Journal of Global Environment Engineering, Vol.10, pp.197-206, 2004

Technical Note Report

MECHANISM OF ESTABLISHING THE ENVIRONMENTAL RELATED GRADUATE SCHOOLS AND MAJORS IN JAPANESE NATIONAL UNIVERSITIES -IN THE VIEW OF HIGHER EDUCATION POLICY-

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Abstract

In order to create a sustainable society, it is necessary to establish Environmental Science as an interdisciplinary science. One of the indices of the institutionalization of Environmental Science is the environment-related divisions in universities. Because the discipline of Environmental Science has not been well established yet, there is a gap between ideals and realities about research and education in these divisions. One of the factors that caused the gap is the way these divisions were established. The purpose of this paper is to scrutinize the mechanism of the establishment of environment-related divisions, focusing on independent graduate schools. As a result, the graduate school policy as well as the efforts of establishment of Environmental Science turns out to be one of the most important factors to the establishment mechanism of environment-related divisions of independent graduate schools.

KEYWORDS: *environment-related departments, higher education policy, institutionalization of Environmental Science, environmental education, independent graduate school*

1. Introduction

In order to solve the global environmental problems and to create a sustainable society, it is necessary to establish Environmental Science as an interdisciplinary science. One of the indices of the institutionalization of Environmental Science is the environment-related divisions[1)] in universities, whose names contain "Environment" (e.g. the graduate schools of Environmental Science). The environment-related divisions are regarded to research and educate about environmental problems, and to train the human resources to deals with environmental problems. Because the discipline of Environmental Science has not been well established yet, there is a gap (Sueishi, 1995)[2)] between ideals and realities about research and education in the environment-related divisions. So it is necessary to examine the ideals and the educational content in each environment-related division. However, before examining that, it is indispensable to clarify the factors that caused the gap.

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One of the factors that caused the gap is the way in which these divisions were established. The research how to establish the environment-related divisions in Schools of engineering and in Schools of education in the Japanese national universities resulted that the higher education policy as well as efforts of establishment of Environmental Science turns out to be one of the most important factors to the mechanism of the establishment of environment-related divisions (Uchiyama, 2000a; Uchiyama, 2002; Uchiyama, 2003b). Therefore, the educational content in each environment-related division is limited by the fields of the faculty members. The mechanisms of the establishment of the environment-related divisions in the other schools and in the general graduate schools which are so-called chimney type graduate schools in national universities are considered to be similar. However, the mechanism of the establishment of the environment-related divisions in the independent graduate schools, and in the schools of the public and the private universities are considered to be different. Therefore, it is necessary to analyze the mechanism of the establishment of the environment-related divisions in these organizations.

The purpose of this paper is to scrutinize the mechanism of the establishment of the environment-related independent graduate schools and majors in national universities (e.g. graduate school of Environmental Science).

2. Methodology

This paper classifies the era of Environmental Science by the framework of Life cycle theory of the academic discipline (Yamada et al., 1986). The framework is used to analyze the development stages of the academic discipline. First, the society or the scientific community demands the new academic discipline. Then the resources (post of the division of the university and the research institution, the research expense, etc.) of the new academic discipline are allocated, and the academic discipline is institutionalized. When the academic discipline goes out of use after many years, it will be liquidated. Table 1 shows the era of Environmental Science. There is a prehistory of Environmental Science. The milestone of the prehistory is the establishment of divisions of Sanitary Engineering in universities, which is the one of the origins of Environmental Science. There are two life cycles of the era of Environmental Science, the first environmental cycle and the second environmental cycle (Uchiyama, 2000a)[3)]. Each life cycle consists of the environmental boom when the resources of Environmental Science were actively allocated, and the stagnation. Present is at stage of the second environmental boom.

Table 1 Era of Environmental Science.

Era		Year	Milestone
Prehistory		1957-1967	Division of Sanitary Engineering
1st cycle	1st Environmental boom	1968-1978	Environment-related Division
	1st Stagnation	1979-1986	
2nd cycle	2nd Environmental boom	1987-	Japanese Society of Environmental Science
	2nd Stagnation		

The framework of the expansion of higher education (Arai, 1989; Saitsu et al., 1996) in higher education policy will be also used in this paper.

This paper examines the mechanism of the establishment of the environment-related independent graduate schools and majors, focusing on the first environmental boom and the second environmental boom using the framework of Life cycle theory of the academic discipline and the framework of the expansion of higher education. This paper uses List of Universities in Japan and List of the independent graduate schools by Ministry of Education and a history of each university.

3. Result

3.1 Expansion of the environment-related divisions at the background of development of Environmental Science

This section examines the trend of the establishment of the environment-related independent graduate schools and majors in national universities at the background of Environmental Science.

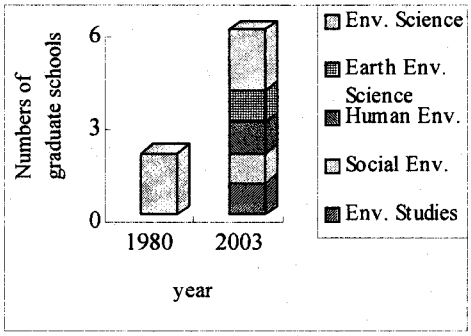

Figure 1 Environment-related Independent Graduate Schools

(1) First environmental boom

In the first environmental boom, the serious environmental disruption was caused, and at the background of it, some scientists advocated the foundation of Environmental Science, which is the interdisciplinary science integrated in natural science, social science and human science. Through 1970s various organizations as the indices of the institutionalization of Environmental Science were established (Uchiyama, 1999a). One of the indices is the environment-related divisions in universities.

There are two types of environment-related divisions. First is the schools derived from existing departments of Sanitary Engineering (Uchiyama, 2000a). Another is graduate schools organized from the departments of natural science, such as ecology or geoscience (Numata, 1985; Uchiyama, 1999) (Figure 1), which are the central fields of Environmental Science advocated in 1970 s. In the latter half of 1970s, graduate schools of Environmental Science were established in University of Tsukuba and Hokkaido University. These graduate schools were the first environment-related independent graduate schools were consisted of interdisciplinary fields. In many independent graduate schools the environment-related majors were established (Figure 2). These establishment rush of the environment-related graduate schools and majors triggered many environmental researchers to discuss about Environmental Science. From 1970s to 1980s, professors of the environment-related graduate schools and majors like graduate school of Environmental Science in University of Tsukuba[4), 5)], and researchers of Specific Research "Environmental Science"[6)] of Science Research Fund by Ministry of Education had discussed about what Environmental Science and the environmental education in universities should be (Uchiyama, 2003a; Tatsumi,1979).

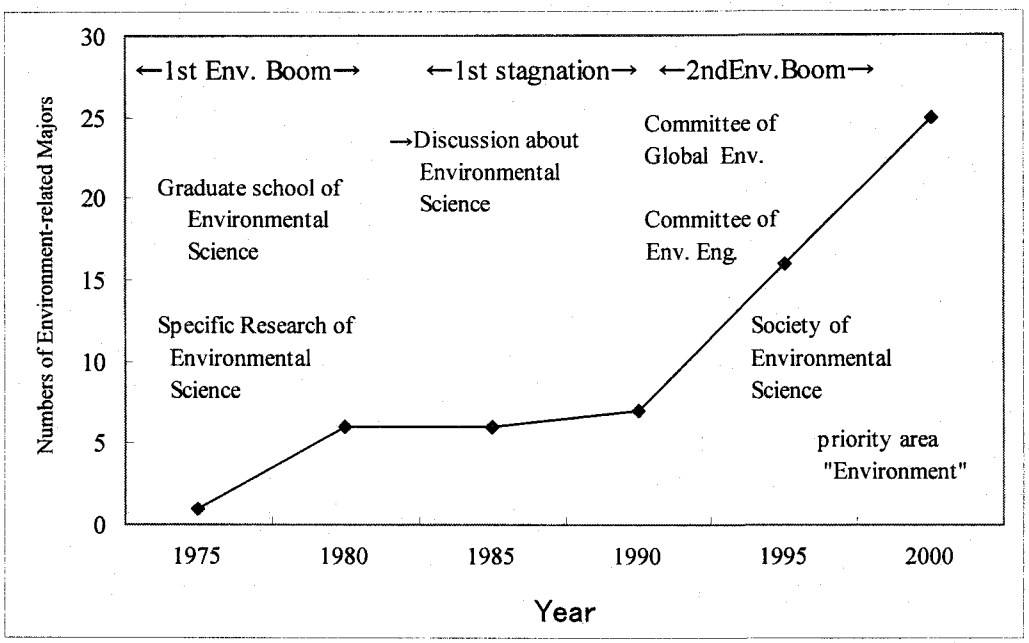

Figure 2 Environment-related majors of the independent graduate schools.

(2) First stagnation

Until the latter half of 1970s, the environmental disruption was resolved, because many antipollution laws were enacted, and the pollution control technologies were developed. In the latter half of 1970s oil crisis caused the economic recession. At the background of that, a social concern of the environmental disruption had rapidly decreased, and the resources of Environmental Science were hardly allocated. After establishing graduate schools of Environmental Science in two universities, the first environmental boom ended.

In the first stagnation, the discussion about Environmental Science and Environmental Education in universities developed, and prepared the conceptual framework and the institutional basis of Environmental Science for the forthcoming second Environmental boom.

(3) Second environmental boom

In the second environmental boom the global environmental problems became the important issues, instead of a military problem after the collapse of the cold war. A social concern of environmental problems was rapidly raised around 1992, the year of UNCED. So the area of Environmental Science globalized and extended to the social and human sciences.

The project of Specific Research "Environmental Science " of Science Research Fund by Ministry of Education was expired in 1987, unfortunately. To continue the discussion about Environmental Science (Ooi, 2000; Matsubara, 1999; Uchiyama, 2000b), Japanese Society of Environmental Science was established in 1987 by the discussant about Environmental Science described previously (Suzuki et al., 1988; Hashimoto, 1988).

Since 1990s the government has promoted the Environmental Science research as a national policy.

In April 1990, Science Council of Japan established the division of Global Environment, and presented the proposals regarding International Geosphere Biosphere Program (IGBP) in 1990 and in 1995. Council for Science and technology policy (2003) focused on "environment" as four priority areas with nanotechnology, information, and life science around 2000.

Since 1990s, the traditional civil engineering has been changing into the environmental engineering (Hashimoto, 1994; Tanbo, 1996; Somiya, 2000). The view of the environmental conservation is needed on the construction business (Kurota, 1998). The researches to reduce the environmental burden and to create the sustainable society have been carried out. In Japan Society of Civil Engineering, environmental related committees like Committee on Environmental System, Committee on Environmental Engineering, and Committee on Global Environment were established. The society founded Earth environmental prize in 1999.

At the background of Environmental Science in 1990s, the rush of the establishment of the environment-related graduate schools and majors are caused again (Figures 1 and 2).

3.2 Changing of graduate school policy and expansion of the environment-related divisions

(1) Development of the policy of the independent graduate schools

The trends of the history of the graduate school policy after the World War II, focusing on the independent graduate schools were classified four periods (Table 2).

Table 2 Period of independent graduated school policy

Periods	Year	Milestone
Period 1	A.W.-1960s[1)]	Graduated school under new University system
Period 2	1970s	Establishing independent graduated school
Period 3	1980s	Development policy of independent graduated school
Period 4	1990s	Expansion of independent graduated school

1) A.W.: After the World War II,

The original type of the graduate school in Japan is so-called chimney type of graduate school based on the schools at undergraduate level[7)].

In Period 2, the independent graduate school was established, which is not based on the school at undergraduate level and is consisted of interdisciplinary fields. The interdisciplinary words such as environment were repeatedly used for the name of the independent graduate schools and majors. At the background of that, the rush of the establishment of the environment-related independent graduate schools and majors was caused.

In Period 3, because establishing the independent graduate schools stagnated, the environment-related graduate schools and majors were hardly established. On the other hand, in Ad Hoc Council on Education and University Council were established, and in these councils the policies of the independent graduate schools were discussed (Ad Hoc Council, 1986). In 1989, Standard of

Establishment of Graduate Schools was partly amended, and the independent graduate schools clarified in the graduate school policy.

In Period 4, Ministry of Education took the expansion policy of the graduate schools, so the independent graduate schools remarkably expanded. At the background of that, the rush of the establishment of the environment-related independent graduate schools and majors was caused again.

(2) The trends of the establishment of the environment-related graduate schools and majors by type of the universities

After the World War II, Ministry of Education had given priority to the prewar imperial universities in the graduated school policy. In Period 1, the graduate schools were established mainly in the prewar imperial universities. As mentioned before, the traditional structure of the graduate schools in Japan is based on the schools at undergraduate level, categorized the chimney type.

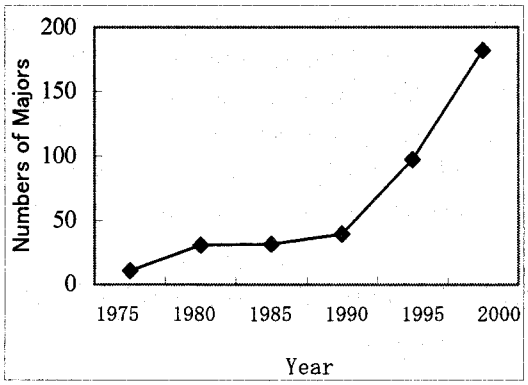

Figure 3 Numbers of majors of the independent graduate schools.

At the beginning of period 2, the chimney types of graduate schools were established on all schools at undergraduate level in the prewar imperial universities. The other national universities which had no graduate schools demanded to establish the graduate schools, and which had the graduate schools with only master courses demanded to establish the doctor course.

In the latter half of 1970s, the independent graduate schools were established for the first time, mainly in the other national universities. At the background of that, the rush of the establishment of the environment-related independent graduate schools and majors were caused. Among these, Hokkaido University was only prewar imperial universities which established environment-related independent graduate schools and majors.

As stated above, in Period 3, the environment-related graduate schools and majors were rarely established. From the latter half of 1980s to the former half of 1990s, in the other national universities, the independent graduate schools with only doctoral courses were established one after another.

In Period 4, the expansion policy of the graduate schools and the clarification of the independent graduate school policy influenced many universities including the prewar Imperial universities to establish the independent graduate schools.

Since the latter half of 1990s, in the other national universities, the chimney type of graduate schools with only master course were integrated into the independent graduate school with only doctor course by reform.

Through 1990s, several prewar imperial universities made the future plan to establish the independent graduate schools with interdisciplinary names such as environment, life science, and information. Around 2000, in these universities, the environment-related independent graduate schools and majors were established one after another by reform.

4. Discussion

The first environmental boom corresponds to Period 2 and the first stagnation corresponds to Period 3. Likewise, the second corresponds to Period 4. By comparing the establishment trends of the environment-related graduate schools and majors at each time the synergy effect of the raise of social concerns for environmental problems and the higher education policies caused the rush of the establishment of the environment-related independent graduate schools and majors, as well as the schools at undergraduate level (Uchiyama, 2000a).

However, there is a disciplinary difference between the environment-related divisions of the schools at undergraduate level and that at graduate level. The former holds traditional disciplines. The latter aims at Environmental Science, which is a sprout interdisciplinary academic field.

There are different higher education policies between establishing the environment-related divisions at undergraduate level and at graduate level. The former was caused by the expansion policy in the first environmental boom, and was caused by "scrapped and build" by reform in the second environmental boom. The latter came along by the foundation of the independent graduate schools in the first environmental boom, and by expansion policy of the graduate schools in the second environmental boom.

In the first environmental boom, Environmental Science was advocated. The rush of the establishment of the environment-related graduate schools and majors triggered the active discussion of how Environmental Science and environmental education in universities should be (Uchiyama, 1999).

In the first stagnation, the policies of the independent graduate schools were discussed. The discussions about how Environmental Science and environmental education in universities should be, developed and prepared the conceptual framework and the institutional basis of Environmental Science for the forthcoming second environmental boom.

In the first environmental boom, as the environmental researches were not carried out so much, the environment-related graduate schools and majors were the centers of the research and the education of Environmental Science in the precincts of many universities. However, in the second environmental boom, through 1990's the environmental researches have been developed in many academic fields. Therefore, especially in the large-scale university like University of Tokyo[8)], the key persons of Environmental Science in precincts did not move from the traditional schools to the new environment-related graduate schools and majors[9)].

Normally, graduate students would want to study in the graduate school where they find to appropriate laboratory or the professor that specialize in the fields of their academic interests. Therefore, at the graduate level, the name of the organization is not important for the students.

5. Conclusion

The graduate school policy as well as the efforts of establishment of Environmental Science turns out to be one of the most important factors to the establishment mechanism of the environment-related independent graduate schools and majors.

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Notes

1) Environment-related divisions (*Kankyo Kanmuri gakka* in Japanese) was named by Uchiyama in the presentation "Present Stage of Environmental Education at the University in the Higher Education Policy" (Uchiyama, 1998) at the Mini-Symposium of University Environment Education in the Annual Meeting of Japanese Society of Environmental Education on May 12 in 1996.
2) The interview with the faculty members and the students of the environment-related divisions of several national universities (Uchiyama, 1998) from April to May in 1996.
3) Era of Environmental Science was classified by Uchiyama in the presentation "The Establishment of the Environment-related Divisions of Schools of Engineering and Schools of Agriculture in National Universities in the First Environmental Boom", at the Annual Meeting of Society of University History on December 6, 1996.
4) In the Annual Meetings of Environment-related Graduate Schools and Majors in National Universities, the ideal of Environmental Science had been discussed.
5) One of the roles of Conference of Dean of Environment-related Graduate Schools and Majors in National Universities was to establish the environment-related graduate schools and majors in national universities.
6) 30% of members regarding the project were occupied by the faculty members of University of Tsukuba.
7) The difference of the structure of the graduate schools between Japan and USA was pointed out by Uchiyama, in the presentation "Establishment of Environment-Related Departments in Japanese

Universities" at the Sub-meeting of Task Force of Environmental Education of AGS held in MIT, in January, 2000.

8) The interview with Research Promotion Bureau of Ministry of Education, Culture, Sports, Science and Technology in August, 2003.

9) In the Symposium "Environmental research on Asia" by Council for Science and Technology Policy, Cabinet Office in November 2003, most of the members of the Council criticized severely, such as "There is a fib in the signboard of the environment-related division", to the faculty members in University of Tokyo who were moved from the traditional schools to the new environment-related division in the university.