	4,173,128	46,683,201
	-	Unit Values (KRW/m^3, 2010)			
		Agricultural	Industrial	Household	Ecological
Han	-	290.8	513.1	733.7	20.3
Geum	-	340.0	561.2	805.7	10.6
Nakdong	-	303.7	901.5	737.4	14.9
Yeongsan-Seomjin	-	326.5	575.7	857.8	3.1
	Values (million KRW/year, 2010)				
	total	Agricultural	Industrial	Household	Ecological
Han	3,918,533	1,784,903	211,516	1,564,776	357,338
Geum	1,707,347	1,079,166	50,436	494,489	83,256
Nakdong	2,959,595	1,471,190	523,309	769,749	195,347
Yeongsan-Seomjin	1,447,366	1,053,674	59,874	308,752	25,066
total	10,032,841	5,388,933	845,135	3,137,766	661,007

Note: 1$ is approximately corresponding 1,250 KRW in 2010

Keywords: Integrated assessment, Impact pathway analysis, Environmental Valuation Information System (EVIS), Valuation of water provision service

2. Type of submission: Abstract

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Introduction of Korean environmental valuation database: Environmental Valuation Information System (EVIS)

Authors(s): Honglim Lee, SoEun Ahn, Hyun No Kim

Affiliation: Korea Environment Institute Korea Environment Institute, Korea, Republic Of

Contact: hllee@kei.re.kr

Ecosystem enriches human life by providing diverse ecosystem services. However, it is hard to evaluate the value of ecosystem services due to its nature of non-market characteristics. In many cases, environmental values are not taken into account in the development planning or policy-making process that affects the environment, which hinders rational decision-making and causes indiscriminate destruction of ecosystem. In this context, several environmental valuation databases have been developed for the purpose of supporting rational decision-making by providing information on environmental values. In Korea, EVIS (Environmental Valuation Information System) has been developed for the same reason.

EVIS, developed by Korea Environment Institute (KEI) in 2011, is an online-database that collects and summarizes the values of environmental assets/services from the previous studies in Korea. It contains the value estimates of environmental impacts on various receptors such as human health, physical or intangible assets as well as ecosystem. As of now, about 1,350 value estimates from 382 valuation studies are summarized in the EVIS, and 60% of them are related to ecosystem sector. EVIS categorizes the ecosystem values into 8 individual ecosystems and 19 ecosystem services which allow users to apply easily when it comes to the assessment of environmental impacts in decision-making. This classification of EVIS is believed to support the monetarization process in "Integrated assessment framework via impact pathway analysis" which is the policy evaluation framework that KEI intends to establish.

EVIS can be used in various environmental valuations, not only by applying benefit transfer but also by using meta-regression analysis to estimate unit values. As examples of environmental valuation with EVIS data, there are studies on estimating recreational value of natural environment(Ahn, S. and J. K., Kim, 2006), wetland values(Ahn S. and B. H., Rho, 2007) and rural amenity values(Lee, H. L. et al., 2015) by using meta-regression benefit

transfer method. In addition, EVIS data is also used to derive unit values by water usages for valuating water provisioning services, and these value estimates support integrated assessment carried out by KEI (Kim, H. N., 2017)

Keywords: EVIS, Valuation database, Ecosystem services, Value estimates, Korea

3. Type of submission: Abstract

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Analysis of Change in the Quality of Aquactic Ecosystem Services: Choice Experiment Approach

Authors(s): Hyun No Kim,
Affiliation: Korea Environment Institute Korea Environment Institute, , Korea, Republic Of
Contact: hnkim@kei.re.kr

Water is one of the most important, essential, and valuable factors for human life and is a vital element in the maintenance of healthy aquatic ecosystems which provide humans with many beneficial services. A few of these services, for example, would be associated with controlling water quality from waste discharge, managing water level from flood and storm water, and supplying various kinds of recreational activities such as fishing, swimming, and boating etc. Because of growing recognition of the importance of water and aquatic ecosystem services, governments have been seeking policies/strategies to enhance or sustain the reliable supply of water related ecosystem services (ES). In order to design such a sustainable management scheme, however, it is necessary to understand the economic values of the various ES. Since most of these services are not associated with economic markets, implementing such analysis requires employing non-market valuation techniques which are methods to assess the value of goods and services that are not transacted in formal economic markets.

This study examines households' preferences for change in the quality of aquatic ecosystem services. This study measured households' perceptions about various ecosystem services provided by water resources in a stated preference mechanism to estimate the value of quality changes and their linkage to water use charges. I used a pivot-style experimental

design approach in developing the choice experiment. In empirical estimation I applied econometric approaches that permit flexible structures in error components of the utility function. The results indicate the presence of heteroscedasticity across choice alternatives. I also find that MWTPs (marginal willingness to pays) for the improvement of aquatic ecosystem services are substantial. This result would be of interest to water managers and policy makers tasked to design and implement future strategies to secure healthy aquatic ecosystems in similar environments.

Keywords: aquatic ecosystem services, stated preference methods, pivot-style experimental design, choice experiment,

4. Type of submission: Abstract

T. Thematic Working Group sessions: Invited speaker abstract only : T7 - Integrated Assessment to the Valuation of Environmental and Ecosystem Service via Impact Pathway Analysis: Korean Experiences

Estimation for Economic value of Urban Green Space Services Using Hedonic Price Method: the Case of the Apartment Complex in Jeonju

Authors(s): Jin Ok Kim,
Affiliation: Korea Environment Institute Korea Environment Institute, Korea, Republic Of
Contact: jokim@kei.re.kr

The urban green space provides various services such as making the housing environment pleasant and providing space for leisure activities of the residents. However, due to the economic growth through industrialization and urbanization, the national income and leisure time has increased but the urban ecosystem has been damaged and the quality of the residential environment has decreased. In order to restore the degraded urban ecosystem and improve the quality of the residential environment, the government has been implementing various projects and policies such as urban park construction to secure urban ecological space. Therefore, it is necessary to estimate the economic value of urban green spaces are required to provide the basis for decision making for the conservation and management of urban green space.

This study estimate the economic value of urban green space services by applying hedonic price method to apartments in Jeonju-si, Jeollabuk-do, Korea. This study select total 4 types

of urban green space including the green space within apartment complex, besides mountain, river, and urban park for analysis. The apartment price data is constructed in two types. One is the actual transaction data provided by the national statistics, and the other is the data collected from the survey of residents of apartment.

As a result of estimating hedonic price function considering spatial dependency, in both samples, the price of apartment increase as the area of green space within complex is larger and the distance to the urban park is closer. Also, in the survey sample, the price of apartment increase as the distance to the river is closer and has a river view. Therefore, residents of apartment in Jeonju are most likely to prefer river, urban park, and green space within complex. This result can be used as a basis for establish the Jeonju green space plan and implement the project.

5. Type of submission: Abstract

T. Thematic Working Group sessions: Invited speaker abstract only : T7 - Integrated Assessment to the Valuation of Environmental and Ecosystem Service via Impact Pathway Analysis: Korean Experiences

Economic Assessment of Health Effects of Particulate Matter (PM2.5) based on Impact Pathway Analysis in Korea

Authors(s): Yoon Rang Cho, SoEun Ahn,
Affiliation: Korea Environment Institute Korea Environment Institute, Korea, Republic Of
Contact: yrjo@kei.re.kr

The Impact pathway analysis is an approach where economic benefits and costs are estimated by following the pathway from human activity via quality changes in environment to physical impacts on receptors. In terms of air quality and human health effect, the impact path can be expressed as tracing from the source of emission, through quality change in air, to mortality or morbidity. In this study, we examined the link between the concentration of PM2.5 in the air and mortality of respiratory diseases and assessed economic costs associated with it.

The outline of this study follows: First, the scope of the analysis was determined including geographical area, target population, and health-end point. The baseline air pollution level

was set up as the annual average concentration level of PM2.5 in 2015. The geographical scope was limited to the metropolitan area, which is consists of 79 counties and the health end-point was defined as the mortality of respiratory disease caused by the short-term exposure of PM2.5. Subject population for the analysis is divided into the all-age-group and over 65-years-old group. Second, the appropriate concentration-response (CR) function was selected from the existing meta-analysis to calculate the number of premature deaths (Y) due to the pollution level of PM2.5 in the base year of 2015. Third, economic costs of the base year are estimated multiplying the value of statistical life (VSL; 1,014,130,000 KRW based on 2015 in Korea) by the number of premature deaths in 2015.

The results show that the number of premature deaths caused by respiratory diseases for all-age-group due to the short-term exposure to PM2.5 was estimated as 1,202 people and corresponding economic cost was computed as 1,219 trillion KRW. The number of premature deaths for over 65-years-old group was estimated as 1,376 with the economic costs of 1,395.5 trillion KRW.

Keywords: Health Effect, Economic Assessment, Impact Pathway Analysis, Mortality, PM2.5