

ENVIRONMENTAL IMPACT ASSESSMENTS OF AGRICULTURAL PROJECTS IN KOREA

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I. Introduction

Economic, social, and environmental changes are inherent to any development efforts. While the ultimate aim of development is to bring about positive changes, it can often lead to negative changes as well. The linkages between agricultural development and the environment are rather complex. The environmental effects of agricultural production can be both positive and negative. Agricultural production can serve environmental benefits in the areas of : i) amenities and cultural functions, ii) biodiversity function, and iii) physical and conservation functions (flood control, erosion prevention, etc.). Agricultural production can have detrimental effects as well. Improper use and poor management of agro-chemicals and livestock waste can cause water, soil, and air pollution while poor agricultural practices, overgrazing, and deforestation can lead to land degradation.

Much of the land currently under agricultural use is in a state of deterioration due to improper planning, implementation and management for non-agricultural purposes. Most development projects invariably result in many far-reaching ecological changes. Some of these development projects serve benefits to the human population, while others threaten the long-term sustainability of the environment.

With the nation's growing economy, combined with the rising personal income level and the operation of the local government

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system, various development projects are being facilitated in Korea. These projects include the creation of industrial and residential sites, and massive-scale regional development projects for specific areas (Ministry of Environment(MOE), 1997).

The Third National Comprehensive Development Plan (1992-2001) includes in its content the Metropolitan Area Development Plan (MADP) for seven metropolitan areas. This development plan is aimed at balancing regional development and decentralizing the national land development strategy. The contents of MADP include project planning for the following matters (Lee, J., 1995):

- i) Land use for the likes of industrial, residential, leisure and recreational facilities.
- ii) Allocation of metropolitan public land for the development of transportation facilities, water supply and sewage facilities.
- iii) Construction of solid waste treatment and disposal facilities.
- iv) Tourism development and environmental protection programs.

In addition, the Third National Comprehensive Development Plan includes national land enlargement programmes. Reclamation and landfill programmes are planned for the areas of 1,180km² over the period of 1989-2001. Approximately two-thirds of the total planned areas for the reclamation and landfill programmes are for agricultural use, i.e., food supply.

Moreover, after the revision of the National Land Use Management Act (NLUMA) in August 1993, the direction of national land use has shifted from 'conservation and control' to 'the mitigation of land use control'. Based on the revised NLUMA, the number of land zone categories was reduced from ten to five; namely, the urban region, semi-urban region, agricultural region, semi-agricultural region, and the natural environmental conservation region. The result is that the land use regulation system of NLUMA has weakened more than ever. Thus, future development activities can be undertaken with much more ease, and consequently inappropriate land use and subsequent environmental pollution will likely be encountered.

All these future development projects will have serious negative impacts on the environment in terms of amenities, habitats and ecology. Hence, there has arisen a dire need to review environmental impacts of administrative plans and development projects more than ever.

In order to predict environmental impacts of development activities and to provide an opportunity to mitigate negative impacts and to enhance positive ones, the environmental impact assessment (EIA) procedure was developed. This assessment procedure was formulated and initiated in the 1970s by the U.S.A.

The EIA is a management tool for planners and decision-makers. Environmental assessment is now accepted as an essential part of development planning and management. The adoption of EIAs will enable countries to plan water and land use in an integrated manner, avoiding irreversible environmental damages. This would in turn lead to higher economic benefits and sustainable resource use (FAO, 1995). Thus, it is necessary to reinforce the EIA system in Korea in order to reduce detrimental effects and enhance positive effects of various future development projects.

There are a number of research papers concerning the EIA system in Korea. However, very few concern the EIA system on agricultural projects, which may be due to the fact that the EIA system has mainly focused on large scale, non-farm level projects. The main objectives of this paper are to review current problems and issues involving EIA systems on agricultural projects in Korea and to discuss possible avenues to promote the functions of EIA on farm level applications. In the next chapter, the development process of EIA in Korea is briefly discussed. The following chapters discuss the problems and issues of EIA on agricultural projects and discuss possible ways to promote EIA functions in agricultural projects. Finally, suggestions and conclusions are made to further promote the EIA systems on agricultural projects in Korea.

II. Development of Environmental Impact Assessment in Korea¹

1. Introduction of the EIA System

In Korea, the EIA system is utilized as a means to prevent environmental

¹ This chapter is based on the Ministry of Environment (1997).

pollution which may be caused by various development projects. In planning and implementing a development project, the project director should devise measures to reduce potential environmental damages and maintain the environmental status quo.

The EIA system was first introduced in Korea with the enactment of the Environmental Preservation Act in December 1977. The system was set in motion with the legislation of "Regulations on the Preparation of EIA" in February 1981.

With the upgrading of the Environmental Administration to the ministerial level in 1990, the previous Environmental Preservation Act was divided into a number of separate laws. Matters concerning the EIA were incorporated into the Basic Environmental Policy Act, which was enacted in August 1990.

Since its inception, the EIA system has improved in Korea by expanding the scope of projects and taking local opinions into consideration. In spite of these improvements, however, problems regarding the system's effectiveness have surfaced. The EIA is often prepared simply as a mere procedural requirement and the decisions reached at prior consultations are not implemented faithfully. Against such a backdrop, the Environmental Impact Assessment Act was enacted as a separate law on June 11, 1993 to rectify these problems. The Act was put into effect on December 12, 1993.

With rising personal income levels and the strengthening and growing importance of the local government system since 1995, there has been a growing concern over the acceleration of environmental destruction due to regional development plans such as leisure /recreation facilities. Consequently, the Environmental Impact Assessment Act was revised on March 7, 1997 to increase efficiency of the system. Major features of the new law are as follows (MOE, 1997):

First, the local governments are encouraged to make aggressive efforts to protect the environment. Those development projects which are not subject to the EIA are required to undergo the EIA by municipal or provincial regulations to minimize destruction of the environment.

Second, the EIA will be conducted a second time to devise measures to reduce the environmental impacts of accidents which are unexpected at the time of the initial EIA and prior consultation.

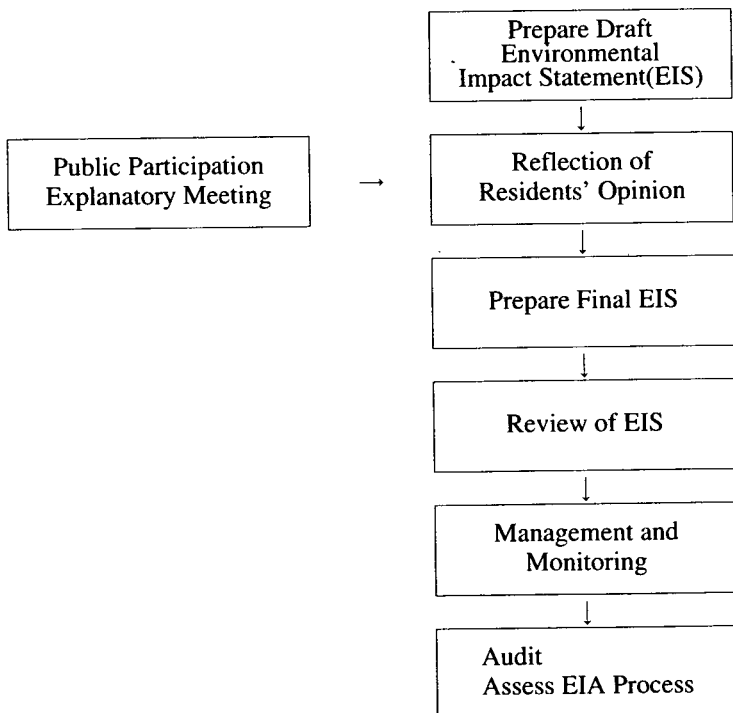
Third, the Korea Environmental Technology Research Institute was expanded and reorganized as the Korea Environment Institute, which specializes in the reviewing of EIA documents, as well as the development and distribution of assessment techniques.

Fourth, operators of wastewater discharging facilities, who violate the agreement on the degree of pollutant concentration in emissions made at a prior consultation, are subject to additional charges for the violation so that agreements at the initial consultation will be faithfully implemented. Moreover, those who prepare false EIA reports will be subject to criminal punishment.

2. EIA Procedure

The procedural steps of EIA in Korea are simplified in Figure 1. Details will be discussed in the next chapter.

FIGURE 1 Flow Diagram of EIA Process in Korea



III. Issues and Problems of EIA System in Agricultural Projects

1. Projects Subject to EIA

The Environmental Preservation Act enacted in December 1977 limited the scope of projects subject to EIAs to urban development, creation of industrial sites, and energy resource development conducted by government administrative agencies.

With the enactment of the Basic Environmental Policy Act in August 1990, the number of development areas subject to EIA increased to 15 with the addition of river use and development and others under the Enforcement Decree of the Act. Finally, with the enactment of the Environmental Impact Assessment Act in June 1993, construction and installation of military facilities were enforced to become subject to the EIA, expanding the number to 16. The Enforcement Decree of the Act was revised in April 1995, under which the number of EIA development areas increased to 17 (covering 63 unit projects) with the addition of sand, mud, and mineral collection (Table 1).

TABLE 1 EIA-obligated Projects

- 1) Urban development
- 2) Industrial complex development
- 3) Energy development
- 4) Construction of harbors
- 5) Roadway construction
- 6) Water resource development
- 7) Railroad construction
- 8) Airport construction
- 9) River-use and canal construction
- 10) Reclamation and landfill
- 11) Tourist resort development
- 12) Sports facility construction
- 13) Development of mountain areas
- 14) Development of special areas
- 15) Sewage/Waste treatment facilities
- 16) Installation of military facilities
- 17) Sand, mud, and mineral collection

Source: Ministry of Environment (MOE, 1998)

Agricultural projects obligated to the EIA can be categorized as: a) water resource development- reservoir and weir, b) reclamation and landfill, and c) sewage/waste treatment facilities- livestock manure treatment.

Agricultural projects of reservoir, reclamation and landfill are subject to the Rural Improvement Act, while the project of livestock manure treatment facilities is subordinate to the Act relating to Treatment of Sewage, Night Soil, and Livestock Management.

2. The Range of EIA

Because EIA is determined on the grounds of the duration, area (location), and volume of the development projects to be assessed, it has become difficult to consider environmental variables such as ecological sensitivity and present pollution levels into the overall assessment. Thus, small-scale development projects with large-scale impacts on surrounding environments can be excluded from assessment.

According to the statutes of the EIA, assessments of agricultural projects are undertaken only according to its size or the amount of pollution emission (Table 2). The EIA-obligated projects of reservoirs, reclamation and landfill are determined by size, whereas the assessment of livestock manure treatment facilities are determined by the amount of waste emission. The development project of reservoirs over 200 hectares is obligated to undergo the EIA, while reclamation over 100 hectares and landfill over 30 hectares are also obligated. However, such large development projects have seldom occurred in Korea (Table 3 and Table 4).

On the other hand, livestock manure treatment facilities have to undergo EIA only when waste emission is over 100 kiloliters per day, which is equivalent to over 20,000 pigs, or 4,500 dairy cows. However, a large livestock farm may be partitioned by several nominal owners, thus large livestock farms can always avoid the EIA. In reality, there are only a few large livestock farms that own approximately 20,000 pigs or 4,500 dairy cows, but they are recycling the livestock wastes as fertilizer.

The establishment of small-sized projects have some advantages in itself, but technical inspection of such projects are

TABLE 2 Agricultural Projects Obligated to EIA

Reservoir, Weir	Over 200ha (2 million m ²)
Reclamation · Land clearing	Over 100ha (1 million m ²)
Landfill	Over 30ha (0.3 million m ²)
Manure treatment facilities	Over 100 k1/day

Source: MOE(1998)

TABLE 3 Irrigation Facilities Over 200ha

Unit : no. of facilities(%)

Year	Net increase of irrigation facilities over 200ha	Existing irrigation facilities over 200ha	Total irrigation facilities
1990	-2	518(1.5%)	35,389(100%)
1991	2	520(1.5%)	35,141(100%)
1992	1	521(1.5%)	35,070(100%)
1993	-2	519(1.5%)	35,313(100%)
1994	-10	509(1.5%)	36,773(100%)

Source: Rural Development Corporation (RDC, 1995)

difficult in terms of detecting environmental impacts on habitat, amenity and ecology. The exclusion of small and medium-sized projects that may be very detrimental to the environment from EIA gives rise to potential threats to the environment.

3. The Establishment of the Priority Assessment Items (Scoping)

There are 23 assessment items involved with the EIA, according to the Environmental Impact Statement (EIS). These assessment items relate to natural, living, and socio-economic environments (Figure 2). However, the EIAs performed with these items have not fared well in properly assessing projects and their effects on the natural, living, and

TABLE 4 Large Scale Reclamation Projects in Sea/Swamp Areas

Project status	Region	Project period	Development area (ha)	Project cost(100 million won, based on initial period)
Completion	Gyehwado	1974-1979	2,467	125
	Sapgyochun	1975-1994	24,573	2,355
	Seosan	1980-1995	16,077	19,260
	Gimpo	1980-1991	3,767	19,100
	Daeho	1980-1996	7,700	1,856
	Youngsankang II	1976-1998	20,700	3,532
On construction	Youngsankang III	1985-2004	11,000	8,136
	Hongbo	1991-2001	8,100	2,223
	Saemankeum	1991-2004	28,300	20,247
Planning	Youngsankang IV *	-	45,767	19,600

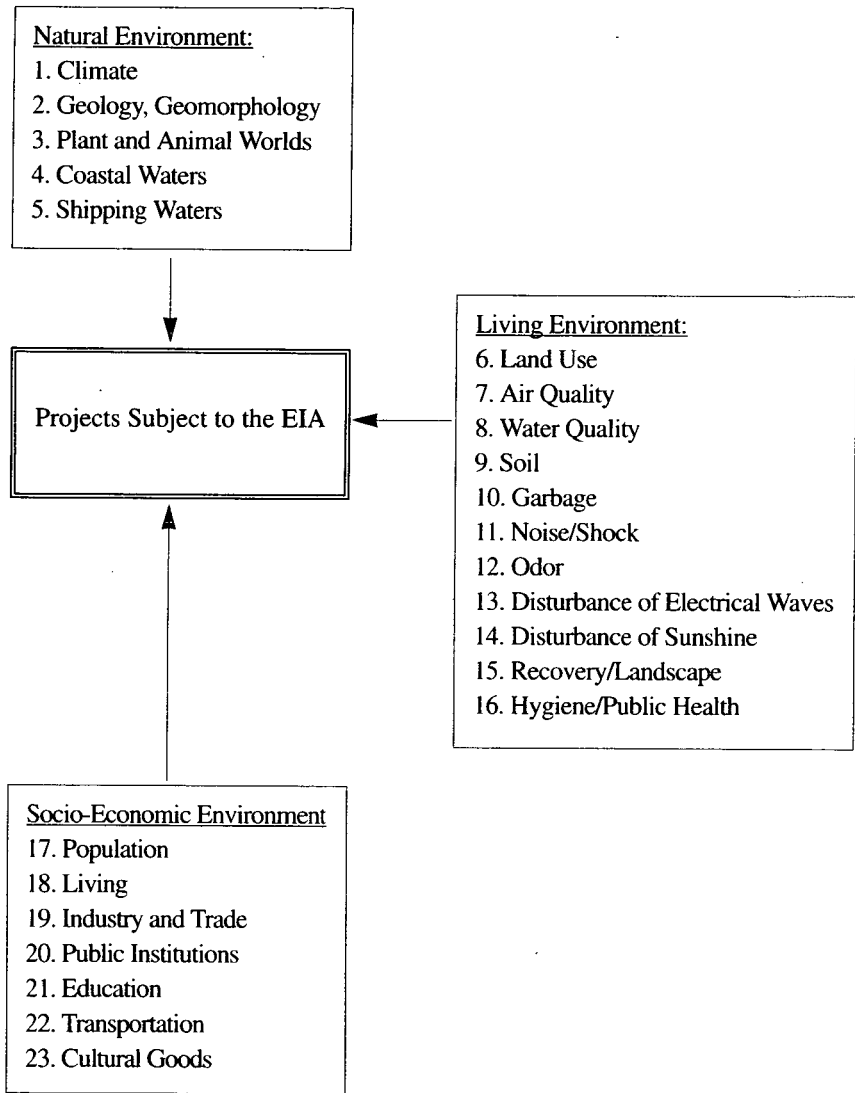
* Reclamation project in Youngsankang IV area has been cancelled as of July 16, 1998 by the Ministry of Agriculture and Forestry.

Source: 'The Hangyoreh' daily newspaper in Republic of Korea, July 16, 1998.

socio-economic environments. Although the actual text of the Environmental Impact Statement (EIS) is quite verbose, the 23 assessment items are insufficient for valid assessment. For example, development projects planned for environmentally sensitive areas such as water resource supply areas, reservoir regions, natural environmental conservation areas, and marine product conservation areas, are all evaluated with the same criteria as other general projects.

Furthermore, assessment costs are generally not included in project budgets, thus assessments are conducted with insufficient funding. The results, therefore, prove to be neither accurate nor purposeful. These problems were addressed at the announcement of the Environmental Impact Assessment Cost Calculation Standards on May 27, 1994. Subsequently, on May 30, 1994, the "priority assessment items" were identified and incorporated into the regulations concerning

FIGURE 2 Environment Factors to be Examined in the Framework of the EIA



Source: MOE(1998)

the EIA documentation. Some key points of the standards are as follows:

First, priority assessment items were selected for each type of project, and assessment methods for each priority item were suggested. The priority assessment system was designed to ensure that assessments would be accurate and to simplify the EIA preparation and review.

Second, the standards for calculating assessment costs were established. Costs are now calculated for each of the assessment items, and later summed together and included in the overall project budget (Annex 2). This calculation scheme was designed to encourage project undertakers to set aside adequate funding for assessment and to discourage assessment contractors from submitting extremely low bids and conducting sloppy assessments (MOE, 1997).

Guidelines of the EIA law prescribe the focal environmental factors for each project type. By way of further details, priority assessment items established for agricultural projects are categorized in Table 5. The categories are subject to some alterations according to the project applicant's own assessment. In general, the focal environmental factors that effect agricultural projects are water quality, habitat, land use, soil, geomorphology, climate and air quality.

Agricultural projects such as reclamations and landfills have potential impacts on coastal and shipping waters, and the socio-economic environments of estuaric/marine communities. Thus, these factors need to be considered as well in the scoping of agricultural projects. Table 6 prepared from JICA (Japan International Cooperation Agency) presents the criteria for initial scoping of agricultural development projects. Also, Annex 3 presents the issues and special considerations for environmental assessment along with each environmental criteria/items for EIA of agricultural projects. These tables can be considered as master criteria checklists for initial scoping of agricultural projects.

4. Public Participation

One of the most important procedures of EIA is the survey and the collection of opinions from local residents. The Basic Environmental Policy Act enacted in August 1990 included provisions for the release

TABLE 5 Priority Assessment Items of EIA in Agricultural Projects

	Items	Reservoir, Weir	Reclama- tion, Landfill	Manure Treatment Facilities
Natural Environment	Climate	o		
	Geology, Geomorphology	o	o	
	Plant and Animal Worlds	o	o	
	Coastal Waters			
	Shipping Waters	o	o	o
Living Environment	Land Use		o	
	Air Quality			
	Water Quality	o		o
	Soil		o	o
	Garbage			o
	Noise/Shock			o
	Odor			
	Disturbance of Electrical Waves			
	Disturbance of Sunshine			
	Recovery/Landscape	o		
	Hygiene/Public Health			o
Socio- Economic Environment	Population			
	Living			
	Industry and Trade			
	Public Institutions			
	Education			
	Transportation			
	Cultural Goods	o		

Source: Chun(1994).

of EIA documents to the general public as well as the establishment of public presentations and hearings concerning the EIA. However, EIA presentations and public hearings were held only when the mayor, county chief or head of the district office deemed it necessary, which was very rare. The EIA system was criticized by citizens for being a mere formal procedure and ineffective in collecting opinions of local residents.

TABLE 6 Reference Matrix for Initial Scoping Checklist

Category of Environmental Impact	Main Project Components*								
	IR								
	New	Rehb.	D.A.	L.L.	S.R.	L.C.	N.S.	D.R.	S.C.
I. Socio-economic Issues									
(1) Social Issues									
1. Planned agricultural settlement						△	◎		
2. Involuntary resettlement				◎	◎			◎	
3. Substantial changes in way of life				◎	◎		◎	○	○
4. Conflict among communities and peoples	○	△	○	○	○		○	○	○
5. Impacts on native people				○	○		○	○	
(2) Demographic Issues									
1. Population increase				○	○		○		
2. Drastic change in population composition	○		○	○	○		◎	○	○
(3) Economic Activities									
1. Relocation of bases of economic activities	○		△	◎	○	○	◎	○	△
2. Occupational change and loss of labor opportunity	○	△	△	○	○		○	○	○
3. Increase in income disparities	○	△		○	○		○		○
(4) Institutional and Custom Related Issues									
1. Adjustment and regulation of water or fishing(riparian) rights	◎	○	△		◎			◎	
2. Changes in social and institutional structures	○	△		○	○	○	○		◎
3. Changes in existing institutions and customs	△				○	○	◎		◎
II. Health and Sanitary Issues									
1. Increased use of agrochemicals									
2. Outbreak of endemic diseases	○	△	○		△		○	△	
3. Prevalence of epidemic diseases	◎	○	○	△	△		○	△	
4. Residual toxicity of agrochemicals									○
5. Increase in domestic and other human wastes							○	○	
III. Cultural Property Issues									
1. Impairment of historic remains and cultural assets	○	△	○	○	△	△	○	◎	
2. Damage to aesthetic sites				○	○			○	
3. Impediment of mineral resources exploitation								○	

* Main project components are abbreviated hereunder:

I.R. : Irrigation D.A. : Drainage L.L. : Land clearing and Levelling

S.R. : Sea/swamp reclamation L.C. : Land consolidation N.S. : Newland settlement

D.R. : Dam and reservoir S.C. : Substantial changes in farming system

New : New project Rehb. : Rehabilitation

· Relation between project component and potential environmental impact ;

◎ = Closely related, ○ = normally related, △ = occasionally related.

(continued) Reference Matrix for Initial Scoping Checklist

Category of Environmental Impact	Main Project Components*								
	LR		D.A	L.L	S.R	L.C.	N.S.	D.R.	S.C.
	New	Rehb							
IV . Biological and Ecological Issues									
1. Deterioration or degradation of vegetation				⊙			△	○	
2. Negative impacts on important or indigenous fauna & flora	○	△	○	⊙			△	⊙	
3. Degradation of ecosystem with biological diversity	○	△	○	⊙			△	⊙	
4. Proliferation of exotic and/or hazardous species	△		△	⊙			△	○	
5. Encroachment on wetlands									
6. Encroachment on tropical forests	○	△		⊙				⊙	
7. Destruction or degradation of mangrove forests									
8. Degradation of coral reef									
V . Soil and Land Resources									
(1) Soil Resources									
1. Soil erosion				⊙				○	
2. Soil salinization									
3. Deterioration of soil fertility				○					
4. Soil contamination by agrochemicals				○					
(2) Land Resources									
1. Devastation or desertification of land				○					
2. Devastation of hinterland				○			○		
3. Ground subsidence									
VI . Hydrology and Air and Water Quality Issues									
(1) Hydrology									
1. Changes in surface water hydrology	⊙	△	△	○				⊙	
2. Changes in groundwater hydrology	⊙		○					△	
3. Inundation and flood	○	△	△	○				⊙	
4. Soil sedimentation			△	○				○	
5. Riverbed degradation								⊙	
6. Impediment of inland navigation	○							○	
(2) Water Quality and Temperature									
1. Water contamination and deterioration of water quality			△	○			△		
2. Water eutrophication			△	○			△		
3. Sea Water intrusion									
4. Low temperature water								○	
(3) Atmosphere									
1. Atmospheric pollution				△					

Source : Japan International Cooperation Agency (JICA)), 1992, *Guideline for Environmental Consideration on Agricultural and Rural Development Projects.*

To address this problem, the Environmental Impact Assessment Act stipulated an addendum to the Act. The addendum states that when more than 30 local residents demand a public hearing, a public hearing must be called to order so that the opinions of local residents can be collected and reflected in the EIA.

Residents are able to actively participate in terms of voicing their ideas concerning issues dealing with development projects once the draft of the EIA has been completed and publicized. The opinions of the residents are considered in the context of a forum or public hearing after an EIA has been drafted, but oppositions to construction or problems related to site selection are underrepresented in the contents of such forums. Public participation was encouraged in the process of site selection since 1995, but the turnouts have been dismal.

However, there has been one good example of public participation in the assessment process of an agricultural development project. Recently the Ministry of Agriculture and Forestry decided to cancel a reclamation project in Youngsankang IV area, mainly due to the opposition voiced by local residents (Table 4). This is the first resignation of a large-scale reclamation project by the government since 1974. Table 4 indicates clearly that there has been several large-scale reclamation projects for agricultural use since 1974. In the past, reclamation of land through drainage was very welcomed by the public because the consensus was that the reclaimed land would contribute to the food supply as well as aiding local residents' welfare. Today, the situation has been changed very differently. Since the early 1990s, dis-externalities of reclamation projects have been recognized by local residents. The recognized dis-externalities are as follows: damages to fisheries, damages to estuary and marine habitats as well as communities, degradation of ecosystems, degradation of aesthetic landscape and riverbeds, etc. In the Youngsankang IV project, local residents and heads of the communities objected to the project very adamantly. Many residents sent opposing letters to the government. Finally, the project was resigned as of July 16, 1998, mainly due to local residents' opposition as well as shortages in project funds. This resignation is expected to affect other large-scale reclamation projects which are currently under construction.

5. Review of EIS

Review of EIS is based on "A Task Practice Regulation in Examination or Consultation of EIS". The registration administration (the Ministry of Environment) passes the EIS on to the examining administration which reviews it for content. The review concentrates on the objectivity of the study, because it is prepared on a commission basis. The examining administration obtains the position of both the EIA commission, which is a division of the Ministry of Environment, and the Korea Environment Institute. However, examinations are characterized by their lack of range in EIA, a lack of validity in the composition of EIA reports, underrepresentation of residents' opinions, and the lack of validity in the evaluations of the projects, etc.

If the EIS is shown to be inadequate, it is sent back to the project applicant with a request for improvements or additions. If necessary, the examining administration itself can conduct field research (material collection, analyses), in order to formulate its own judgement regarding certain questionable issues, but this approach is seldom used in practice. Also, the EIA examinations reflect weaknesses in terms of information gathering, methodologies, technical scientific accuracy, and objectivity. These weaknesses are attributed to the lack of qualified expertise of those conducting the EIAs.

6. Monitoring and Post-surveys of Environmental Effects

After the EIS was separated from the Ministry of Environment, the Ministry discontinued the monitoring of development plans derived by project developers to see if the measures for reducing environmental damage were being carried out. The Minister of Environment had no means of enforcing the application of reduction measures on project developers.

According to the new EIA mandate, the monitoring of development projects is now primarily the task of the authorizing administration, which has greater accessibility to adequately monitor projects than the examining administration. Furthermore, the commissioning body is obligated to post plans of execution on the

construction site, and to adhere to it.

An important element of the new mandate is the authority given to the examining and authorizing administrations to order the discontinuation of any project if it had commenced development prior to the completion of the EIA, which is a serious disregard of the agreement between the government and the project developers.

The duration of post-surveys on environmental effects is five years from the commencement year of the development project. Given that the operation period of any given reservoir or manure treatment facility lasts relatively longer than five years, the duration of post-surveys need to be extended beyond the stated five years.

7. Prior Consultation

There exists a prior consultation system, similar to the EIA between the Ministry of Environment and other ministries. Under the prior consultation system, there are two types of consultations : Those under applicable laws and those under “Regulations on the Environmental Review of Administrative Plans and Projects”.

Prior consultation under applicable laws covers large-scale project plans, such as the designation of sites for the development of residential areas, and alterations to national land use plans, which have the potential for great impacts on the environment. This system was established in order to prevent environmental pollution and the destruction of the natural environment by enforcing project applicants to consider environmental impacts from the early stages of the project such as site selection and construction planning.

There are ten laws which require prior consultation for the approval of a development plan. Under the ten laws, plans for changes in land use are subject to the National Land Use and Management Act. Decisions regarding national parks are subject to the Natural Park Act. Urban planning for metropolitan areas and mining development plans are subject to prior consultation as mentioned in the Natural Environmental Preservation Act.

In order to minimize the environmental impact of development projects which are not subject to the EIA or other applicable laws, “Regulations on the Environmental Review of Administrative Plans and Projects” was enacted by the Prime Minister’s Decree in January

1993. The regulations were then revised in June 1995. The revised law provided consultation procedures that were simplified from before. These regulations call for prior review of small-scale development projects, which are not subject to an EIA, if they are on sites in environmentally sensitive or ecologically vulnerable areas.

Development projects that entail changes in the purpose of land use or the designation of land for development in the areas where the need for environmental preservation is high are required to be consulted by the Minister of Environment or heads of the Regional Environmental Offices. A development project or projects encompassing an area of land larger than 1,000sq. meters in the areas designated as ecologically important or valuable by the Minister of Environment in consultation with related ministers, mayors and governors in the jurisdiction, are required to be consulted by the Minister of Environment or with heads of the Regional Environmental Offices before such projects are approved and finalized (MOE, 1997).

IV. Promotion of EIA in Agricultural Projects

1. Execution Times and Political Function of the EIAs

Public meetings and the execution of the EIA on agricultural projects are held just preceding the implementation or approval of the projects. This means that, public meetings and the execution of the EIA take place after the "master plan" for project implementation is already derived. The "master plan" contains contents regarding the scale and size of a project, the economical effect of a project and the selection of techniques. Hence, the results of EIAs have no bearing on the master plan and the alteration of project scale.

If we consider that a change in the "master plan" in accordance to the EIA on agricultural project is needed, such as a change in the project plan, site and/or project validity, the EIAs should be administered before confirming the site and master plan of the project. This means that EIAs should focus not only on environment preservation but also on policy decision-making so that it can be incorporated into the planning process of development projects.

2. Adoption of a Screening to Select Evaluation Objects

While the evaluative effort of an EIA is defined and measured in terms of scale and size, screening has to be applied to small and medium-scale projects as well. Small and medium-scale projects have the ability to cause just as much or even more damage to the natural environment as their large-scale counterparts.

Depending on the screening results, a plan which determines the execution or non-execution of an EIA must be developed. Even in the case of small-size facilities which may have serious environmental impacts such as small-sized livestock manure treatment facilities, environmental assessment via screening, technical inspection, and alternative regulations are necessary.

3. Introduction of Scoping to Establish the Major Evaluation Items

The process of scoping is introduced in order to establish major evaluation items for the EIA. The major items must be established upon consideration of regional features and sensitivity of the local environment. These evaluation items can be shown to the public for viewing and discussion to ensure a more accurate evaluation. During the phase of establishing major evaluation items, problems concerning the development project should be presented in addition to problems related to regional features.

4. Improvement of the Public Participation System

Allowing the general public to participate in the process of EIAs would most effectively resolve the problems of public objection during the implementation of any agricultural project. In order to expand the range of public participation, the possibility of involving public opinion from the planning stage until the post-management of EIA results should be examined.

5. Accurate and Objective Review of EIS

Above all, the purpose of an EIA on agricultural projects should be to

accurately and thoroughly investigate or evaluate the environmental impacts that any development project may bring forth. The EIS should provide an objective view and include information regarding the quality level of the project. Hence, the following should be considered: The establishment of evaluation items according to project site environmental features, the negative impact on environmental property, the appropriateness of an environmental effect survey, the concrete and inclusive descriptions of the evaluation objective, the environmental sensitivity of the project sites or region, the creditable prediction of the post-effects including time, space and location, investigation/evaluation of alternatives, the accuracy of data used, and public opinion.

6. Surveying Post Environmental Impacts and Making Results of Public Information

Surveying post environmental impacts of agricultural projects should be emphasized from the early stage of project operation until its completion. This will help prevent environmental accidents caused by project management. Surveys of post environmental impacts should be conducted periodically and the survey results should contain the following items: quality measurements of environmental variables such as water, soil, and air quality, number of habitats prior to and following the project, monitoring results, the name of the environmental management organization on the projects, and the costs of management and operation.

V. Suggestions and Conclusion

The aim of any EIA should be to facilitate sustainable development, in which beneficial environmental effects are maximized while adverse effects are ameliorated or avoided to the greatest extent possible. If EIA is incorporated from the beginning of the project it will help selecting and designing projects, programmes or plans with long term viability and, therefore, improving cost effectiveness.

In order to ensure the credibility of EIAs on agricultural projects, an overall improvement of EIAs in Korea is deemed

necessary. First, the recognition of EIAs and their functional purpose by developers or administrators needs to be heightened.

Second, the contents of the EIA system should be expanded and improved. In particular, all environmental impacts should be analyzed and predicted as accurately as possible. Moreover, alternatives should be evaluated objectively.

Third, the impact assessment of a development project entailing environmental problems should be conducted in consideration of the characteristics of the surrounding region, regardless of the type and size of the development project. Necessary EIA factors should also be included.

Fourth, because the EIA system is designed to encourage project undertakers to seek ways of reducing environmental impacts during the course of project planning, a multilateral approach is necessary for effective analysis of the impacts on many areas. However, as the assessment requires expertise in various fields such as natural science, social science, applied science, etc., it is quite arduous to establish a theoretical framework. In particular, future environmental changes need to be forecasted without uncertainties. Continuous research and accumulation of data and information are also needed so that new assessment technologies can be developed and utilized. Also, problems regarding the existing regulations, which concern public hearings, the scope of assessment, and requests for consultations over the EIA, should be addressed (MOE, 1997).

To enable the EIA process to be of maximum benefit, it must be incorporated into the planning process of the country. An EIA method can be applied to not only large-scale development projects but also rural development planning and reforms that cover wide areas or an entire nation. Development planning and reforms can benefit from an EIA by using it to carefully consider the benefits as well as the costs or damages of implementing the plan and reforms ahead of time.

Environmental assessment is appropriate for both site-specific projects and wider programmes or plans that cover wide geographic areas. Modernization programmes, development of new varieties and new technology raise special issues which need to be addressed by the EIA. EIAs on these non-site specific programmes can provide greater opportunities to correct situations where the environment is adversely affected.

EIA was initially used for specific, particularly large-scale, projects such as dams, which have obvious long-term consequences. Now, however, greater attention should be given to the general relationship between development and the environment. The relatively insignificant actions of many individual farmers may have a much greater impact on the environment than a single construction project. For example, a programme to support small-holder development or small single livestock farming may not warrant an EIA if each scheme is considered in itself. However, an impact within a river basin or in a watershed in the region can be quite significant. A sectoral or basin-wide EIA would enable an assessment of the collective impact of the programme.

It is important that an EIA is not just considered as part of the approval process. Volumes of reports produced for such a purpose, which are neither read nor executed, will devalue the process. A key output of the EIA should be an action plan to be followed closely during implementation and after implementation during the monitoring phase. To effectuate the action plan, the EIA may also recommend changes to laws and institutional structures (FAO, 1995).

ANNEX 1 Number of Development Projects Subjected to EIA

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Total
Total	4	27	48	53	53	69	73	120	212	210	127	149	1145
Urban development	1	9	14	12	10	13	12	27	44	38	21	21	222
Land readjustment				1		1		6	9	11	6	3	37
Development of housing site	1	8	13	10	10	11	12	21	35	25	12	14	172
Others		1	1	1		1				2	3	4	13
Industrial complex siting	1	1	6	4	4	7	12	19	37	26	28	14	159
Energy development	2	12	19	21	15	28	20	24	36	59	5	4	248
Power plant	2	1	2	3	1	1	2	4	5	6	4		31
Power source development		11	17	21	14	27	18	20	31	53	1	4	217
Construction of harbors			3				1	2	5	5	8	7	31
River, water resource development		2	1		4	1		1	3	3	9	5	29
Forest development												3	3
Reclamation and Landfill		3	1	2	2	3	5	9	10	16	1	2	54
Sports facility construction							7	24	45	23	5	4	108
Tourist resort development			2	5	10	9	7	1	8	11	12	12	77
Airport construction					1		1	3	3	4	1	1	14
Railroad construction					3		1	2	4	9	5	6	30
Roadway construction					1	2	2	2	8	8	13	47	86
Environmental facilities	11		2	5	2	5	5	6	9	8	19	23	84
Sewage treatment					1	2	1	2	6	4	12	15	43
Solid waste			1	2	1	3	4	4	2	2	7	8	34
Excrement treatment	11		1	3					1	2			18

Source : Heo, J.(1997).

ANNEX 2 Project Cost vs. EIS Preparation Cost, 1981-1992

Unit : million won(no. of cases)

Project \ Cost	Project cost (million won)	EIS cost (million won)	Ratio %* (EIS cost/ project cost)
Urban development	152,039(171)	26.42(97)	0.08(74)
Industrial complex siting	269,213(128)	38.27(57)	0.14(46)
Energy development	490,819(22)	90.63(15)	0.08(13)
Construction of harbors	314,856(16)	38.08(7)	0.11(6)
Roadway construction	516,172(29)	38.27(14)	0.16(12)
River, water resource development	138,169(13)	30.08(9)	0.04(7)
Railroad construction	808,764(15)	43.64(19)	0.07(11)
Airport construction	43,291(5)	47.50(2)	0.05(1)
Reclamation and Landfill	83,916(37)	49.92(27)	0.18(23)
Tourist resort development	73,622(57)	41.76(16)	0.17(13)
Sports facility construction	27,652(122)	27.73(39)	0.14(37)
Sewage/Waste treatment facilities	17,089(18)	41.31(15)	0.82(10)
Average	183,049	37.38	0.20

* EIS cost ratio out of project costs are calculated from the cases in the parenthesis in the 3rd row, which are part of the cases in the 1st and 2nd rows.

Source: Lee, Jae-Woon et. al.(1994)

ANNEX 3 Technical Criteria for EIA of Agricultural Development Projects

Environmental Criteria/Item	Special Consideration for Environmental Assessment
<u>Socio-Economic Issues</u>	
<u>Social Issues</u>	
New land settlement	Impact on local people, land allocation, tilting and inheritance, settle selection, cropping system and land use, family planning, special considerations for the socially weak including ethnic minorities and aged persons
Involuntary settlement	Resettlement plan on natural, human-made and social environment; host population, resource use patterns, and use of area by non-residents; formal legal and customary use-rights; social infrastructure and public health conditions
Substantial changes in way of life	Age and gender; ethnic/tribal groups; socioeconomic stratification; traditional system of affected people
Conflict among communities and people	Potential existence of those who may be victimized by or otherwise oppose development; identification of aspirations and concerns of related people, and rural organizations
Impact on natives	Indigenous communities, minorities - their aspirations, way of life and knowledge of local ecosystems
<u>Demographic Issues</u>	
Population increase	Rapid increase/decrease of population due to migration construction labor
Drastic change in population composition	Insufficiency of social infrastructure or alteration of social institutions
<u>Economic Activities</u>	
Relocation of bases of economic activities	Provisions formulated on the basis of the consideration of aspirations and abilities of affected people; possibility of emergence of refugees or those otherwise victimized
Occupational change and loss of labor opportunity	Same as above
Increase in income disparities	Adequate allocation of development benefits to landless farmers, tenant farmers and small-scale farmers is essential
<u>Institutional and Custom-related Issues</u>	
Adjustment and regulation of water of fishing rights	Water and fishing rights in study area
Changes in social and institutional structures	Existing formal and informal rural organizations; factors of formation, function and value structure
Changes in existing institutions and customs	Same as above

(Continued) Technical Criteria for EIA of Agricultural Development Projects

Environmental Criteria/Item	Special Consideration for Environmental Assessment
<i>Health and Sanitary Issues</i>	
Increased use of agrochemicals	Monoculture and continuous cropping using agrochemicals extensively
Outbreak of endemic diseases	Consideration of increasing inflow of human and animal population into project area due to development and adequacy of sanitation and hygiene
Prevalence of epidemic diseases	Same as above
Residual toxicity of agrochemicals	Monitoring and predicting toxicity; defining agrochemical usage criteria
Increase in domestic and other human wastes	Monitoring population change and animal husbandry activities
<i>Cultural Property Issues</i>	
Impairment of historic remains and cultural assets	Comprehensive countermeasures are essential based on identification of distribution, value, preservation policies and existing conservation measures for these assets
Damage to aesthetic sites	Same as above
Impediment of mineral resource exploitation	Preliminary consultation and investigation on predicted locations of mineral resources and their impacts if exploited
<i>Biological and Ecological Issues</i>	
Deterioration or degradation of vegetation	Important habitats like tropical forests, mangroves, etc. should be studied
Negative impacts on important or indigenous flora and fauna	Reduction or extinction of important or indigenous species
Degradation of ecosystem and biodiversity loss	Ecosystems like wetlands, tropical forests etc. should be considered carefully
<i>Soil and Land Resources</i>	
<u>Soil Resources</u>	
Soil erosion	Upland crop cultivation on sloping lands, light soils such as volcanic ash soil, and removal of vegetation during rainy or windy seasons are conducive to erosion
Soil salinization	Salinization is liable to occur in areas where availability of irrigated water is limited and water with high salt content is used for irrigation, and arid or semi-arid areas, and in coastal zones
Deterioration of soil fertility	Removal or burning of vegetation cover, soil erosions, cultivation of crops with high nutrient absorption capacity and continuous cropping of non-leguminous crops may result in deterioration of soil fertility

(Continued) Technical Criteria for EIA of Agricultural Development Projects

Environmental Criteria/Item	Special Consideration for Environmental Assessment
Soil contamination by agrochemicals	Continuous and excessive use of agrochemicals with high residual toxicity is a major cause
<u>Land Resources</u>	
Devastation or desertification of land	Sensitive ecosystem needs consideration
Devastation of hinterland	Disappearance of forests used as fuelwood resources and population increase leads to increased adverse effects to surrounding areas, resulting in destruction of ecosystems and land degradation
Ground subsidence	Design of structures with careful attention to potential subsidence
<u>Hydrology, Water and Air Quality Issues</u>	
<u>Hydrology</u>	
Changes in surface water hydrology	Seasonal changes in river water level and discharge before and after implementation of a project should be carefully examined
Changes in groundwater hydrology	Deep tubewell development and over-exploitation of groundwater, irrigation development planning in areas of poor drainage
Inundation and flood	Changes in run-off coefficients caused by development of new irrigation and drainage canals and conversion of forests to upland fields
Soil sedimentation	Development activities involving vegetation alteration and large-scale earth surface disturbance must be reviewed carefully
Riverbed degradation	Reservoir construction can bring about river degradation
Impediment of inland navigation	Development activities such as construction of reservoir, intake facilities and land clearing
<u>Water Quality and Temperature</u>	
Water quality deterioration	Impacts on downstream areas of waste disposal into waterways
Eutrophication	Increased application of fertilizer, livestock development and settlement programs require careful review
Sea water intrusion	Reduction of river discharge during the dry season due to irrigation water intake and construction of reservoir and diversion weir should be carefully reviewed
<u>Atmosphere</u>	
Atmospheric pollution	Careful review of impact of aerial spray of agrochemicals, large-scale clearing and establishment of livestock and agro-processing facilities around residential area is necessary

Source : JICA, 1992, Guidelines for Agricultural and Rural Development.

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