Climate Change and Sustainable Development: The Response from Education in Korea

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I. The national context: Sustainable Development of Korea

The Republic of Korea has achieved rapid economic growth since the 1960s but is experiencing a serious level of ill-balanced development in terms of environmental preservation and social integration. Its development-oriented economic growth resulted in pollution load that exceeded the environment's auto-purification capacity and increased conflicts between regions, classes and generations. Consequently, the level of Korea's national sustainability was evaluated to be weak (PCSD, 2006).

In the economic sector, Korea's economic size has increased and people's income has risen substantially as shown in its GDP increase. However, lack of consideration of environmental issues in the economic development and industrialization process led to a weak socio-economic structure in terms of pollution prevention comprising industrial structure, production and consumption patterns and people's attitudes.

In the environmental sector, there are limits in improving the environment as post-pollution treatment is much more focused than pollution prevention. Environmental pressure has exceeded the receiving capacity of the ecosystem, thus threatening the sustainability of national environment and increasing conflicts between development-oriented policies and environmental movements.

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In the social sector, Korea's 'compressed economic growth' caused the increase of social conflicts due to a concentration of wealth and lack of social welfare system such as employment, public health and welfare. This proves that social basis for sustainable development cannot be established without an equitable distribution of wealth.

In short, the Republic of Korea has a relatively large population for its territorial size and its environmental pollution load is high as the industrial production activities are high energy and resource consuming. Therefore, Korea is vulnerable to environmental pollution. Social conflicts related to development and preservation thus frequently arise and sometimes in duplication with those between income classes or regions.

To cope with these national situations, it was necessary to manage economic, social and environmental sectors in a comprehensive and integrated way when formulating and implementing national policies. On the occasion of the President's declaration of the 'National Vision for Sustainable Development' in June 2005, the Republic of Korea drove forward the formulation of the National Strategy for Sustainable Development (NSSD) which had been partially carried out from 2000 and finalized the NSSD in October 2006 through multi-stakeholder consultations including government departments, civil society organizations and business (PCSD, 2006).

II. ESD Overall Conception

In the Republic of Korea, how are the conception of Education for Sustainable Development (ESD) and the relation between sustainable development and education defined? What has been researched on ESD? In which direction, has the ESD been developed? This section deals with these questions based on documents such as national strategy for ESD and reports on ESD from Korean National Commission for UNESCO (KNCU) and Local Sustainability Alliance of Korea (LSAK) which is the former Korea Council for Local Agenda 21 (KCLA21).

1. The beginning of discourse on ESD in Korea

The history of discourse on ESD in Korea has begun with the UN Conference on Environment and Development (1992) held in Rio de Janeiro where the Agenda 21 was adopted. The chapter 36 of Agenda 21 deals with 'education, public awareness and training.' People who participated in the conference introduced the conception of 'Environmentally Sound and Sustainable Development' into Korea and tried to share and deliberate on the idea (Ku, 1996). The 'Symposium on Environment Policy for ESSD' was held in 1993. Two years later, the book of 『Sustainable Society and Environment』 was published by a study group of experts from various fields and the book introduced the conception of sustainable development (SD) and SD-related subjects. Choi (1995), one of the authors of the book, suggested as below;

Up until now, we have talked about education about the environment, education for the environment, and education in the environment but we should replace 'environment' with 'sustainable development.' The education should develop from acquisition of the knowledge on sustainable development to establishment of the value and action skills for sustainable development (Choi, 1995).

In 1997, it is suggested that the relationship between the conservation of the environment and sustainable development should be emphasized as one of the future directions of EE program (KNCU, 1998). Thus, KNCU co-developed a pilot environmental education program with UNDP, implemented with forty participants from community-based organizations, and then published an environmental education guide book based on the reflection of the results of the program.

Many local governments have made their own local agenda 21s in Korea. While sharing the conception or vision of sustainable development (SD), the local agenda 21s showed different features based upon the local situations. The

Korean Council for Local Agenda 21 (KCLA21), a network of local agenda 21s, was organized in 2000. The Ministry of Environment (2002) conducted the 『Research on development of EE implementation strategy for sustainable development in Korea』 where formal/informal EE strategy and indicators for sustainable development were developed. An international seminar on 'Quality environmental education in schools for a sustainable society' was held in Chong-ju National University of Education by the Korean Society for Environmental Education in 2004. In the seminar, the participants from abroad introduced the United Nations Decade of Education for Sustainable Development (UN DESD) and the activities of the Environment and School Initiatives (ENSI), and suggested possible ESD approaches such as action research while the participants from Korea presented about the situations of EE in Korean school systems (Lang, et al, 2004).

2. National Strategy for UN DESD

The role of the Presidential Commission on Sustainable Development (PCSD) is to deliberate the direction of national plans for sustainable development and issues concerning the establishment and implementation of policies on water, energy, local agenda 21, major international environmental convention and follow-up to the World Summit on Sustainable Development (WSSD). Since 2003, PCSD has taken responsibility for UN DESD activities. The Committee of International Cooperation and Education in its 3rd term (2003-2005) and the Committee for Implementation of Sustainable Development in its 4th term (2006-2008) have played a focal role for UN DESD in Korea. Within the PCSD, discussion about implementation of the DESD began in February 2004, and was later carried over to the research project for developing the 『National Strategy for DESD』 in 2005 (Lee & Choi, 2008). The researchers comprising experts from universities, schools, environmental NGOs and KNCU made a draft of national strategy for the UN DESD. The draft was shared during numerous meetings with stakeholders, including government officials,

local Agenda 21 representatives, teachers, NGO representatives and researchers. Such a process contributed to information sharing and triggered discussions and debates on ESD among stakeholders involved. Based on this consultation process, which lasted a total of 14 months, the implementation plan for the DESD was established and announced by PCSD in 2006.

The research project was carried out based on the conception of ESD suggested by the draft of UN DESD Implementation Strategy (UNESCO, 2004)and suggested the relation between sustainable development and education as follow:

The vision of education for sustainable development is a world where everyone has the opportunity to benefit from quality education and learn values, behavior and lifestyle required for a sustainable future and for positive societal transformation (UNESCO, 2004).

Education should be a core strategy of sustainable development because the 'people' is the most important factor for driving sustainable development (Lee et al, 2005).

3. Current status of ESD in Korea

Lee et al. (2005) highlighted the current states of ESD in Korea - in schools, the society, the private sector and higher education institutions.

(1) School: ESD in school can be implemented through curricular activities and extracurricular activities. The excellent cases are discovered among the whole school initiatives such as Environmental Conservation Model Schools, School Forest Project, UNESCO Associated Schools Project, alternative schools, ESD Model School, and so on.

(2) Society: Through local Agenda 21, the SD-related educational activities are being carried out. The ESD in social organizations includes environmental education, human rights education, re-unification education, peace education,

and so on.

(3) Private sector: The role of private sectors in ESD is very important, since it can support partnerships among school, society, organizations and companies in many ways. Such partnerships are not so active yet.

(4) Higher educational institutions: In most higher education institutions, there are no explicit approaches to implement ESD yet. There are some programs to prepare EE experts such as the Graduate Program of Environmental Education at the Seoul National University.

Many challenges to the implementation of successful ESD initiatives in Korea are identified. First of all, the awareness level of teachers is low. Most teachers in Korea do not know much about sustainable development or ESD. A survey measuring teachers' awareness of sustainable development and ESD showed that 68% of the school teachers answered that they had never heard of those terms in 2004 (Lee et al., 2005). Teachers also reported that there have been limited opportunities for training and education on ESD-related themes. The university entrance examination system is another obstacle in changing educational system more sustainable.

4. Objectives and recommendations for ESD

The national ESD vision of Korea is 'Sustainable development and sustainable society leaded by education.' In the vision, everyone learns the values, action competencies, and lifestyles for sustainable development, which lead to a sustainable society (Lee, et al, 2005).

The objectives of national ESD are as follows:

Both individuals and groups share the vision and high awareness for SD.

Both individuals and groups are equipped with the capacity for learning and implementing SD.

Multi-stakeholders of ESD have strong partnerships and solidarity through

active communication.

Both individuals and groups participate actively in creating SD and a sustainable society.

The national ESD implementation strategy also includes 8 policy recommendations and each policy recommendation includes current status, problems, and suggestions for improvement.

The policy recommendations are as follows:

Construct the legal and administrative base for ESD

Construct the national implementation system

Establish and implement the vision sharing plan to improve the (E)SD-related awareness through a participatory approach

Expand the opportunities of education and training for building capacity for SD

Establish research and development system for supporting ESD

Strengthen the solidarity and communication among ESD stakeholders

Promote the integration of SD and education through practical action

Establish the monitoring and evaluation system for implementation and improvement of ESD

5. Initiatives for ESD in Korea

The conceptions and visions of SD and ESD in Korea have been shared and strengthened among the leading bodies such as PCSD, KNCU and KLCA21. They have been carrying the national ESD plans into practice. For example, in 2006, attempts to integrate ESD into the national curriculum revision process were carried out by PCSD in cooperation with experts in education. Efforts to integrate ESD into the curriculum involved many features such as incorporating ESD into subjects and extracurricular activities. In 2007, the PCSD launched the first Sustainable Development Week from 4 to 10 October in cooperation with the Ministry of Environment, the Korea Business Council on Sustainable

Development (KBCSD) and the Local Sustainability Alliance of Korea (LSAK). The programs of the week consisted of sharing best practices of EE, forum on national climate change strategy and forum on SD at local level.

The establishment of a Regional Centre of Expertise for ESD (RCE) was also an innovative initiative for ESD in Korea. Tongyoung, a harbor city in the southern end of the country, was designated as a RCE by United Nations University (UNU) in 2006, and has established the RCE Commission responsible for planning and implementing SD/ESD activities. Many planned programs are related to the preservations of the city's maritime heritage. One elementary and one secondary school have been designated as ESD research schools.

As a leading agency of UN DESD, KNCU (2007) published a guide on ESD for teachers in cooperation with Tongyoung RCE. KNCU also organized the 'International Forum on ESD' with KEEN, LSAK and ESD-J in 2007 of which objectives are discussing ESD perspectives, strategies, and tools among NGOs, governments and academies. In the international forum, ESD experiences and practices of each country were shared: community-based, policy-based, and formal or alternative school education. In 2008, KNCU published a booklet titled 『Education for Sustainable Future』 consisted of UN DESD implementation plan, ESD toolkit (McKweon, 2002), and teaching and learning materials on ESD (KNCU, 2008). Asia-Pacific Centre of Education for International Understanding (APCEIU), one of UNESCO organizations, conducted a project 'Development of EIU Programmes & Teaching/Learning Materials' of which core themes were cultural diversity, sustainability, human rights, peace and globalization (APCEIU, 2007).

LASK (former KCLA21) changed its 'Environmental Education' sub-committee into 'Sustainable Education' sub-committee in 2005, and implemented a workshop on ESD where most participants agreed that promoting processes of the local agenda 21 are the very sorts of ESD practices and it is necessary to strengthen the partnership and promote participation of all the stakeholders toward sustainability. In its re-organization process later, LASK dismantled the Sustainable Education sub-committee and decided to integrate the conception of

ESD into the all initiatives instead. In the meanwhile, there is no research or evaluation regarding how ESD is approached and implemented in policy yet.

6. ESD and education research

In Korea, research on ESD has been carried out mainly by environmental education researchers and teachers. This is due to the close relation between ESD and EE. For example, if you search research articles with such keywords as 'Sustainable Development & Education,' 'Education for Sustainable Development' or 'Education for Sustainability' through online databases, you could find the articles are mostly written by EE researchers. Many of the research documents are deliberations on how we could integrate sustainability or SD into EE as contents or orientation and how we could deepen discourse and widen practices of EE with the concept of SD. For example, according to the Ministry of Environment (2002), the vision of EE is to 'build a civil society with literacy and will to participate in for the realization of sustainable society.' In their research titled 『Research on improving support for experiential EE program and Environment Conservation Model School Initiatives』, Lee et al. (2006) proposed that the overall direction of the model schools should be changed for the link to sustainable development from the existing direction to 'help the youth increase awareness on values of environment and develop and disseminate model case of environment preservation efforts' to 'develop, disseminate and promote model cases of environment education towards sustainability.'

Most education research documents on ESD propose teaching and learning methods or approaches for ESD at schools. There are a limited number of research documents (e. g. Kim, 2006; Ji & Nam, 2007a) which attempt to deepen or refine the very conception or definition ESD. Rather, most research documents are based on the conventional ESD conception or definition by international policy documents such as 'UN DESD Implementation Scheme' (UNESCO, 2004). In other words, many of ESD researchers seem to accept the

conception of SD or ESD suggested in international policy documents as a definite premise upon which they seek for appropriate methods to implement the conception.

7. Prospect and suggestions

It is expected that the EE community will keep its interests in ESD in Korea. Considering that the conception of sustainable development began as 'Environmentally Sound and Sustainable Development (ESSD),' it is convinced that EE community may lead discourse on ESD in Korea. However, we still have a long way to go. Now, it is necessary to deepen and widen the conception of ESD and to get all the educational fields and stakeholders involved into the discourse or practices on ESD or SD.

ESD in Korea is now at the crossroads and the trajectory will differ depending on social, environmental, political and economic situations as well as the contribution of educational research and practices. In the 'Dynamic Korea', there have been a lot of chances for all of the society to participate in social learning process to deliberate and discuss on sustainability. Such controversial issues on 'Saemangeum project, the biggest land reclamation project in the world (2006),' 'Siting a nuclear waste disposal facility in Buan (2005),' 'Oil spill by Samsung Heavy Industries (2007),' 'Importing American beef suspicious of mad cow disease and candlelight movement (2008),' 'Great Canal Project (2008),' 'Low Carbon, Green Growth (2008),' 'North Korean nuclear weapons program and rocket (2009)' have became hot topics of debates all over the country. Such topics can be used for more inventive social learning in ESD if educational researches could interpret these phenomena from a view of sustainability and the government could provide the public with space to learn from each other and with materials to deliberate on. Reflections on the relation between Lee administration's policies/perspectives on SD and ESD will be discussed in the following sections.

In addition, the conception and practices of ESD in Korea should be rooted in

relevant unique cultural, philosophical and historical backgrounds of Korea. This means that we should share the vision and method of SD/ESD with international community while seeking impetus and methodology for SD/ESD in our root.

III. Sustainable Development (SD) and Education for Sustainable Development (ESD)

It is widely recognized that education plays a vital role in socio-economic development of Korea. Looking at the changes that have taken place in the Republic of Korea over the past 50 years, it is clear that the driving force for improvements came from gains in knowledge and technologies, and the transformation of value systems through education. Education plays a crucial role in development but we need to find the type of education that can bring about the changes needed for sustainable development. The important thing is the quality of education, and it is necessary for students to learn what truly matters. In order to steer society towards sustainable development, we must ensure that the values and skills required for sustainability are integrated into the various levels of education. Here the role of education in pursue of sustainable development in Korea will be reviewed based on policy documents and research articles.

1. National vision and strategy for sustainable development

The official 『National Strategy for Sustainable Development (NSSD) of the Republic of Korea』 is the very first national strategy integrating economic, social and environmental policies (PCSD, 2006). The NSSD came into being as the official through the Vice-Ministerial Meeting on October 27, 2006 and the Cabinet Meeting on October 31, 2006. The NSSD of the Republic of Korea was

launched to mainstream sustainable development into the government's national policy.

The PCSD (2006) systematically organized 48 implementation tasks under 5 strategic policy areas for the goal to enhance integration of economic, social and environmental policies. The five strategic policy areas are 'sustainable natural resource management', 'social integration,' 'sustainable economic growth,' 'climate change' and 'institutionalization and education.'

Education (ESD) has its role to consolidate the foundation for the enforcement of the implementation plans. Education in Korea is supposed to play a crucial role in ensuring the social foundations for sustainable development by raising public awareness, educating youth and adults, and training professionals (Table 1).

<Table 1> National Strategy for Sustainable Development (NSSD) of the Republic of Korea (PCSD, 2006)

Goal	Enhance integration of economic, social and environmental policies			
Strategic Policy Areas	Sustainable natural management (17 tasks)	Social integration and national health promotion (10 tasks)	Sustainable economic growth (13 tasks)	Dealing with climate change and global environmental issues (5 tasks)
Implementation Tasks	◦ Integrating development and preservation ◦ Sustainable water management ◦ Biodiversity ◦ Sustainable natural disaster prevention	◦ Promoting women's economic activities ◦ Promoting the development of farming and fishing communities ◦ Establishing a social conflict management system	◦ Establishing a sustainable energy system ◦ Promoting a sustainable production system ◦ Safe management of hazardous chemicals and disposals	◦ Establishing national climate change policies ◦ Bridging global digital divide
	Institutionalization and education of sustainable development (3 tasks) ◦ Developing sustainable development indicators and an evaluation system ◦ Consolidating a foundation for sustainable development ◦ Action plan for education for sustainable development			

2. Action Plan for Education for Sustainable Development

In order to promote implementation of SD at the national level, the NSSD includes the 'Action plan for ESD' prepared through public-private deliberation. This action plan comprises programs to consolidate a foundation for ESD, raise public awareness, expand sectoral education programs and establish a network (PCSD, 2006).

1) Establish a foundation for education for sustainable development
Objective: Formulate a comprehensive plan for national ESD
Action Plan
Formulate a comprehensive plan to systematically promote ESD
Extend support to education programs for sustainable development carried out by local authorities, industry and civil society organizations

2) Raise public awareness of sustainable development
Objective: Reinforce promotion and research support for sustainable development
Action Plan
Formulate and implement a promotional plan for sustainable development
Achieve full expansion through organizing a launching ceremony of a national 10-year education strategy for sustainable development
Increase support to sustainable development-related policy research
Find best practices of sustainable development, disseminate them and put them into trial operation at the national level

3) Expand sectoral education programs and reinforce cooperation
Objective: Expand education programs and establish a network for reinforcing sustainable development capacity
Action Plan
Expand and integrate ESD in school curriculums

Carry out education programs on sustainable development for public servants, citizens and companies
Support the creation of a training program for experts in sustainable development
Establish a sustainable development network in private, public, industrial and academic sectors
Lead ESD in North East Asia and reinforce international cooperation

IV. Education for Sustainable Development (ESD) and Climate Change Education (CCE)

ESD can contribute substantially to addressing key sustainable development challenges. To successfully confront issues like climate change, the re-orientation of education is necessary. Indeed, introducing sustainable development issues into all areas of education will help to make education more relevant. Engaging learners in contemporary questions such as climate change brings education closer to life and enhances the learning experience by stimulating motivation and interest.
In the ESD of Korea, the topic of climate change has been considered as one of key themes (Table 2). The topic of climate change has been included in some school subjects: e.g., Climate (Geography), Energy (Science) and Global warming (Environment). However, any national curriculum or guideline for climate change education is not established yet.

1. Climate Change Education (CCE) in Korea

Korea is striving to better inform and educate the public about global warming and climate change to achieve a national consensus on Korea's commitment towards the international efforts for the issue of global climate

change. Many agendas have been set to encourage industries and individuals to voluntarily take part in the efforts. As such, systematic educational programs are targeted accordingly by source, means and stage. Education on climate change functions as a means of informing the public about the adverse effects of and preventive measures for climate change. By educating children and youth about the important role they can play in preserving the environment, they will carry into their adulthood a changed perspective and attitude towards the environment that is lasting and make a positive impact on future greenhouse gas reduction.

The 'Environment' is being instituted as an independent subject in the secondary school curriculum to ensure systematic education on energy, climate change and other environmental issues, whereas the environment is introduced in relation to each subject at the primary school level. Moreover, the Korean government has encouraged the compiling and publishing agencies to modify or add entries regarding the climate change and/or 'green growth' in textbooks.

The government is also providing grants to thirty-two primary schools and junior high schools nationwide that have been designated as 'Research schools for energy conservation education.' Furthermore, government-approved textbooks are put together and distributed to schools to be used during discretionary activity hours to develop educational programs on energy conservation and climate change during classes and extracurricular activities. Energy conservation field trips, lectures and regional community campaigns are additional programs that are being implemented.

2. Green Growth: Korea's new strategy

Korean government is now making its every effort to promote a green economy with the 'green growth' strategy. 'Low-carbon, green growth' has become the Lee Myung-bak administration's new paradigm for national development. The president has presented it as a strategy to overcome the global economic crisis with job creation.

Korea has not been well-prepared for energy and environmental problems in the process of rapid economic growth and industrialization. As climate change and a natural resource crisis became a real threat, those problems have emerged as major factors in determining our future. Moreover, they are considered crucial factors for sustainable growth, especially at a time when joblessness continues to rise and a powerful new growth engine has yet to emerge to take over the information technology industry.

Ban Ki-moon, the United Nations Secretary-General, and many supporters of the green growth policy believe that this strategy can tackle two of the most vexing challenges of our time - climate change and sustainable economic growth.

Recent global crises require a drastic reassessment of how we define progress. An opportunity exists to usher in a new model-one that provides for greater social equity, economic accountability, and environmental sustainability. UNESCAP's Green Growth attempts to assist in making this vision a viable reality.

The Green Growth approach is a new policy focus which is aimed at helping Asia-Pacific countries to achieve progress towards sustainable development and poverty reduction. The Green Growth approach seeks to harmonize the two imperatives of economic growth and environmental sustainability by promoting fundamental changes in the way societies produce and consume (UNESCAP, 2006).

Based upon a needs assessment of the Asian Pacific region, UNESCAP proposed five focus areas as the most important policy measures to enhance green growth:

Promotion of sustainable consumption and production
Greening the market and green business
Development of sustainable infrastructure
Green tax and budget reform
Monitoring eco-efficiency indicators

3. Green Growth and its influence on ESD

Now most governmental supports for ESD or EE have been re-oriented towards so-called 'Green Growth education.' Thus the Green Growth policy in Korea seems to substantially influence ESD and EE practices. Rhetorically, the concept of green growth education is in line with the core of ESD or EE. Jung (2008), the alleged developer of concept of 'green growth' (UNESCAP, 2006), argued that to tackle the challenges of climate change we need to change our worldviews and life-styles as well as to find a way to increase energy efficiency. Such fundamental changes in worldviews and life-styles can be achieved by education. However, the features of green growth policy seem to have less focus on changing life-styles but place most emphasis on economic growth through green technologies or energy efficiency industries. Thus, many of citizen groups and environmentalists are expressing their concerns about some Green Growth policies such as the four major river restoration project. Furthermore, while the concept of 'green growth' harmonizes the two imperatives of economic growth and environmental sustainability, it places less emphasis social equity which is another important aspect of sustainable development. Finally, some Green Growth policies are rather implemented as a 'top-down' approach than based upon the participatory principles of sustainable development. Such processes as multi-stakeholder consultations and consensus-making are essential to make our society more sustainable.

V. ESD and the curriculum

To explain how ESD is integrated in the national curriculum in Korea, we focused on the national policy documents and research articles on ESD in Korea especially related to school curriculum. The review of important policy documents and research papers on ESD showed that there are few research

articles which suggest the ways of incorporating ESD into the national curriculum. However, we could find that there are some reports on 'Environment' subject in the '2007 Revised Curriculum' which suggest guidelines of ESD at national level. To explain ESD in Korean curriculum, therefore, we mainly reviewed policy documents on ESD, '2007 Revised Curriculum' and 'Environment' subject with regard to ESD.

1. Re-orientation of the basic school curriculum

National documents of ESD have recommended that Korean education system needs fundamental change through the re-orientation of school curriculum and whole school approach. For example, PCSD (2005) suggests that ESD should not be approached as an individual curriculum or educational content.

ESD should be approached as the re-orientation of the whole education process not as an individual curriculum or educational content. The whole school initiatives should be encouraged to change the school ethos (PCSD, 2005).
ESD in school can be implemented through the connection with curricular activities and extracurricular activities (PCSD, 2005).

These quotations mean that ESD aims to change school systems rather than a specific curriculum. Such approach can be described as 'whole-school approach.' There are several whole-school projects in Korea that have high potential in supporting ESD. The Environmental Conservation Model School Initiative, School Forest Project and Associated Schools Project Network can be examples of whole school approach in Korea (Lee, 2008a).
Like these initiatives, national documents suggest many different approaches for school reorientation. One of main approaches in Korea is through national curriculum. In the process of revision for the '2007 Revised National Curriculum', the PCSD has recommended that ESD can be included as one of

cross-curricular themes. The themes of cross-curricular learning feature key ideas of ESD such as democratic citizenship education, environmental education, energy education, economics education, consumer education, gender education, human rights education and global understanding education. ESD can readily be used as the framework to coordinate and integrate these themes by serving as an umbrella to link the relevant topics.

It is explained that the approaches to ESD in Korea are not based on subjects but through cross-curricular themes or whole school initiatives.

2. Themes in ESD

The core perspectives and priorities for ESD in Korea were identified based on UNESCO (2004) and then re-identified based upon the social, economic and environmental situations of Korea (PCSD, 2005). These themes can be regarded as the main topics of ESD in Korean national curriculum in the future. The ESD themes in Korea are as follow.

<Table 2> Core perspectives of ESD in Korea (PCSD, 2005)

	Socio-cultural perspectives	Environmental perspectives	Economic perspectives
UNESCO (2004)	◦ Human rights ◦ Peace and human security ◦ Gender equality ◦ Cultural diversity and inter-cultural understanding ◦ Health ◦ HIV/AIDS ◦ Governance	◦ Natural resources ◦ Climate change ◦ Rural transformation ◦ Sustainable urbanization ◦ Disaster prevention and mitigation	◦ Poverty reduction ◦ Corporate responsibility and accountability ◦ Market economy
PCSD (2005)	◦ Conflict resolution ◦ Re-unification ◦ Society renovation ◦ Partnership ◦ Media literacy	◦ Natural resources ◦ Biodiversity ◦ Transportation ◦ Housing	◦ Sustainable production and consumption

Regarding this, the KNCU had already suggested that the notion of ESD in Korea should be further developed according to the national and local needs. Choi (2004) from KNCU wrote 'considering the special political situation of Korea, education for re-unification can be one of ESD elements. Peace education in Korea has always been related to education for re-unification in some way because a peaceful re-unification is one of the most critical elements for the sustainable development of Korea.' Another issue that KNCU is focusing on ESD is education for conflict resolution. The challenge against social cohesion due to the globalization and economic growth is serious than ever before. And desires of public participation in social issues have been increased. However, not only young students but also parents have never received any education on how to resolve conflicts.

3. ESD and CCE in the curriculum

The Korean National Curriculum for grades 1 - 10 is divided into three components: the curriculum with compulsory subjects regulated by the government, subjects selected by each school, and special activities. ESD, in Korea, is suggested to be included through either disciplinary or interdisciplinary approach. ESD is more often recommended through interdisciplinary approaches, however, few national documents and research shows specific ways for such inclusion in national curriculum. For this reason, ESD in curriculum mainly can be seen at the specific subjects which have similar or common themes and contents with ESD. Lee et al. (2005) analyzed the degree to which ESD is included in the subjects of the 7th National Curriculum and the result is as follow.

<Table 3> ESD in Korean curriculum (PCSD, 2005)

Subjects		Number of objectives	Number of ESD objectives	% (related with ESD objectives)
Korean		95	3	3.2
Ethics		22	11	50
Social Studies		34	19	55.9
Technology / Home Economics		35	6	17.1
Physical Education		63	6	9.5
Music		15	5	33.3
Art		8	1	12.5
Optional Subjects	Chinese Characters	49	5	10.2
	Environment	42	42	100

This analysis focused on key ESD content addressed in the existing curriculum and thus indicates the potential for ESD, but does not reflect the ESD approach in teaching and learning contexts. The study found that ESD was most prevalent in the subjects of Environment, Social Studies and Ethics. The 'Environment' is one of the subjects and it is closely related to ESD. Recently, a new revised national curriculum (2007 Revised) of the 'Environment' subject for middle and high schools was announced. In the new national curriculum, some of the contents have been revised to incorporate the changed status of environmental education areas since the last announcement of the 'Environment' curriculum in the late of 1997. Especially, in this new curriculum, the concept of the 'Education for Sustainable Development (ESD)' was incorporated.

In a new revised national curriculum, 'Sustainable Development' and 'Education for Sustainable Development,' which is widespread concept internationally, are considered on the selection of the contents of 'Environment' (MEST, 2007).

In addition, cross-curricular learning or interdisciplinary learning, which

crosses discipline-based subjects, can contribute much to activate ESD (Lee et al., 2005). Cross-curricular learning can take place outside of the systematic curricular structure. Cross-curricular learning encourages the education of the whole person in many areas of societal interest and needs. Since such cross-curricular learning is not main subjects, it stands the risk of being marginalized. At the same time, any relevant contents can be featured in many classes through cross-curricular learning.

To sum up, ESD in Korean national curriculum is recommended to be included not only in disciplinary subjects but also in interdisciplinary learning. The ways to integrate ESD in the curriculum are often seen through such specific subjects as 'Environment.'

4. The citizen's roles and competences of ESD

Ideal citizens described in ESD documents are who have competences to participate actively for a sustainable future. PCSD (2005) suggested that active participation of students should be the most important process of ESD, through which students can improve the awareness, knowledge, understanding, and value of ESD. To promote ESD within the realm of independent and special activities, PCSD recommended the inclusion of ESD contents to promote not only the development of personal knowledge on sustainable development but the idea of societal approaches featuring family, school and society. Lee (2008b) further recommended the development of a variety of special ESD activities that stress critical thinking, participatory decision making, and problem solving.

The competences and skills of students and citizens for sustainable society have been suggested at the EE field. For example, the aim of 'Environment' subject in the revised curriculum is to foster 'environmentally responsible citizens' (KICE, 2006). And the Ministry of Environment (2006) rephrased the aim of EE as to bring up citizens who is suitable for sustainable society, in other words, who understand their roles for sustainable society and act for it.

5. Reflection

Through review of policy documents and research articles on ESD, we found that there are several ways of efforts to initiative ESD at schools. Since most efforts for ESD are made by the experts on EE and environmental educators, we could find that ESD is more explicitly integrated in the 'Environment' subject at school curriculum.

ESD is insufficiently descried throughout national curriculum. According to Lee (2008a), ESD at Korea schools is not apparent yet and does not have any important position at all. She also suggests that it is necessary to find out excellence cases of ESD which show best practices. Ji and Nam (2007a) also suggested the need of a newly defined concept of sustainable development and more emphasis on system thinking in the context of the knowledge-based society in Korea.

As a result, ESD in Korean school curriculum is recommended through ESD-related policy documents and research articles. However, it is necessary to prepare effective ways to incorporate ESD into school curriculum.

VI. ESD and pedagogical traditions

Many of policy documents on ESD mentioned the meanings and directions on ESD but less directly described teaching methodologies or pedagogical approaches. Rather, education research has suggested a variety of ways to incorporate the concept of ESD into school curricula. A group of EE researchers proposed teaching and learning methods of ESD in schools. Some of them suggested the possibilities for interaction between the school and the local community.

The PCSD (2005) recommended that ESD should be approached as the re-orientation of the whole education process not as an individual curriculum or educational content. The PCSD further recommended the development of

new pedagogical approaches for ESD which stress critical thinking, participatory decision making and problem solving.

1. ESD teaching methods

Teaching and learning methods and its impacts on classrooms are rather reported in research papers than policy documents. Ji & Nam (2006a) developed an ESD program with three key teaching-learning strategies such as case study, story telling and project learning, and then reported that those methods could play a key role in the ESD learning process. Ji & Nam (2006b) also reported that cooperative learning methods could encourage discussions among students and respects for other opinions. Lee (2004) developed an ESD project learning model with role-play, investigation and discussions. Kim (2008) developed an ESD program for 5th grade social studies using project learning method. After implementing the program, the author reported that project learning method could build not only learning capacity but also democratic attitudes, decision-making functions, investigation, critical thinking, problem-solving skills, and acceptance of other opinions which are required for the purpose of the Social Studies and ESD.

2. ESD through the whole-school approach

It is alleged that ESD should be approached as the re-orientation of whole education process. Thus, the whole school initiatives can be encouraged to change the school ethos. There are several whole-school projects in Korea that have high potential in supporting ESD such as Environmental Conservation Model School Initiative, School Forest Project, UNESCO Associate Schools Project and alternative schools.

The Environmental Conservation Model School Initiative is a national-level program since 1985. The two-year model school program for environmental conservation supported by the Ministry of Environment. Up to 11th program

(1985-2007), 173 schools in total attended the model schools program. The designated schools receive government grants and educational materials in order to provide best teaching practices to instill students with positive attitudes towards the environment and to encourage environmental conservation in everyday lives of students.

Choi & Choi (2005) carried out an evaluation study for the new directions of model school program in EE. A school evaluation framework was made with modification based on the SUSDE project of Europe and UNESCO Teaching & Learning for Sustainable Future (TLSF) program. The school evaluation framework was used to reveal how well the model schools implement sustainable development education in each of the five areas: formal curriculum, and social, ecological, economic and democratic sustainability. In the study, qualitative and quantitative data were collected mainly based on the operation reports of ten (10) participating schools and then analyzed through the evaluation framework for sustainability. The study revealed the areas where the model schools are already making a positive contribution to sustainable development education and where the schools achieve low accomplishments. The results provided meaningful implications for teachers and governmental officers involved in the model school program in EE.

While the initial goal was to develop model teaching-learning programs for environmental conservation and to systemize environment education by disseminating the programs out to other general schools, the program has been modified to shift emphasis from environmental conservation to sustainability. The research of Lee at al. (2006) proposed that the overall direction of Environmental Conservation Schools should be changed to develop, disseminate and promote model cases EE towards sustainability. Such change in direction may lead to an increase in the participation of schools with strong whole-school ESD programs.

The Associated Schools Project Network (ASPnet) led by UNESCO could be another example of a whole-school approach. The ASPnet started in Korea in 1961 with 4 schools; by 2005 the number grew to 80. These schools cover four

major areas of understanding: international organization, international affairs, inter-cultural understanding, and environmental education.

The School Forest Project is also a good example of the whole-school approach in Korea. The program transforms barren school grounds into environmentally friendly forests or garden areas with a partnership among various stakeholders including students and community members. Since 1999, nearly 700 schools participated as model schools for this initiative.

Research on school forests has focused on exemplary cases and showed educational effects in schools. Jung (2001) studied how to implement EE programs in school forests. And Lee & Kim (2005) showed the effects of school forest on elementary students' awareness of their own school and the nature. The study was intended to investigate effects of building school forests on elementary students, including changes in mental image of their own school, attitude toward the nature and forests, and awareness of their relationship with school forest. The results showed that there were significant differences between two student groups, respectively forest school group versus non-forest school group, in their mental image of school. In the writings of forest school group students, stories about school forests and curiosity regarding the nature were more frequently found than non-forest school group.

Kim (2002) studied how the students' participation in school forest projects influenced their environmental attitudes. Participation in school forest projects is expected to provide students with great opportunities for developing stewardship and further maintaining the strong motivation necessary for enhancing their community's environment. The results implied that youth' participation in school forest activities can help them grow to be citizens who are environmentally responsible and active in community sustainability issues.

3. Interaction between the school and the local community

The needs for school-community collaboration in implementing ESD programs

are found in several policy documents. As one of them, PCSD (2005) suggested to develop and implement ESD programs through the collaboration among researchers, teachers, school administrators, local education board, and local government. The Ministry of Environment (2005), in 『10 Year Plan for Developing Environmental Education in Korea』, suggested that environmental education programs should be implemented in local communities. As one way, community centers can provide ESD programs to foster decision making skills of their members in solving local issues.

One good example of school-community collaboration can be found at Tongyoung, a city in southern coast of Korean peninsula. Tongyoung was selected as the 8th city to have a Regional Center for Expertise (RCE) on ESD sponsored by the United Nations University. Inpyung Elementary School, a model school for ESD, has integrated ESD into existing school curriculum and extracurricular activities through a whole-school approach. With the supports of Tongyoung RCE, teachers at the school developed an objective to increase awareness of harmonious lives through the exploration of the future of the community.

At first, teachers there had difficulty understanding the concept of ESD and in finding where and how to start the integration processes. They participated in workshops and forums with the Tongyoung RCE, consultative meetings with the College of Marine Science of the Gyeongsang National University and the Research Institute of East and West Studies at Younsei University and then developed the objective of increasing awareness of harmonious lives.

To achieve the objective, the school enhanced its ESD curriculum by studying regional environmental, social, and economic issues in order to understand the key concepts and values necessary for regional sustainability. An Eco-School was built in InPyung Elementary School in order to transform it into a sustainable system featuring tree planting, an 'Empty Plate' campaign, and a 'Zero Waste' campaign.

To expand ESD within and outside of the school, the school has training programs for teachers and parents and a research exhibition on the 'Future of

Our Town.' For the exhibition, a team consisting of students, a teacher, and parents researched a subject of importance to Tongyoung's sustainable development. Many efforts of Inpyung Elementary School are closely linked with outside organizations such as Tongyoung RCE, Korean Marine Rescue Center, Fisheries Science Museum, College of Marine Science at Gyeongsang National University and Younsei University. Though still developing, Inpyung Elementary School's ESD initiative is significant as the entire school strives for sustainability.

4. Korean Traditions and ESD

As suggested, the practices of ESD in Korea should be rooted in relevant unique cultural, philosophical, historical background of Korea. While sharing the vision and methods of ESD which are internationally accepted, each country needs to seek methodology for ESD in their own roots. There are educational efforts to incorporate Korean traditional cultures into ESD programs.

For example, Kim (2003) developed a program with cooperative learning based on the spirit of 'Dure' which is one of Korean traditional cultures. 'Dure' was an institution as well as an organization in the late Chosun Dynasty that mobilized farmer's labor intensively when periodic agricultural necessity took place. The formation of 'Dure' was autonomous but the mobilization was mandatory and implemented very strictly. Nevertheless, the operation of 'Dure' was not just focused on the farming labor mobilization but connected to various activities such as instrumental music of peasants, village guardian rituals, and so on. Therefore, 'Dure' was a labor organization of farmers, an autonomous and cooperative guild, and an amusement group (Bae, 2005). The study implied that the program could foster students' learning capacity in collaboration and understanding of others.

Ji & Nam (2007b) investigated cultural aspects of sustainable development in Korean traditional children songs and proposed to use such songs for elementary ESD classes. The Ministry of Environment (2007) developed lesson

plans on traditional foods, traditional ecological knowledge, natural dyeing, and so on in the context of Tripartite Environmental Education Network (TEEN) among Korea, China, and Japan.

As seen above, teaching methods or pedagogical approaches for ESD are rather found in education research than policy documents. A group of EE researchers has shown ways to incorporate the concept of ESD into school curricula and influences on classes. The possibilities for interaction between the school and the local community are also suggested explicitly.

VII. Conclusions

Based upon ten (10) national reports including this paper for Korea, the International Alliance of Leading Education Institute (IALEI) proposed a number of research-based recommendations on Education for Sustainable Development and climate change education at the Seoul Conference in August 2009. Each of the five themes presented in this paper includes three recommendations. The 15 recommendations can be boiled down to the following three overall recommendations:

To develop education that provides citizens with competences to actively manage sustainable development.

To integrate climate change within Education for Sustainable Development

To improve conditions for interdisciplinary learning, provide teachers with the necessary competences and transform Education for Sustainable Development from a low priority to a high priority dimension.

In December 2009, the detailed recommendations will also be presented to a global public, policy-makers and other influential individuals/groups during the 15th conference of parties (COP15) in the UN Framework Convention on Climate Change (UNFCCC) in Copenhagen.

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<초록>

기후변화와 지속가능발전: 교육으로부터의 대응

김종욱, 김찬국, 김남수, 김이성, 김희경

이 논문은 세계 12개국의 주요 사범대학들이 회원으로 참여하는 '세계선도사범대학회의(International Alliance for Leading Education Institute: IALEI)'에서 수행한 공동연구의 일부분이다. 지속가능발전과 기후변화와 관련한 교육계의 현황과 쟁점을 논의하고 대안을 모색하기 위해 진행된 연구에서 각 회원국은 자국에서 발행된 지속가능발전과 지속가능발전교육에 대한 정책 문서나 연구문헌 등을 바탕으로 국가보고서를 작성하였다. 지속가능발전교육(ESD)을 중심으로 논의하면서 기후변화교육을 지속가능발전교육의 틀 안에서 포함하였고, 연구의 범위에 있어 기본적으로 지속가능발전교육과 관련한 학교교육에 초점을 두었다. 이러한 논의를 바탕으로 진행된 이 논문은 크게 다섯 주제 영역으로 구성된다: 지속가능발전교육의 개념 및 정체성, 지속가능발전과 지속가능발전교육, 지속가능발전교육과 기후변화교육의 관계, 지속가능발전교육과 학교 교육과정, 지속가능발전교육을 위한 교육 실천 방식. 이 논문은 이러한 주제 영역에 대한 문헌 분석과 함께 지속가능발전에 대한 연구자들의 해석을 포함하고, 국제비교연구를 바탕으로 제시된 지속가능발전과 기후변화교육을 위한 제언을 소개하고 있다.

【주요어】 지속가능발전, 지속가능발전교육, 기후변화, 세계선도사범대학회의

【Key Words】 Sustainable development, Education for Sustainable Development (ESD), Climate change, IALEI