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Report on 2013-2014 M.Sc. Program, "Water-related Disaster Management Course of Disaster Management Policy Program"

August 2015

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PWRI

UNESCO
United Nations
Educational, Scientific and
Cultural Organization

International Centre for Water Hazard and Risk Management
Under the auspices of UNESCO (ICHARM)
Public Works Research Institute (PWRI)

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Report on 2013-2014 M.Sc. Program, "Water-related Disaster Management Course of Disaster Management Policy Program"

By

International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM)

Minoru Kamoto, Chief Researcher

Katsuichi Tadokoro, Administrative head

Takashi Shirai, Chief staff

Shun Kudo, Researcher

ICHARM conducted a one-year Master's program entitled the "Water-related Disaster Management Course of Disaster Management Policy Program" from 2 October 2013 to 12 September 2014 in collaboration with JICA and GRIPS. The twelve students were mainly technical officials, engineers or researchers in the field of river management or water-related disasters in developing countries.

This course aims to foster solution-oriented practitioners with solid theoretical and engineering bases who can serve for planning and practices of flood management within the framework of integrated river basin management at all levels from nations to localities.

In the first half of the course, the students mainly attended lectures and exercises; in the second half, they worked on their individual studies, this enabling them to prepare and complete their master's theses and to visit numerous locations across Japan over the course of several field trips in order to learn about up-to-date flood control countermeasures in action.

This report details the course activities and the achievements thereof and aims to contribute improvements in the next year.

Key Words: Training, Master's program, Disaster prevention, Flood disaster

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Congratulatory address
by Prof. Takeuchi, ICHARM Director

Congratulatory address
By Prof. Ando, GRIPS

Address by participant representative
Mr. Sanath

Group photo after opening ceremony

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＜Welcome Meeting（October 4）＞

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Prof. Huang, Sophia University

Prof. Tanaka, Kyoto University

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Prof. Egashira, ICHARM

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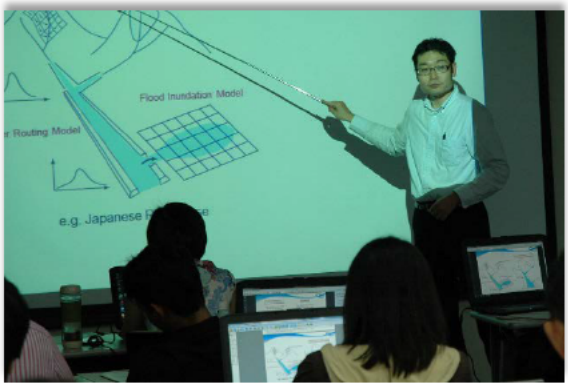
Prof. Kondo,
Sabo and Landslide Technical Center

Asso. Prof. Kibler, ICHARM



Asso. Prof. Sayama, ICHARM

Asso. Prof. Yorozuya, ICHARM

Prof. Oki, The University of Tokyo

Photo 4

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Prof. Sugai, The University of Tokyo

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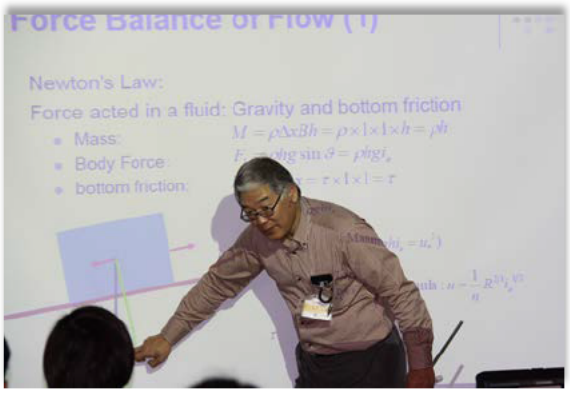

Prof. Watanabe, Kitami Institute of Technology

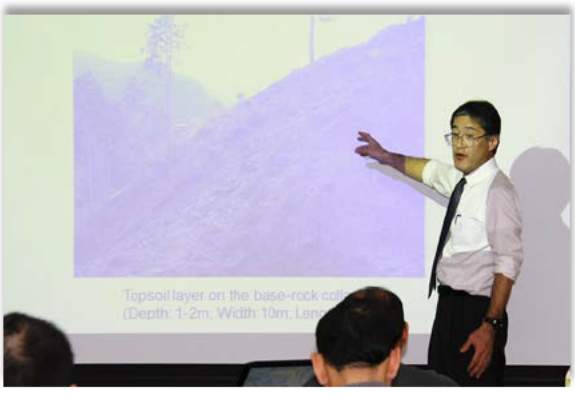

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Photo 5

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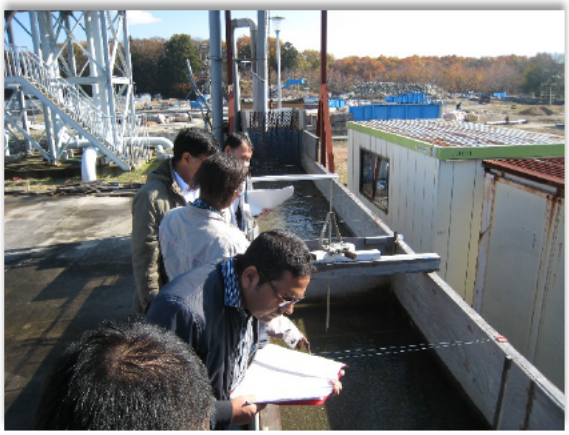

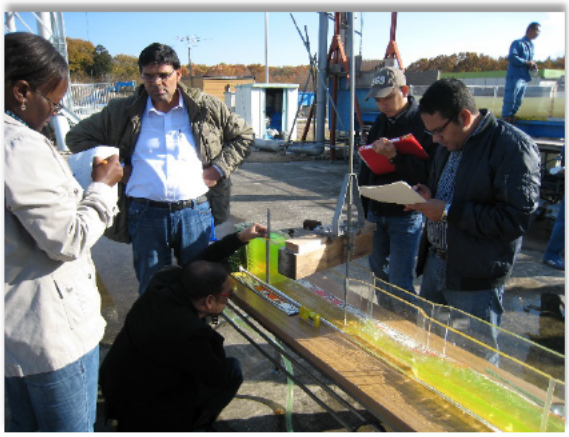

Photo 6

[Exercise on Project Cycle Management]

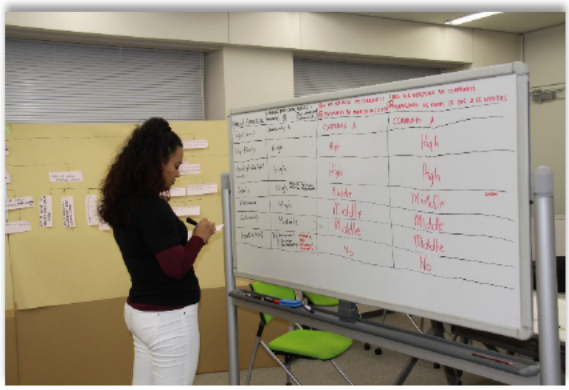

Photo 7

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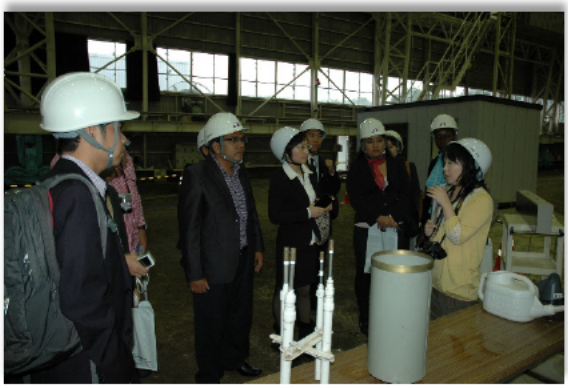
National Research Institute for Earth Science and Disaster Prevention	National Research Institute for Earth Science and Disaster Prevention
	
National Research Institute for Earth Science and Disaster Prevention	Geospatial Information Authority of Japan
	
Geospatial Information Authority of Japan	Geospatial Information Authority of Japan

Photo 9

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Photo 11

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＜Visit to Nikko on Oct. 30, 31 and Nov. 1＞ (1)

	
Tone River Upper Reaches Work Office	Tone River Upper Reaches Work Office
	
Explanation at the MLIT sub-office	Explanation at the MLIT sub-office
	
Watarase Retarding basin	Watarase Retarding basin

Photo 13

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Kawaji Dam

Kawaji Dam

Kawaji Dam

Kawaji Dam

Photo 14

<Visit to Nikko on Oct. 30, 31 and Nov. 1> (3)

Yunishigawa Dam

Yunishigawa Dam

Yunishigawa Dam

Yunishigawa Dam

Photo 15

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Inarigawa Sabo Works

Inarigawa Sabo Works

Inarigawa Sabo Works

Inarigawa Sabo Works

Ashio Sabo Works

Photo 16

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Photo 17

＜Urban River in Japan on Dec. 4, 5 and 6＞ (1)

	
Kanto Regional Bureau of MLIT	Kanto Regional Bureau of MLIT

Photo 18

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Lecture by Mr. Imbe
at the Tsurumi River Basin Center

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Group photo at Tsurumi River Basin Center

Kawawa Retarding Basin

Kawawa Retarding Basin

Photo 19

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Kawawa Retarding Basin

Kawawa Retarding Basin

Kirigaoka Retarding Pond

Onmawashi Park Underground Reservoir

Onmawashi Park Underground Reservoir

Onmawashi Park Underground Reservoir

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Lecture at Japan Meteorological Agency	Lecture at Japan Meteorological Agency

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Photo 23

Fukuoka weir on April 8

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Shinano River Downstream Work Office, MLIT

Group Photo at Shinano River Downstream Work Office

Museum of Ohkouzu Diversion Chanel

Okozu Movable Weir

Okozu Movable Weir

No.2 Ground Sill

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Sagurigawa Dam, MLIT

Sagurigawa Dam, MLIT

Sagurigawa Dam, MLIT

Group Photo at Sagurigawa Dam, MLIT

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Kinki Regional Development Bureau,

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Amagase Dam

Amagase Dam

Photo 27

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Biwako River Office

Biwako River Office

Lake Biwa

Lake Biwa Museum

Photo 28

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The Lake Biwa Canal

Photo 29

＜Final Presentation on Aug. 8＞

Ms. FERRER Santy Bumali

Mr. ISLAM Md. Khairul

Ms. HAO Ying

Ms. ALFARO LOPEZ Ingrid Altagracia

Ms. ONJIRA Pauline Ingado

Mr. ZAW Myo Khaing

Photo 30

	
Mr. GUNASENA Muthubanda Appuhamige Sanath Susila	Mr. MOUFAR Mohamed Mashood Mohamed
	
Mr. Muhammad Afzal	Mr. BASILAN, Emar Guevara
	
Mr. ALAM Muhammad Jahangir	Mr. CABRITA Alfonzo Raul Figuera

Photo 31

Photo 32

＜Closing Ceremony (September 11) at JICA Tsukuba＞

Mr. Kimura, director of JICA Tsukuba, giving a congratulatory speech

Prof. Takeuchi, director of ICHARM, giving a congratulatory speech

Prof. Ando of GRIPS, giving a congratulatory speech

Mr. Khaing (left), receiving the ICHARM Award

Mr. Raul, giving a graduation speech

＜Graduation Ceremony at GRIPS on Sept.12＞

Mr. Khairul (center), after receiving the Dean's Award

Water-related Disaster Management Course of Disaster Management Policy Program

Disaster Management Policy Program

Chapter 1: Background and Objectives of this Course

1.1 Background of this Course

Natural disasters cause human tragedy and economic loss, and hamper the development of the countries where they occur. In particular, due to recent urbanization in developing countries, there is a tendency for the poor to be forced to settle in buildings and areas that are vulnerable to natural disasters. This significantly increases vulnerability to natural disasters in developing countries.

During natural disasters, particularly the mitigation of water-related damage from floods and droughts is a major challenge that needs to be overcome through the cooperation of the international community in order to ensure development of sustainable human societies and alleviation of poverty. Such devastating disasters have not only been statistically increasing, but also expanding especially in Asia and Africa (Figure 1-1). According to a UN population projection (UN World Urbanization Prospects 2005), urban population will continue growing in size and proportion across the world, and most of the growth will be seen in developing countries. For example, between 2000 and 2030, the urban population in Asia and Africa is projected to increase rapidly, growing from 1.36 to 2.64 billion and 294 to 742 million, respectively (Figure 1-2). Projections show that, even in the next 10 years, rapid population growth will occur in major waterfront cities in Asia, e.g. Dhaka (Bangladesh), Mumbai (India) and Jakarta (Indonesia). If appropriate measures are not taken to protect these cities, their vulnerability to major water-related disasters, such as floods, storms and tsunamis, is likely to become increasingly high (Figure 1-3).

Asia alone accounts for over 80% of worldwide fatalities due to water-related disasters (Figure 1-4). Looking ahead, it is predicted that precipitation and its patterns of distribution will change due to climate change, and this may exacerbate the intensity and frequency of water-related disasters. Sea level is expected to rise worldwide due to global warming, which in turn will worsen exposure of coastal areas, delta areas in the lower reaches of rivers, and small islands.

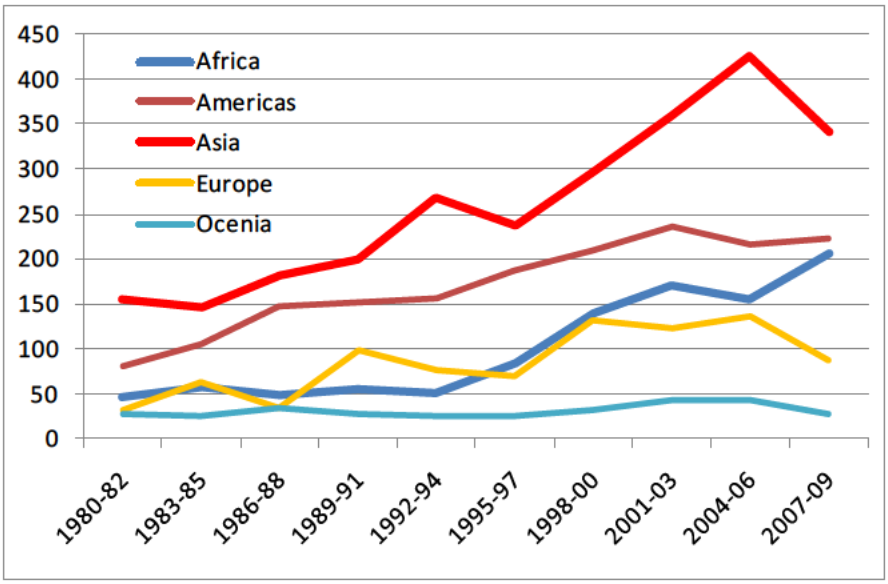


Figure 1-1 Annual variation in the number of water-related disasters by region

(Prepared by ICHARM based on CRED EM-DAT)

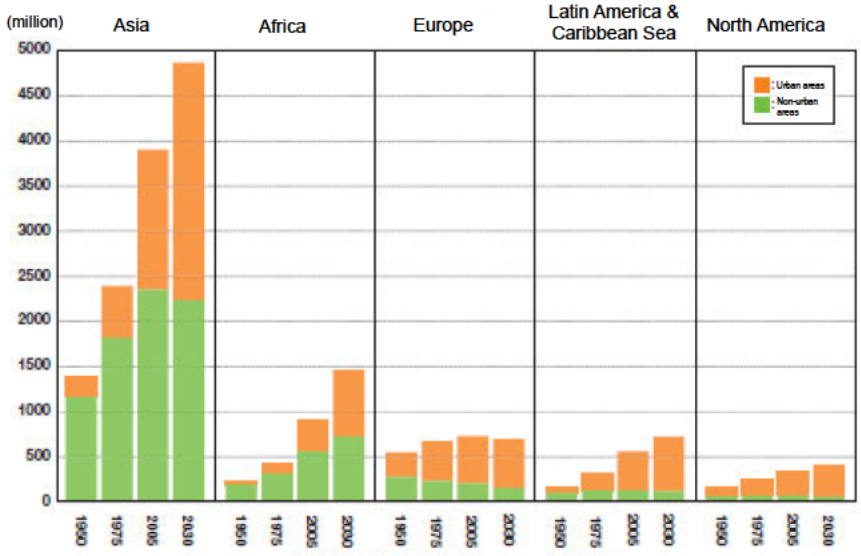


Figure 1-2 Demographic change in urban and non-urban areas by region

(Prepared by ICHARM based on World Urbanization Prospects:
2005 Revision by the Population Division, Department of Economic and Social Affairs, UN)

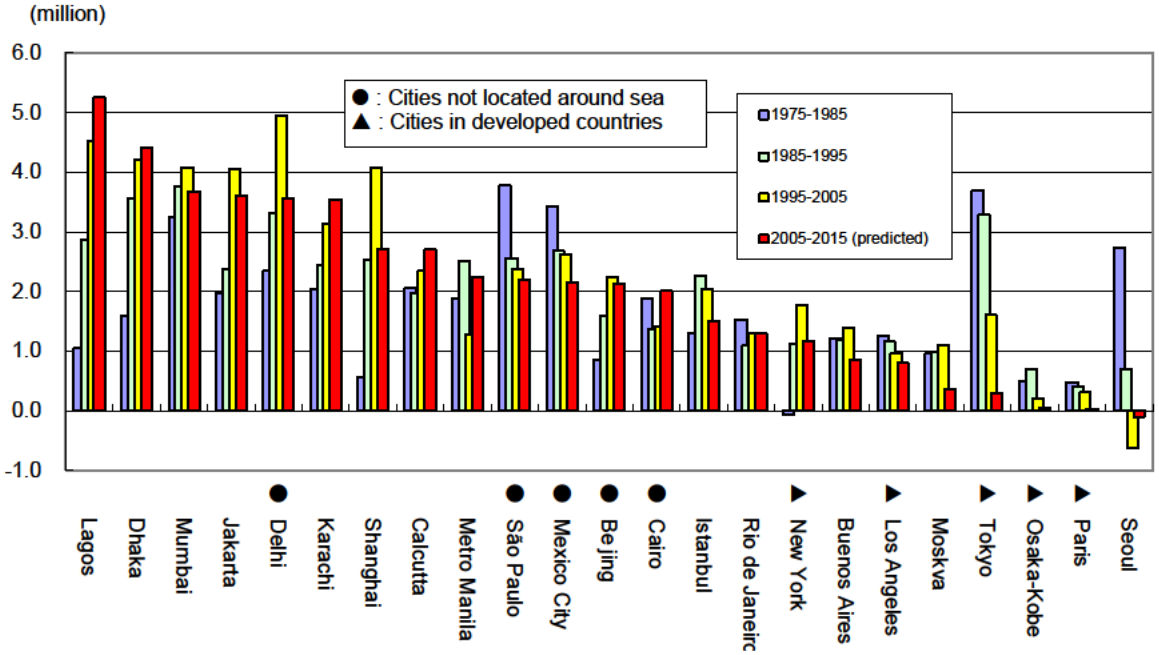


Figure 1-3 Demographic changes in major cities worldwide between 1975 and 2015

(Prepared by ICHARM based on World Urbanization Prospects:
2005 Revision by the Population Division, Department of Economic and Social Affairs, UN)

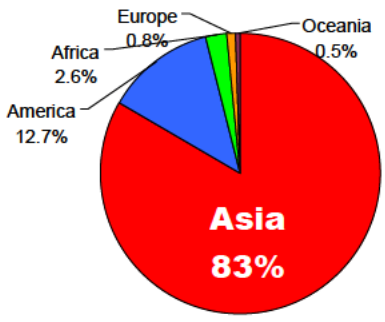


Figure 1-4
Distribution of fatalities due to water-related disasters (1980–2006)

(Prepared by ICHARM based on CRED EM-DAT)

In order to reduce the impact of natural disasters, well-balanced risk management before, during, and after disasters must be established in a multi-disciplinary manner, covering measures that involve infrastructure such as dams and levees, measures that involve non-infrastructure such as flood warning systems, risk-map/hazard-map and social psychology. To meet this need, disaster management experts must be created through professional education and training so that they can develop appropriate disaster management policies and techniques based on local conditions and needs, and exchange various information with local residents in order to raise awareness of disaster prevention in local communities.

Given these circumstances, in order to enhance the capabilities of experts in developing countries to cope with water-related disasters, ICHARM, the National Graduate Institute for Policy Studies (GRIPS), and the Japan International Cooperation Agency (JICA) jointly launched a master's degree program called the "Water-related Disaster Management Course of Disaster Management Policy Program" (afterwards referred to as "the course") in 2007. The JICA training name was "FLOOD DISASTER MITIGATION." This year marked the seventh time this course was held.

The United Nations designate 2005–2014 as the Decade for Education and Sustainable Development, under the initiative of the United Nations Educational Scientific and Cultural Organization (UNESCO). The course is exactly in step with the spirit of that Decade. ICHARM is honored to be one of the organizers, especially in consideration of the fact that the center was established under the auspices of UNESCO.

1.2 Objectives of this Course

Against this background, we have set the final goals and objectives of the course to be as follows.

<Overall Goal>

The damage of water-related disasters is reduced by planning and implementing the countermeasures of water-related disasters in their countries.

<Program Objective>

The participant's capacity to practically manage the problems and issues concerning water-related disasters is developed for contributing to mitigation of water-related disasters in their countries.

1.3 Outputs of this Course

Participants are expected to achieve the following outputs;

(1) To be able to explain basic concept and theory on generation process of water-related disasters, water-related hazard risk evaluation, disaster risk management policy and technologies.

(2) To be able to explain basic concept and theory on flood countermeasures including landslide and debris flow.

(3) To formulate the countermeasures to solve the problems and issues concerning water-related disasters in their countries by applying techniques and knowledge acquired through the program.

1.4 Features of this Course

The course is characterized by the three following points:

I. "Problem Solving-Oriented" course

In order to manage major disasters, it is essential to develop disaster management capabilities at the level of the organization as well as the abilities of the individuals within that organization, since there is always a limit on what each individual can achieve.

JICA training programs in recent years have shifted their focus to "problem solving-oriented training" which aims to improve the ability of organizations to deal with relevant problems and situations. This shift of course emphasis is based on the idea that such training delivers a dual benefit. First, the training will be more effective and efficient for each student if they first identify water issues specific to their countries and then proactively study in order to solve them. Moreover, it will produce results which are effective for solving the issues faced by the respective students' organizations.

Based on this course philosophy, this course is designed not to be one in which students are, in some way, forced to study but one in which they think independently and find solutions to issues that are of interest to them. One of the requirements for graduation from this course is to write a master's thesis on an issue which each student identifies and to which they find their own solution. Such assignments help students develop the ability to formulate integrated flood mitigation plans, and help them address other issues at home.

II. "Practical" rather than "Theoretical"

To make the course solution-oriented, lectures and exercises which are practical rather than theoretical are provided on the course in order to enable students to work effectively in actual situations. For this reason, field trips are an essential part of the course.

III. 1 year master's course

This master's course is intended for personnel working in administrative organizations. For this reason, it is designed to let them earn a master's degree within a single year rather than the usual two years so that they do not have to be absent from work for an excessively long period.

1.5 Qualification for this Course

There are two methods for attendance of this course. In the first, trainees of the JICA training program "FLOOD DISASTER MITIGATION," who were recruited and selected by overseas JICA offices, participate as GRIPS students. In the second, students apply directly and are accepted for GRIPS. For the former, the overseas JICA offices in each country determine course participation once they have checked and understood the needs of participation with the relevant organizations in that country in advance, which means that students from countries for which participation has not been determined are unable to participate.

1.5.1 Application as JICA Trainee

According to the preliminary participation needs survey, the candidate countries, eligible organizations, and requirements for applicants were as follows.

Target Regions or Countries: 24 countries

Republic of Albania, People's Republic of Bangladesh, Republic of Colombia, Federal Democratic Republic of Ethiopia, Grenada, Republic of Haiti, Malaysia, Republic of Moldova, Mongolia, Republic of Mozambique, Republic of the Union of Myanmar, Lao

People's Democratic Republic, Federal Democratic Republic of Nepal, Federal Republic of Nigeria, Republic of the Philippines, Saint Vincent and the Grenadines, Kingdom of Saudi Arabia, Republic of Serbia, Solomon Islands, Republic of South Africa, Kingdom of Thailand, The Democratic Republic of Timor-Leste, Bolivarian Republic of Venezuela, Socialist Republic of Viet Nam

Eligible/Target Organization:

Governmental organizations concerning river management or water-related disasters

Nominee Qualifications:

Applicants should;

(1) be nominated by their governments.

(2) be technical officials, engineers or researchers who have three (3) or more year of experience in the field of flood management in governmental organizations.
(* Basically, researcher in the University (ex: professor, etc) are excluded.)

(3) be university graduates, preferably in civil engineering, water resource management, disaster mitigation, or related department.

(4) be proficient in basic computer skills.

(5) be proficient in English ---with a minimum TOEFL score of Internet-Based Test (iBT) 79 (Paper-Based Test 550), IELTS 6.0 or its equivalent.

(6) be in good health, both physically and mentally, to participate in the program in Japan.

(7) be over twenty-five (25) and under forty (40) years of age.

(8) not be serving any form of military service.

1.5.2 Direct Application to GRIPS

Requirements for direct application to GRIPS were as follows.

To be eligible for admission to this master's program, an applicant

1) must hold a bachelor's degree or its equivalent from a recognized/accredited university of the highest standard in the field of civil engineering, water resource management, or disaster mitigation.

2) must have working knowledge of civil engineering, especially of hydraulics and hydrology.

3) must be familiar with mathematics such as differentiation and integration techniques.

4) must satisfy the English language requirements with a minimum TOEFL score of Internet-Based Test (iBT) 79 (Paper-Based Test 550), IELTS 6.0 or its equivalent.

5) must be in good health.

1.5.3 Final Decision on Acceptance of Students

After recruiting students through 1.5.1 and 1.5.2, a program committee directed by Professor Shoichi Ando (National Graduate Institute for Policy Studies) chose the enrollees to the Disaster Management Policy Program. The program committee consisted of the following members:

- Prof. Shoichi Ando, GRIPS [Director of the program]

- Senior Prof. Shigeru Morichi, GRIPS
- Prof. Ikuo Shimomura, GRIPS
- Prof. Hideo Fukui, GRIPS
- Dr. Toshiaki Yokoi, Chief Research Scientist, IISEE, BRI
- Koichi Morita, Chief Research Scientist, IISEE, BRI
- Dr. Kuniyoshi Takeuchi, Director, ICHARM
- Dr. Nario Yasuda, Deputy Director, ICHARM (until March 2014)
- Special Prof. Hiroshi Ikeya, GRIPS
- Prof. Fumio Takeda, GRIPS

As a result of deliberations among program committee members, a total of 12 students were selected. Annex 1-1 shows the list of students. Please note that for this academic year, the 12 students will be participating as JICA trainees.

1.6 Organization of Course Teaching Personnel

The course uses the following organizational structure for teaching personnel. Please note that all instructors were appointed as collaborative faculty by GRIPS.

International Centre for Water Hazard and Risk Management (ICHARM), PWRI

Collaborating Professor (Director)	Kuniyoshi Takeuchi
Collaborating Professor (Research and Training Advisor)	Shinji Egashira
Collaborating Professor (Deputy Director)	Nario Yasuda (until March 2014)
Collaborating Associate Professor (Researcher)	Takahiro Sayama
Collaborating Associate Professor (Researcher)	Atsuhiro Yorozuya
Collaborating Associate Professor (Research Specialist)	Kelly Kibler

In accordance with the research themes of the students, ICHARM researchers in the relevant fields provided instructions whenever necessary.

Chapter 2: Course Content

2.1 Course Schedule

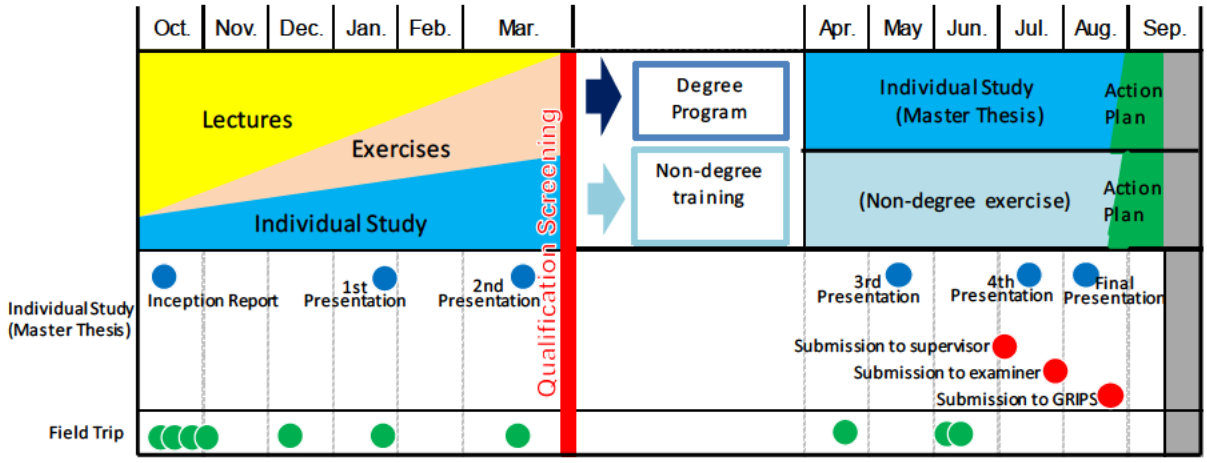


Figure 2-1 Conceptual figure of course schedule

The course was conducted over a period of around one year, from October 1, 2013 (date of arrival in Japan) to September 13, 2014 (departure date). The opening ceremony at GRIPS was held on October 3, 2013, and the graduation ceremony on September 12, 2014.

Figure 2-1 shows a course schedule.

The first half of the course (October to March) consists mainly of "Lectures" (11 subjects) and "Exercises" (3 subjects). Several "Site Visit (1 subject)" are also conducted throughout the year to enhance the students' understanding of the content of the lectures. In addition, in order to provide opportunities for students to learn about the latest knowledge and trends regarding water-related disasters, students are required to attend some ICHARM R&D Seminars held with invited experts.

In late March the Qualification Screening was held, in which ICHARM faculty determined whether students had the levels of knowledge required to write a master's thesis.

In the second half of the course (April to September), students conducted Individual Study (1 subject), consulting with their supervisors (ICHARM researchers, etc.) as they proceeded to complete their master's theses. To check progress on master's theses, individual students are given opportunities of Interim Presentations of around ten minutes about once every one to two months. In these presentations, students receive advice from other students and supervisors as necessary. After submitting their master's theses, students, who are accepted through the JICA recruitment procedure, start creating Action Plans for activities that they will perform after they return to their home countries.

Table 2-1 shows a summary of the year's course schedule. In addition, the overall course timetable is described in detail in Annex 2-1.

Table 2-1 Main schedule for year

Red: Thesis related, Blue: Site visit

Date		Event
2013 October	2nd (Wed) 4th (Fri) 4th (Fri) 7th (Mon) 11th (Fri) 17th (Thu) 17th (Thu) 28th (Mon) 30th (Wed)- 1st (Fri)	Entrance Guidance & Orientation at GRIPS Ph.D. & M.Sc. Joint Opening Ceremony at ICHAM Visit to Tsukuba Research Institute (GSI, NIED) Introduction of ICHARM research activities Site Visit Tour of flood countermeasures around Tsukuba (Tsukuba area and Kokai River) Site visit of PWRI experimental facilities Joint Class (Public Works Research Institute and Building Research Institute) Presentation on Inception Report Site Visit to Nikko (Watarase Retarding basin, Kinu River and Kawaji Dam)
November	6th (Wed) 15th (Fri)	Visit to Elementary School by JICA Discussion with ICHARM educational staff
December	4th (Wed)- 6th (Fri) 10th (Tue) 20th (Fri)	Site Visit to Urban River (Kanto Regional Bureau of MLIT, Tsurumi River Basin Information Center and JMA) Visit to Junior High School by JICA Discussion with ICHARM educational staff
2014 January	7th (Tue) -9th (Thu) 24th (Fri) 27th (Mon)- 31stt (Fri) -1st (Sat)	Exercise on Project Cycle Management (PCM) 1st Interim Presentation Lectures at GRIPS Site Visit to Nagoya City conducted by GRIPS
February	-7th (Fri)	Lectures at GRIPS
March	4th (Tue) 20th (Thu)	Site Visit to Shirako River (Underground Regulating Reservoir of Shirako River) 2nd Interim Presentation

Date		Event
April	4th (Fri) 18th (Fri) 24th (Thu)-26th (Sat)	Deadline of JSCE international summer symposium ICHARM Open Day Site Visit Shinano River, (Exercise on river discharge measurement at Uono River)
May	9th(Fri)	3rd Interim Presentation in ICHARM Auditorium
June	4th(Wed)-7th(Sat)	Site Visit Yodo River Basin
July	4th (Fri) 6th(Sun) 8th (Tue) 25th (Fri)	Deadline of the 1st draft thesis to ICHARM Supervisor Flood Fighting Drill in Joso City 4th Interim Presentation in ICHARM Auditorium Deadline of the 2nd draft thesis to ICHARM Supervisor
August	8th (Fri) 27th (Wed) 29th (Fri)	Final Presentation in ICHARM Auditorium Deadline of final thesis Faculty meeting at GRIPS
September	8th(Mon) 10th(Wed) 11th(Thu) 12th (Fri)	Presentation on Action Plan at ICHARM JSCE Summer Symposium Closing Ceremony at JICA Graduation Ceremony at GRIPS

2.2 Course Curriculum

2.2.1 Lectures and Exercises

The course is oriented towards problem solving and focuses on application to actual tasks. Therefore, in addition to basic studies on water hazard risk management, it is characterized by heavy emphasis on studies and exercises involving actual applications.

Table 2-2 shows the list of course classes. Overall, the course consists of 16 subjects in three categories: I. Required Course, II. Recommended Course and III. Elective Course. In the main, lecture-oriented courses are Recommended Course, and exercise-oriented courses are Elective Course.

Each subject consists of 15 periods. All the Recommended Course are compulsory (two credits), all the Elective Course are optional (one credit), and the Individual Study requires ten credits. To be awarded a master's degree, students must earn at least 30 credits, 16 credits of which must be from Recommended Course. Students are awarded a master's degree on "Disaster Management" after having earned the necessary credits and passing the thesis review. Students

are not necessarily required to complete all subjects to earn the necessary credits, but the students on this course took all subjects.

Annex 2-2 lists the curriculum for each course, and Annex 2-3 gives the syllabus for each subject.

2.2.2 Lecturers

The lecturers for this course include not only ICHARM researchers but also many professionals invited from PWRI, National Institute for Land and Infrastructure Management (NILIM) and universities, etc., so that students can learn the latest information. As shown in Table 2-3, there were 12 lecturers from universities, 6 from incorporated government agencies/foundations/securities research institutes, etc., 5 from the Cabinet Office/PWRI/NILIM, and 15 from ICHARM, for a total of 38 lecturers both in-house and invited.

With respect to the implementation of lectures, exercises, and individual studies on this course, the ICHARM staff and responsible lecturers are also contracted to act as GRIPS coordinating instructors, providing guidance.

2.2.3 Field Trips and Lectures conducted by officials related to Disaster Prevention Administration

This course includes field trips to retarding basins, diversion channels, dams, and sediment control and landslide prevention works in addition to lectures and exercises at ICHARM so students can learn by experiencing the actual local conditions related to Japan's flood control measures for themselves. Students also visit Regional Bureaus of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and local government offices to listen to lectures given by disaster prevention officials whose work involves direct interaction with local residents. These officials gave explanations of the flood information transmission systems and flood hazard maps used in Japan so that students can enhance their understanding of the problems actually encountered by Japanese disaster prevention authorities. Table 2-4 shows the list of field trip sites. The field trip sites were carefully selected so that students can actually observe the flood prevention facilities described in lectures and see representative flood prevention facilities in Japan. To ensure that they are not simply enjoyed in the manner of leisure excursions, students are required to submit reports after field trips so as to enhance their understanding of the relevant issues. Annex 2-4 shows the itineraries of the field trips.

Table 2-2 List of courses

Category	Course No.	Course Title	Instructor	Term	Credit	
I Required Courses	DMP4800E	Individual Study		Winter through Summer	10	
II Recommended Courses	DMP2000E	Disaster Mitigation - Recovery Policy	Morichi	Winter	2	16
	DMP2010E	Disaster Risk Management	Ando	Winter	2	
	DMP2800E	Hydrology	Koike	Fall through Winter	2	
	DMP2810E	Hydraulics	Huang	Fall through Winter	2	
	DMP2820E	Basic Concepts of Integrated Flood Risk Management (FRM)	Takeuchi	Fall through Winter	2	
	DMP2870E	Urban Flood Management and Flood Hazard Mapping	Tanaka	Fall through Spring	2	
	DMP3810E	Flood Hydraulics and Sediment Transport	Fukuoka	Fall through Winter	2	
	DMP3820E	Mechanics of Sediment Transportation and Channel Changes	Egashira	Fall through Winter	2	
	DMP3830E	Sustainable Reservoir Development & Management	Yasuda	Fall through Winter	2	
	DMP3840E	Control Measures for Landslide & Debris Flow	Kondo	Fall through Winter	2	
	DMP3870E	River Ecohydraulics	Kibler	Fall through Winter	2	
III Elective Courses	DMP1800E	Computer Programming	Sayama	Fall through Winter	1	30
	DMP2890E	Basic Practice on Flood Forecasting & Inundation Analysis	Sayama	Fall through Spring	1	
	DMP3802E	Advanced Practice on Flood Forecasting & Inundation Analysis	Yorozuya	Fall through Spring	1	
	DMP3900E	Site Visit of Water-related Disaster Management Practice in Japan	Kibler	Fall through Summer	1	
		Selected Topics in Policy Studies I-IV				

Notes:

1. Graduation Requirements: Students must complete a minimum of 30 credits, 16 of which must come from Category II.

2. Courses offered in the Program are subject to change.

3. * Course Number, Instructor, and Term for the course will be announced later when the course is offered.

Table 2-3 List of Lecturers (positions as of that time)

Lecturer	Affiliation	Lecture
University		
Prof. Shigeru Morichi 森地　茂	GRIPS	Disaster Mitigation - Recovery Policy
Prof. Shoichi Ando 安藤　尚一	GRIPS	Disaster Risk Management
Prof. Toshio Koike 小池　俊雄	University of Tokyo	Hydrology
Prof. Guangwei Huang 黄　光偉	Sophia University	Hydraulics
Prof. Taikan Oki 沖　大幹	University of Tokyo	Basic Concepts of IFRM
Prof. Shigenobu Tanaka 田中　茂信	Kyoto University	Urban Flood Management and Flood Hazard Mapping
Prof. Toshihiko Sugai 須貝　俊彦	University of Tokyo	Urban Flood Management and Flood Hazard Mapping
Prof. Haruo Hayashi 林　春男	Disaster Prevention Research Institute, Kyoto University	Urban Flood Management and Flood Hazard Mapping
Prof. Shoji Fukuoka 福岡　捷二	Chuo University	Flood Hydraulics and Sediment Transport
Prof. Yasuharu Watanabe 渡邊　康玄	Kitami Institute of Technology	Flood Hydraulics and Sediment Transport
Prof. Katsuo Sasahara 笹原　克夫	Kochi University	Control Measures for Landslide & Debris Flow
Prof. Tetsuya Sumi 角　哲也	Kyoto University	River Ecohydraulics
Private sectors, and others		
Mr. Masayuki Watanabe 渡辺　正幸	Institute for international, social development & cooperation	Basic Concepts of IFRM
Mr. Masahiro Imbe 忌部　正博	Association for Rainwater Storage and Infiltration Technology	Urban Flood Management and Flood Hazard Mapping
Dr. Koichi Kondo 近藤　浩一	Sabo Technical Center	Control Measures for Landslide & Debris Flow
Dr. Yoshihumi Hara 原　義文	Japan Sabo Association	Control Measures for Landslide & Debris Flow
Dr. Kazuyuki Takanashi 高梨　和行	Asia Air Survey Co., Ltd.	Control Measures for Landslide & Debris Flow
Dr. Ryosuke Tsunaki 綱木　亮介	Sabo Technical Center	Control Measures for Landslide & Debris Flow

Cabinet Office, NILIM, PWRI		
Dr. Taketo Uomoto 魚本　健人	Public Works Research Institute (PWRI)	Sustainable Reservoir Development & Management
Mr. Yoichi Iwami 岩見　洋一	National Institute for Land and Infrastructure Management (NILIM)	River Ecohydraulics
Dr. Nobutomo Osanai 小山内　信智	Public Works Research Institute (PWRI)	Control Measures for Landslide & Debris Flow
Dr. Takashi Sasaki 佐々木　隆	Public Works Research Institute (PWRI)	Sustainable Reservoir Development & Management
Dr. Hitoshi Umino 海野　仁	Public Works Research Institute (PWRI)	Sustainable Reservoir Development & Management

ICHARM	
Prof. Kuniyoshi Takeuchi 竹内　邦良	Basic Concepts of IFRM, Master's Thesis
Prof. Shinji Egashira 江頭　進治	Mechanics of Sediment Transportation and River Change, Master's Thesis
Prof. Nario Yasuda 安田　成夫	Sustainable Reservoir Development & Management
Mr. Minoru Kamoto 加本　実	Urban Flood Management and Flood Hazard Mapping, Master's Thesis
Asso. Prof. Takahiro Sayama 佐山　敬洋	Computer Programming, Basic Practice on Flood Forecasting & Inundation Analysis, Advanced Practice on Flood Forecasting & Inundation Analysis, Master's Thesis
Asso. Prof. Atsuhiro Yorozuya 萬矢　敦啓	Hydraulics, Basic Practice on Flood Forecasting & Inundation Analysis, Advanced Practice on Flood Forecasting & Inundation Analysis, Master's Thesis
Asso. Prof. Kelly Kibler	River Ecohydraulics, Site Visit of Water-related Disaster Management Practice in Japan, Master's Thesis
Dr. Kwak Young Joo 郭　栄珠	Basic Practice on Flood Forecasting & Inundation Analysis, Advanced Practice on Flood Forecasting & Inundation Analysis, Master's Thesis
Dr. Akira Hasegawa 長谷川　聡	Computer Programming, Master's Thesis
Dr. Tomoki Ushiyama 牛山　朋來	Computer Programming, Master's Thesis, Master's Thesis
Dr. GUSYEV　MAKSYM	Basic Practice on Flood Forecasting & Inundation Analysis, Advanced Practice on Flood Forecasting & Inundation Analysis, Master's Thesis
Dr. Shrestha Badri Bhakta	Basic Practice on Flood Forecasting & Inundation Analysis, Advanced Practice on Flood Forecasting & Inundation Analysis
Dr. Mamoru Miyamoto 宮本　守	Master's Thesis
Dr. Ai Sugiura 杉浦　愛	Master's Thesis
Dr. PERERA Duminda	Master's Thesis

Table 2-4　List of field trip sites

Date	Site	Details	Cooperating office
October 4th (Fri)	Geospatial Information Authority of Japan (GSI)	Overall disaster management services in GSI, basic map information, Digital Japan Basic Map, etc.	Geospatial Information Authority of Japan (GSI)
	National Research Institute for Earth Science and Disaster Prevention (NIED)	Overall research activities concerning disaster prevention in NIED	National Research Institute for Earth Science and Disaster Prevention (NIED)
October 11th (Fri)	Office of Urban Renaissance Agency (Takezono, Tsukuba-city), In and around Tsukuba Science City	Infiltration and storage facilities in Tsukuba	Business Planning Team, Business Department, Ibaraki Branch Office, Tokyo Metropolitan Area New Town Office, Urban Renaissance Agency
	Kokai River, Hakojima retarding basin, Kuroko Water Level and Flow Observation Station	Observation of retarding basin and water level observation station	Shimodate River Office, Kanto Regional Development Bureau, MLIT
October 30th (Wed)	Tonegawa-Joryu (Tone River Upstream) River Office, and Kurihashi District in Kuki City	• Water level forecasting for river • Cooperation with municipalities • Communication of flood information in Kurihashi	Tonegawa-Joryu (Tone River Upstream) River Office, Kanto Regional Development Bureau, MLIT
	Watarase retarding basin	Roles of retarding basin	
October 31st (Thu)	Kinugawa Integrated Dam Control Office	Dam network in the upper course of the Kinugawa River	Kinugawa Integrated Dam Control Office, Kanto Regional Development Bureau, MLIT
	Kawaji Dam	Observation of arch dam	
	Yunishigawa Dam	Observation of concrete gravity dam	
November 1st (Fri)	Sabo project in the Inari River (Nikko)	Sabo project in the Inari River (Nikko)	Nikko Sabo Office, Kanto Regional Development Bureau, MLIT
	Sabo project in Ashio	Sabo project in Ashio	Watarase River Office, Kanto Regional Development Bureau, MLIT

December 4th (Wed)	Wide Area Water Control Office/ Disaster Management Office, Kanto Regional Development Bureau	• Flood forecast/warning systems in Japan • Collection and communication of flood information	River Department/ Planning Department, Kanto Regional Development Bureau, MLIT
December 5th (Thu)	Kawawa Retarding Basin	Flood countermeasures in Kanagawa Prefecture (integrated flood control project)	River Division 1, Yokohama Kawasaki Flood Control Office, Kanagawa Prefectural Government
	Onmawashi Park Regulating Reservoir		Engineering Division, Kawasaki Flood Control Center, Yokohama Kawasaki Flood Control Office, Kanagawa Prefectural Government
December 6th (Fri)	Japan Meteorological Agency (JMA)	Meteorological services of Japan, etc.	Japan Meteorological Agency (JMA)
March 4th (Tue)	Shirako River, Tokyo Metropolitan Government	Flood countermeasures in urban area (measures in small and medium-sized rivers)	Chief, Small and Medium-sized Rivers Subsection, Planning Section, River Department, Bureau of Construction, Tokyo Metropolitan Government
April 24th (Thu)	Shinanogawa-Karyu (Shinano River Downstream) River Office	Outline of flood disasters and past disasters in the Shinano River Basin (torrential rain in July 2011, torrential rain in July 2004, etc.)	Shinanogawa-Karyu (Shinano River Downstream) River Office, River Planning Division, River Department, Hokuriku Regional Development Bureau, MLIT
	Ohkouzu Diversion Channel	[Observation] Ohkouzu Museum, Ohkouzu Movable Weir, mouth of the diversion channel	Shinano River Office, Hokuriku Regional Development Bureau, MLIT
April 25th (Fri)	Sagurigawa Dams	[Observation] Structure of rockfill dams Roles of Sagurigawa Dam in flood control	Sagurigawa Dam Control Office, Hokuriku Regional Development Bureau, MLIT

June 4th (Wed)	Kinki Regional Development Bureau	Damage from and response to Typhoon No. 18 in 2013 Flood forecasting	River Planning Division, River Department, Kinki Regional Development Bureau, MLIT
June 5th (Thu)	Yodogawa Museum	Outline of the Yodo River Basin	Yodo River Office, Kinki Regional Development Bureau, MLIT
	Field visit in the Yodo River	Super levee, machines for disaster countermeasures, etc.	
	Katsura River (Koga Bridge), Arashiyama (Togetsukyo Bridge)	[Observation] Damaged spots due to Typhoon No. 18 in 2013	
June 6th (Fri)	Yodogawa Integrated Dams Control Office	Outline of dams under the jurisdiction	Yodogawa Integrated Dams Control Office, Kinki Regional Development Bureau, MLIT
	Amagase Dam	Dam operation at the time of Typhoon No. 18 in 2013	
	Lake Biwa River Office	Description of work contents and observation of overfall weir, Otsu Diversion Channel and Aqua Biwa	Lake Biwa River Office, Kinki Regional Development Bureau, MLIT

2.2.4 Studying and Living Environment

As is usual in universities, lesson time is divided into credits of 90 minutes. Table 2-5 shows the daily timetable. Students stay at JICA Tsukuba (Kouyadai, Tsukuba, Ibaraki) and commute to classes on the JICA bus.

Table 2-5 Daily timetable

1st period	9:00–10:30
2nd period	10:45–12:15
3rd period	13:15–14:45
4th period	15:00–16:30

As was the case last year, in the first half of the course from October to March there is an "Nicchoku" (officer-of-the-day) system, with the students participating in turn; the student assigned as the Nicchoku for the day performs tasks such as taking attendance, cleaning whiteboards after classes, making sure doors and windows are locked and lights are turned off, and writing a simple report on the day's results on a "Nicchoku Sheet" (one page of A4 sized paper). In the second half of the course, from April to September, which mainly consists of individual study, students take turns on a weekly basis, checking attendance and producing a weekly summary report.

2.3 Master's Thesis

As mentioned above, this course is characterized by its "Problem Solving-Oriented" nature, which aims to allow students think and solve problems rather than forcing them to study. In accordance with this objective, students are required, for their master's thesis on this course, to study themes related to solving problems in their own countries. We hope to develop people with the ability to create comprehensive plans for the reduction of damage from water-related disasters and to promote problem solving in the home countries of our students when they return there.

Therefore, immediately after the course starts, we held an "Inception Report" presentation in which students explained the water related problems in their home countries, gave information concerning the areas in which they were planning to study for their master's theses, and described the tasks required for the performance of projects. Following this, ICHARM supervisors and students discussed themes for study, and students started working on their own study themes even before they had completed most of their lectures and exercises. The deadline for submitting master's theses was late August 2014, and submission was followed by acceptance examinations in GRIPS to determine whether master's degrees could be awarded.

Chapter 3: 2013–2014 Activity Report

Group photo taken at the front gate of the GRIPS
(September 12, 2014)

Photographs have been collected in the attachment, please see as needed. Titles are effective as of the date when each photo was taken.

ICHARM implemented the Water-related Disaster Management Course of Disaster Management Policy Program (JICA training name "FLOOD DISASTER MITIGATION") over a period of around one year from October 2, 2013 to September 12, 2014 as a joint program with the Japan International Cooperation Agency (JICA) and the National Graduate Institute for Policy Studies (GRIPS).

The goal of this course is to improve participants' capability to practically manage problems related to water-related disasters on a local level and to eventually contribute to socioeconomic or environmental improvement at a national level.

The course has several specific features, as follows. Students can earn a master's degree in one year. The training is oriented toward problem solving in order to improve the students' ability to propose solutions to actual problems in their home countries. The course focuses on actual tasks rather than theory.

There are 12 students this year: two from Bangladesh, one from China, one from El Salvador, one from Kenya, one from Myanmar, two from Sri Lanka, one from Pakistan, two from the Philippines, and one from Venezuela. These 12 students all successfully passed their thesis examinations, earned their master's degree (in Disaster Management), and returned to their home countries.

The course formally started on October 2, 2013, with an entrance ceremony (course orientation) held by GRIPS at the GRIPS building (Roppongi, Tokyo).

On October 3, the course orientation was held at JICA, and on October 4, with the attendance of ICHARM (Director Takeuchi, Deputy Director Yasuda, Research and Training Advisor Egashira, Chief Researcher Kamoto, Research Specialist Kibler, Researcher Kudo, Training Support Staff

Hamada), JICA Tsukuba (Director General Kimura, Director Kawasumi, Officer Nemoto, Training Coordinator Yamada, Training Support Staff Mugiyama) and GRIPS (Prof. Ando), the Opening Ceremony was held at PWRI where welcome speeches were presented by each organization, followed by the student resolutions presented by Mr. GUNASENA Muthubanda Appuhamige Sanath Susila (Sri Lanka) on behalf of the participating students.

The first half of this one year course consisted mainly of lectures and exercises related to water-related disasters, and in the second half, students spent a long period working on their individual studies. The students also went on field trips in order to learn from the actual locations where Japan's flood countermeasures are implemented.

The instructors on the course included not only researchers at ICHARM but also those at PWRI, NILIM, and universities in Japan involved in leading edge research in various fields of study connected with water-related disasters.

<Lectures/Exercises (October to December)> (positions as of that time)

On October 7, soon after the start of this course, chief researchers of ICHARM introduced participants to the research topics of the projects for which they are responsible. This was intended to ensure that participants' understanding of ICHARM's research projects triggers them to begin thinking about the theme of own master's thesis and their questions to researchers of ICHARM about the research content. On October 17, joint lectures were held for the students of this course and those of the Earthquake Course and Tsunami/Earthquake Course of the Disaster Management Program along with field trips. In the morning, the students listened to a lecture by ICHARM Director Kuniyoshi Takeuchi at PWRI and then they visited the facilities of the dam hydraulic laboratory and river model experiment facility. In the afternoon, they moved to the Building Research Institute to see some experiment facilities and listen to another lecture.

Lectures the students took included the Basic Concepts of Integrated Flood Risk Management (IFRM), which is indispensable knowledge for students of a master's course learning how to cope with flood disasters. Prof. Kuniyoshi Takeuchi, ICHARM, Prof. Taikan Oki, the University of Tokyo, and Masayuki Watanabe, President of the Institute for International Development and Peace, Inc., lectured the students on the basic concepts of flood disaster control and global warming.

At the same time, a Hydraulics lecture was delivered to teach the students the basics of hydraulics, which is also an essential subject for the course. Associate Prof. Atsuhiro Yorozuya, ICHARM, delivered a refresher course on calculus, and Prof. Huang Guangwei, Sophia University, delivered basic lectures. Then, hydraulic exercises and discharge observation exercises were conducted by Assoc. Prof. Yorozuya.

In addition, Professor Shoji Fukuoka (Chuo University) and Professor Yasuharu Watanabe (Kitami Institute of Technology) gave lectures under the title "Flood Hydraulics and Sediment Transport" teaching the basic principles of flood flow and sediment transport. These lectures were followed by "Mechanics of Sediment Transportation and River Changes" lectures, by Professor Shinji Egashira (ICHARM).

The lecture "Hydrology" by Prof. Toshio Koike (the University of Tokyo) was given in November and December, and the students were lectured on basin-wide water circulation/hydrological processes, field observations/remote sensing, and water resources management.

In addition, lectures under the title "Urban Flood Management and Flood Hazard Mapping" were given as more practical lessons. Specifically, Prof. Shigenobu Tanaka (Kyoto University) and Chief Researcher Minoru Kamoto (ICHARM) lectured on Japanese disaster prevention systems, river

information systems and evacuation. Furthermore, Prof. Haruo Hayashi (Kyoto University) provided a lecture on disaster psychology, and Prof. Toshihiko Sugai (University of Tokyo) gave a lecture on geomorphology, an important topic for understanding flood-prone areas.

Also, ICHARM researchers started offering various exercises.

In the “Basic Practice on Flood Forecasting & Inundation Analysis” exercise, the students were provided with lectures and exercises on the following topics: GIS by Research Specialist Young Joo Kwak, rainwater runoff inundation model (RRI model) by Assoc. Prof. Takahiro Sayama, Integrated Flood Analysis System (IFAS) by Researcher Badri Bhakta Shrestha, and BTOP model by Research Specialist Maksym Gusyev.

In the “Computer Programming” exercises, Assoc. Professor Takahiro Sayama, Research Specialist Tomoki Ushiyama, and Research Specialist Akira Hasegawa provided instruction on numerical solutions using FORTRAN.

On November 26, they visited a hydraulic experiment facility in Sakutani, Tsukuba city (Tsukuba Research Center of Pacific Consultants Co., Ltd.) to learn the basics of hydrology hands-on under the guidance of Assoc. Prof. Atsuhiro Yorozuya. The students conducted hydraulic experiments in groups.

<Lectures/Exercises (January to May)> (positions as of that time)

In the two weeks from January 27 to February 7, intensive lectures on “Disaster Mitigation - Recovery Policy” and “Disaster Risk Management” were delivered, with Prof. Shigeru Morichi, GRIPS, and Prof. Shoichi Ando, GRIPS, acting as the main lecturers. The students also visited a few places in Nagoya city.

From February to March, the lectures “Sustainable Reservoir Development & Management” and “Control Measures for Landslide & Debris Flow” were delivered. In “Sustainable Reservoir Development & Management,” Prof. Nario Yasuda (ICHARM), Chief Executive Taketo Uomoto (PWRI), Team leader Takashi Sasaki (NILIM), and Senior Researcher Hitoshi Umino (PWRI) delivered lectures on the latest trends and technologies in dams.

In “Control Measures for Landslide & Debris Flow,” Prof. Koichi Kondo (Director, Sabo Technical Center), Prof. Katsuo Sasahara (Kochi University), Permanent Councilor Yoshifumi Hara (Japan Sabo Association), Manager Ryosuke Tsunaki (Sabo Technical Center), Lecturer Kazuyuki Takanashi (Consultant, Asia Air Survey Co., Ltd.), and Group Leader Nobutomo Osanai (PWRI) gave lectures on the latest trends and technologies in erosion control.

In “River Ecohydraulics,” Asso. Prof. Kelly Kibler (ICHARM), Prof. Tetsuya Sumi (Kyoto University) and Chief Researcher Yoichi Iwami (ICHARM) delivered lectures on river ecosystems and the impact of dams on river environments.

In the “Advanced Practice on Flood Forecasting & Inundation Analysis” exercise, the students engaged in exercises with more advanced content about GIS based on what they had learned from the exercises for “Basic Practice on Flood Forecasting & Inundation Analysis.” In addition, each student selected the model that is closest in content to his/her master’s thesis from among RRI, IFAS or BTOP, and intensively studied the selected model.

On April 19 during our visit to the midstream area of the Shinano River, the students were introduced to aDcp (acoustic Doppler current profilers) observation equipment, and performed exercises on discharge observation using the float observation method and a radio current meter in the Uono River near Nekoya Bridge, Horinouchi, Uonuma City, Niigata Prefecture under the guidance of Asso. Prof. Yorozuya, Research Specialist Motonaga, and Researcher Kudo (ICHARM), with the cooperation of

Suimon Kankyo Co., Ltd. Although it was the first observation for many of the students and the exercise was conducted in cold temperatures, each group showed a keen interest in the exercise.

<Field trips and exercises>

With the support of local offices of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and local governments, there were field trips to various flood control facilities in Japan enabling students to acquire clues to solving the problems presented by water-related disasters in their various countries.

On October 4, soon after their arrival in Japan, the students embarked on a visit to research institutes in Tsukuba city. The first leg was the Geospatial Information Authority of Japan (GSI), where they were given an overview of GSI operations as well as various measurement results associated with the Great East Japan Earthquake. The second leg was the National Research Institute for Earth Science and Disaster Prevention (NIED), where they were given an overview of the technology for satellite-based precipitation measurement using X-band MP radar, and after that, they observed a large-scale rainfall experiment facility. On October 11 of the following week, the students first visited a newly developed area in Tsukuba city to observe storm water storage and infiltration facilities. With the cooperation of the Ibaraki Branch Office of the Urban Renaissance Agency, after being given an overview at the office, we visited a reservoir and an infiltration facility in the vicinity of Tsukuba Science City. In the afternoon, the students visited the Hakojima Retarding Basin in the Kokai River to learn the roles and functions of the retarding basin. In addition, they were guided to the Kuroko Water Level and Flow Observation Station where explanation was provided on the water level observation method.

From October 30 to November 1, we visited a few sites in the river basins of the Tone River and Kinu River to observe case examples of flood countermeasures in non-urban areas, especially dams to which flood control technologies are applied using the topographical feature of a rapid river. On the 30th, with the cooperation of the Tonegawa-Joryu River Office of the MLIT, the students were given a lecture on damages caused by Typhoon Kathleen and on flood forecasting at the office, and after that, we saw the “Marugoto Machigoto Hazard Map” signs in the Kurihashi area, the Tone River water level display tower constructed at the Kurihashi branch office in Kuki city, and a “mizuka” (protective mound and structure) restored by the Kuki City Board of Education. “Marugoto Machigoto Hazard Map” indicates the inundation depth registered by Typhoon Kathleen on utility poles positioned on major roads around the city. This system is an inexpensive measure which allows users to quickly learn risks of flooding, and is therefore thought to be fully applicable to developing countries. In the afternoon, we moved to the Watarase Retarding Basin and got to see a panoramic view of the basin from the observation tower within the basin. On this day, the students asked many questions based on what they learned from the lectures at ICHARM, including a question on the forecasting models.

On the following day, October 31, we went on a field trip to learn about the effective operation of dams in the Kanto region with the cooperation of the Kinugawa Integrated Dam Control Office, MLIT. After the students received explanations of the outline of the four dams in the upstream area of the river and their operational coordination at the Office, they were brought to the Kawaji Dam and Yunishigawa Dam. It was a valuable visit as they were able to observe inside the dam body. On the last day of the 11th, we visited erosion control sites in the Inari River and Ashio area with the cooperation of the Nikko Sabo Office and Watarase River Office. The students were awestruck by the grandeur of the slit-type erosion control facility in the Inari River when they were able to go down very close to the facility. In the Ashio area, after being welcomed by Japan’s largest class of erosion control weir, they heard a lecture on the sediment control works with mock-up display models at the Akagane Shinsui Park and then visited hillside works where sediment control work is being carried

out. The students appeared to realize the importance of erosion control projects all over again after the course of this one day.

Over the period from December 4 to 6, a study tour was conducted with primary emphasis on flood control in urban rivers. The students were first given lectures at the Kanto Regional Development Bureau on flood forecasting/warning and on X-band MP radar with an explanation on differences between it and C-band. On December 5, we went on a field trip to observe the comprehensive flood control measures in an urban river basin with the help and guidance of Assoc. Prof. Masahiro Imbe (Executive Director of the Association for Rainwater Storage and Infiltration Technology), and the Kanagawa prefectural government. Specifically, we visited the Tsurumi River Retarding Basin, the Kirigaoka Retarding Pond, the Kawawa Retarding Basin, Onmawashi Park Underground Reservoir, and the houses of local residents who had installed rainwater infiltration systems on their properties. The area along the Tsurumi River was rapidly urbanized after the war; learning about the flood measures implemented there was thought to prove useful in implementing flood control measures in major Asian cities where populations are still increasing. In particular, in the Kawawa Retarding Basin, we learned that there is a storage facility underneath a subway line depot. We were strongly reminded of the importance of intersectoral collaboration, such as between rivers and railroads, when implementing flood control measures in urban areas where there is scarcity of land for structural measures. There are growing concerns about the recent frequent occurrence of localized short-term heavy rainfall caused by global warming, and the students understood the importance of providing storage facilities in urban areas to cope with such rainfall attacks. On December 6, they visited the Japan Meteorological Agency (JMA) and were given an overview of the meteorological services and methods of forecasting, and then they visited the forecasting room. They were informed of the fact that JMA, MLIT and prefectural governments work closely together to forecast river floods.

On March 4, with the help of the Construction Bureau of the Tokyo Metropolitan Government (TMG), we visited a river improvement project site, the Shirako River Reservoir Cluster, as an example of a flood control works in an urban area lacking sufficient available land for works. The students entered a surge tank at the Shirako River Reservoir, saw a vertical shaft constructed by clever use of the land in the Oizumi Junction, and then went down the shaft for about 50 m on a service elevator and saw the inside of the tunnel designed to store water in the event of a flood.

On April 8, we visited the Fukuoka Weir. It was built to secure irrigation water, so this visit provided an opportunity to learn about irrigation technologies in addition to those for flood control. We were also able to show the students the beautiful nature of Japan as the sakura (Cherry Blossoms) season was in full swing.

From April 24 to 26, we visited the midstream area of the Shinano River and conducted discharge observation exercises. On the 24th, the students were given an overview of the flood countermeasures at the Shinanogawa-Karyu River Office of MLIT, and then they moved to the Ohkouzu Diversion Channel where they learned the history of the floods and countermeasures in the Shinano River and observed the new and former movable weirs to understand roles of the Ohkouzu Diversion Channel, a key facility for flood countermeasures in the Shinano River. On the 25th, we visited the Sagurigawa Dam, and after hearing a lecture on the structure of a rockfill dam, the students observed the dam body. As mentioned earlier, we observed the discharge of the Uono River near Nekoya Bridge, Horinouchi, Uonuma city.

Over the period from June 4 to June 7, a study tour to the Kinki region was conducted. Its purpose was for students to learn about flood control measures in the Yodo River Basin, which has developed over the years using abundant water resources derived from Lake Biwa, and to learn about the impact of and administrative bodies' response to Typhoon No. 18 which brought record rainfall in September 2013. First, we visited the Kinki Regional Development Bureau of MLIT, to get an overview of the typhoon and damages within the jurisdiction. It was explained to the students that even though Typhoon

No. 18 brought record precipitation and wreaked enormous damage on every corner of Japan, quite a few areas were able to avert damage thanks to countermeasures constructed after the typhoon damage in 2004, and expansion of damage was able to be avoided through collaborative operations of a group of dams in the Yodo River system and operation of the Setagawa Weir. On the following two days, we visited the field offices and areas damaged by the typhoon and were provided with detailed descriptions. On the final day, the students visited the Lake Biwa Museum and the Lake Biwa Canal Museum to learn about the rich culture in the Yodo River Basin. During this study tour, the students enthusiastically attended the observation program and actively asked questions to the personnel on site, of which some were related to the themes of their own master's theses.

On July 6, we observed the Flood Fighting Drill sponsored by the city government of Joso. The students observed a variety of flood fighting methods and were amazed at the fact that such a drill is performed every year.

On September 10, we visited the Ninomiya Sontoku Museum, Moka city, Tochigi prefecture. This visit was very beneficial for the participants because understanding Sontoku's philosophy of "Hotoku Shiso" helps them realize the importance of developing an affluent society through the cooperation of many people and the importance of self-help, mutual help, and public help. Through mutual voting among the students, ICHARM offers the "ICHARM Sontoku Award" to honor the student who contributed the most to this course.

<Master's thesis>

For students writing their master's thesis, ICHARM researchers interviewed each of the students individually to find out which aspects they wished to research and supported them in what paths to take in their research in order to resolve water–related disasters in their respective countries. First of all, on October 25, the students presented their inception reports. Then, the students and the researchers discussed the process of the students' master thesis research to determine which ICHARM researcher each student should work with on their own thesis research and they narrowed down their research themes.

For three days from January 7 to 9, we invited a lecturer from the GLM Institute to provide a practice session on "Project Cycle Management." This subject aimed to teach students to illustrate a problem in a tree structure, analyze it and prepare and set the schedule for measures against it. This is a very useful exercise as it helps students objectively analyze the problems faced by each student's home country and to determine the direction of their thesis research.

With the students' first interim thesis presentation being on February 12, they had a total of four presentations to give including the three ensuing on March 20, May 9 and July 8. These interim presentations not only provided the students with the opportunity to receive advice from ICHARM researchers, it also allowed them to see their fellow students' progress which motivated them to prepare theses of their own. On the final presentation day, August 8, Prof. Shoichi Ando (GRIPS) also attended the presentation and commented on each student's achievement in the past year.

In this course, students are actively encouraged to submit their papers to Japanese academic societies. This year four students, or Mr. ISLAM Md. Khairul (Bangladesh), Ms. ALFARO LOPEZ Ingrid Altagracia (El Salvador), Ms. ONJIRA Pauline Ingado (Kenya) and Mr. BASILAN, Emar Guevara (Philippines), had the opportunity to present their research at the 16th International Summer Symposium held on September 10 by the Japan Society of Civil Engineers at Osaka University. This year, although it was assumed that it would not be possible for the students to attend this event because its date was so close to the closing ceremony and graduation ceremony, four students were able to present their aspirations for participation in spite of the hard schedule. Ms. Pauline made a

presentation at the GRIPS Student Meeting held on September 2 at GRIPS on behalf of all the students in the course.

In this way, we intend to actively provide students with opportunities to present their research findings in order to motivate them in their work on their master's theses.

<Others>

Students actively participated in the "ICHARM R&D Seminar" presented by water disaster area specialists invited by ICHARM. Students were given a large number of opportunities to learn about the most recent trends and knowledge related to water disasters in both Japan and the wider world.

On April 7, a cherry blossom viewing party, jointly organized by the Director of PWRI and the Director of ICHARM, was held in the ICHARM facility grounds to help the students experience Japanese culture. They were enchanted by the view of the cherry blossoms beautifully in bloom.

On September 8, the Action Plans, which report how the results of training will be used once the students return home and what students will be involved with, were announced.

The closing ceremony for JICA training was held at JICA Tsukuba on September 11. During the ceremony, JICA Tsukuba Director Kimura, ICHARM Director Takeuchi and GRIPS Prof. Ando made congratulatory remarks, after which JICA awarded the students with their program completion certificates. The Best Research Award, an award established jointly by GRIPS and PWRI for students who wrote the best master's theses, was given to Ms. FERRER Santy Bumali (Philippines) and Ms. ONJIRA Pauline Ingado (Kenya). Then, the ICHARM Sontoku Award, an award decided through mutual voting among the students that is granted to the student who contributed the most to the operation of this course, was presented to Mr. ZAW Myo Khaing. Representing the students, Mr. Raul shared a few words of thanks to conclude the ceremony.

On September 12, the graduation ceremony was held at GRIPS. Prof. Ando, the program director, read out the name of each student, and the Dean of GRIPS presented a diploma to each of them on stage. The students then firmly shook hands with Prof. Takeuchi, taking their diplomas—the fruit of their year's study—with expressions on their faces showing great satisfaction.

Over the following days, the students left Japan for their respective homes.

Chapter 4: Master's Thesis

As noted above, Table 4-1 shows the main schedule relating to the master's theses this year.

Table 4-1 Schedule relating to master's thesis

2013	28th October	Presentation on Inception Report
2014	7th–9th January	Project Cycle Management exercise
	24th January	1st Interim Presentation
	20th March	2nd Interim Presentation
	9th May	3rd Interim Presentation
	4th July	Deadline of submission of the 1st draft thesis
	8th July	4th Interim Presentation
	25th July	Deadline of submission of the 2nd draft thesis
	8th August	Final Presentation
	27th August	Submission to GRIPS

This project is a one-year master's course, and as such students select their thesis themes in October or November, immediately after arriving in Japan and without waiting for the lectures and exercises to be completed. The principle of the project was for each student to be assigned an appropriate ICHARM teaching faculty member after ample time was taken to consider the various research areas of each ICHARM research specialist. Students who chose similar themes were divided into similar groups, rather than each student being assigned one supervisor so that two or more teachers could conduct lectures and discussions in a seminar-type format.

As a general rule, students performed their subsequent thesis writing while receiving individual support from their supervisors.

There were four interim presentations in which students presented their own research in order to receive advice from ICHARM faculty and other students and also to allow them to get a sense of the other students' state of progress and foster an appropriate level of tension. One of our aims was also to improve the presentation skills of students by giving them several opportunities to stand up and present in front of other people.

The students worked on their master's theses with the assistance of Ms. Natsuko Nakamori, an English proofreader who intensively checked English in the master's theses during the two weeks in the middle of August, and finally submitted their master's theses to their supervisors or assistant supervisors on August 27. After their papers had been marked, all 12 students had successfully acquired a Master of Disaster Management.

Table 4-2 shows the title of each master's thesis and his or her main supervisor and assistant supervisor. Note that a synopsis of each thesis is planned to be collected in a separate report.

Working on their master's thesis allows students to not only increase their knowledge but to deepen their relationship with ICHARM, a process which serves to smooth communication channels between the agencies to which the students belong and ICHARM's research activities, thereby making research data easier to obtain. Establishing this sort of international network through students will greatly assist future ICHARM initiatives.

Table 4-2 List of master's Thesis

No.	Name	Title or Topic	Teaching Staff
1	Mr. ALAM Muhammad Jahangir	MORPHOLOGICAL CHANGES OF JAMUNA RIVER AND ITS COUNTERMEASURE IN SIRAJGANJ HARD POINT AREA	Kelly Egashira Yorozuya
2	Mr. ISLAM Md. Khairul	IMPORTANCE OF DISTRIBUTED HYDROLOGICAL MODEL FOR PRESENT AND FUTURE FLOOD RISK MANAGEMENT IN BANGLADESH	Takeuchi Maksym Kwak
3	Ms. HAO,Ying	IMPROVEMENT OF QUANTITATIVE PRECIPITATION FORECAST IN HUAIHE BASIN BASED ON DOWNSCALING BY WRF MODEL	Ushiyama Egashira Sayama
4	Ms. ALFARO LOPEZ Ingrid Altagracia	Debris Flow Characteristic along the Main Channel with Structures in the Arenal de Mejicanos, San Salvador, El Salvador.	Yorozuya Egashira Kamoto
5	Ms. ONJIRA Pauline Ingado	APPLICATION OF REMOTE SENSING AND RAINFALL-RUNOFF-INUNDATION MODEL TO NEAR REALT ME FLOOD INUNDATION MAPPING IN KENYA	Sayama Ushiyama Hasegawa
6	Mr. Zaw Myo Khaing	FLOOD INUNDATION ANALYSIS AND RISK ASSESSMENT OF SITTOUNG RIVER BASIN	Sayama Kelly Sugiura
7	Mr. GUNASENA Muthubanda Appuhamige Sanath Susila	EFFECTIVE DAM OPERATION METHOD BASED ON INFLOW FORECASTING FOR SENANAYAKA SAMUDRA RESERVOIR, SRI LANKA	Miyamoto Takeuchi Duminda
8	Mr. MOUFAR Mohamed Mashood Mohamed	FLOOD INUNDATION ANALYSIS FOR METRO COLOMBO AREA – SRI LANKA	Duminda Sayama Yorozuya
9	Mr. AFZAL Muhammad	ESTIMATION OF SNOWMELT CONTRIBUTION TO DISCHARGE IN UPPER INDUS BASIN IN PAKISTAN USING DEGREE DAY METHOD	Takeuchi Sayama Hasegawa
10	Mr. BASILAN Emar Guevara	Evaluation of Flood-Prone Areas in Bicol River Basin, Philippines: Comparison of Flood Hazard Mapping Using Hydro-geomorphic and Hydrologic Modelling Methods	Kelly Sayama Duminda
11	Ms. FERRER Santy Bumali	FLOOD RISK ASSESSMENT UNDER THE CLIMATE CHANGE IN THE CASE OF PAMPANGA BASIN, PHILIPPINES	Miyamoto Ohara Maksym
12	Mr. CABRITA Raul Alfonzo	NUMERICAL ANALYSIS OF THE BED MORPHOLOGY IN THE REACH BETWEEN CABRUTA AND CAICARA IN ORINOCO RIVER.	Egashira Yorozuya Kamoto

Chapter 5: Course Evaluation and Issues for Future Improvement

5.1 Course Evaluation

In order to identify points for improvement, this section analyzes the results of questionnaires on “the Course in General,” which deals with the course period and design, and “the Course Specifics,” which asks about lectures and exercises.

For the “Course in General,” we analyzed the results of a questionnaire given to students during the JICA Evaluation Session on the final day of the course. For the “Course Specifics,” we analyzed the results of questionnaires sporadically carried out by ICHARM.

5.1.1 Course in General

This year is the seventh year for the course, since it was begun in 2007. Since the second year, a questionnaire with the same questions has been given to students every year, therefore allowing us to analyze the changes in students’ evaluation over the past six years, from the second year to the seventh. Although we pursued various questions in the questionnaire, our analysis focused on the following six questions:

1. Do you find the design of the program appropriate for you (your organization) to achieve the Program Objective?
2. Was the quality of lectures good enough for you to understand clearly?
3. Were you satisfied with the textbooks and materials used in the program?
4. Do you find the period of the program appropriate?
5. Do you find the number of participants in the program appropriate?
6. Do you think the knowledge and experience you acquired through the program in Japan is useful?

Tables 5-1 to 6 in the following pages show the evaluation results for the above six items in the past six years, while the breakdowns are shown in Figures 5-1 to 6.

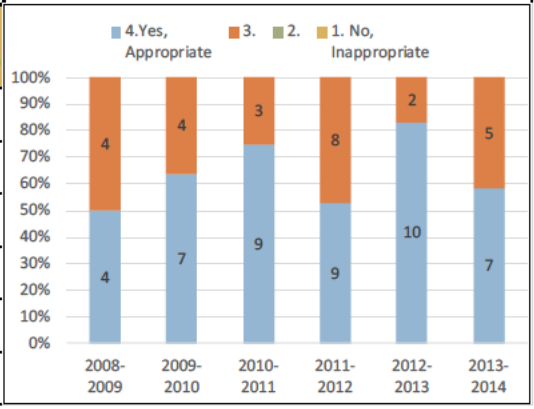
1. あなたもしくは所属組織が案件目標を達成する上で、プログラムのデザインは適切であると思いますか。

Do you finde the dedsing of the program appropriate for you (your organization) to achieve the Program Objective?

表5-1 Table 5-1

	4.Yes, Appropriate	3.	2.	1. No, Inappropriate
2008-2009	4	4	0	0
2009-2010	7	4	0	0
2010-2011	9	3	0	0
2011-2012	9	8	0	0
2012-2013	10	2	0	0
2013-2014	**7**	**5**	**0**	**0**

図5-1Figure 5-1



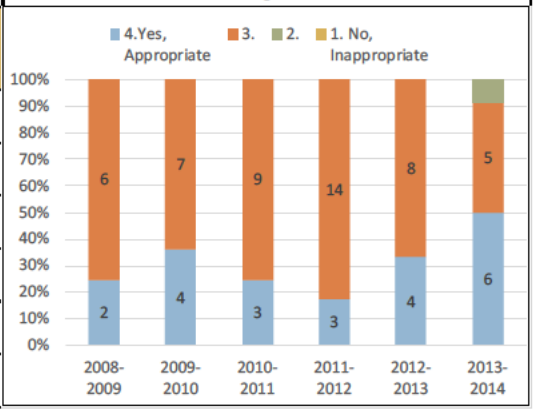
2. 講義の質は高く、理解しやすかったですか。

Was the quality of lectures good enough for you to understand clearly?

表5-2 Table 5-2

	4.Yes, Appropriate	3.	2.	1. No, Inappropriate
2008-2009	2	6	0	0
2009-2010	4	7	0	0
2010-2011	3	9	0	0
2011-2012	3	14	0	0
2012-2013	4	8	0	0
2013-2014	**6**	**5**	**1**	**0**

図5-2Figure 5-2



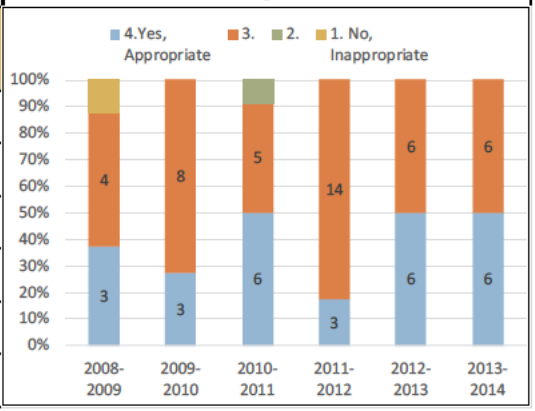
3. テキストや研修教材は満足するものでしたか。

Were you satisfied with the textbooks and materials used in the program?

表5-3 Table 5-3

	4.Yes, Appropriate	3.	2.	1. No, Inappropriate
2008-2009	3	4	0	1
2009-2010	3	8	0	0
2010-2011	6	5	1	0
2011-2012	3	14	0	0
2012-2013	6	6	0	0
2013-2014	**6**	**6**	**0**	**0**

図5-3Figure 5-3



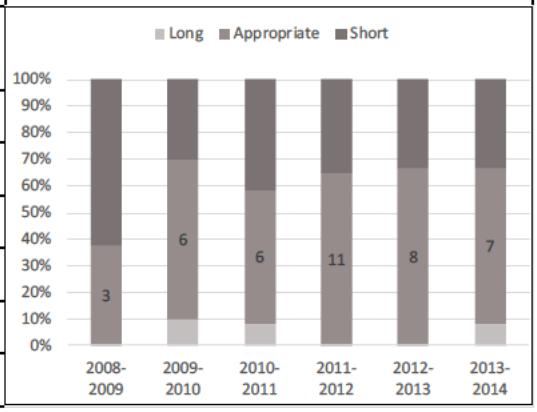
4. 研修期間は適切でしたか。

Do you find the period of the program appropriate?

表5-4 Table 5-4

	Long	Appropriate	Short	
2008-2009	0	3	5	
2009-2010	1	6	3	
2010-2011	1	6	5	
2011-2012	0	11	6	
2012-2013	0	8	4	
2013-2014	1	7	4	

図5-4Figure 5-4



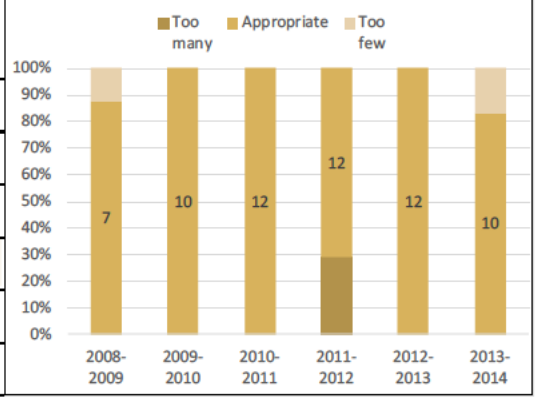
5. 本研修の参加者人数は適切と思いますか。

Do you find the number of participants in the program appropriate?

表5-5 Table 5-5

	Too many	Appropriate	Too few	TOTAL
2008-2009	0	7	1	8
2009-2010	0	10	0	10
2010-2011	0	12	0	12
2011-2012	5	12	0	17
2012-2013	0	12	0	12
2013-2014	0	10	2	12

図5-5Figure 5-5



6. 本邦研修で得た日本の知識・経験は役立つと思いますか？

Do you think the knowledge and experience you acquired throught the program in Japan?

表5-6 Table 5-6

	A. Yes, it can be directly applied to work	B. It cannnot be directly applied, but it can be adaptable to work	C. It cannnot be directly applied or adapted, but it can be of reference to me.	D. No, it was not useful at all
2008-2009	2	6	0	0
2009-2010	3	5	2	0
2010-2011	3	9	0	0
2011-2012	8	9	0	0
2012-2013	6	5	1	0
2013-2014	4	8	0	0

図5-6Figure 5-6

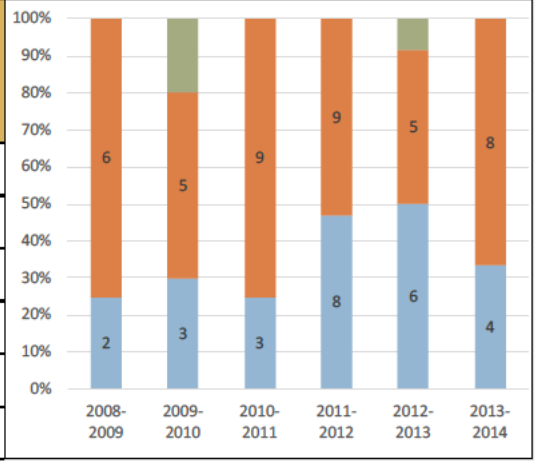


Table 5-1 and Figure 5-1 indicate a continual trend in participants giving improved evaluations of the design of the entire program over the period between the 2nd and 6th year, with the exception of the 5th year, and that the evaluation for this year (7th) slightly declined from the highest mark, which was last year's. The results of the questionnaire survey suggest that further improvement is required.

Table 5-2 and Figure 5-2 show that, on the one hand, the ratio of the answer "4. Yes, Appropriate" reached a record high this year, but on the other hand, it was the first time it was evaluated as "2. Somewhat Inappropriate." As a result of curriculum improvement every year, bipolarization of feedback occurred between the students who felt the curriculum was appropriate and the students who felt it was inappropriate. Intended for officials at the working level and not entirely focused on conceptual theories, this training course aims to provide a valuable curriculum for practical operations, but the participants work in the two different and specialized fields of civil engineering and meteorology. Also, applicable technologies and knowledge depend on the country. Given this background, the difficulty in establishing a practically useful curriculum stood out. Looking ahead, while giving consideration to students who do not feel the curriculum is fulfilling their expectations, we would like to carefully communicate the importance of receiving the same lectures on the phenomenon of flood damage and then as students from different countries with different expertise, sharing their knowledge and opinions with each other from their different professional standpoints.

Table 5-3 and Figure 5-3 show that the evaluation given to the course texts and teaching materials this year is equal to that of last year which was the highest in the past six years. In this course, every year we ask our lecturers to prepare texts that are easy for students to understand. The recent high evaluations are purely due to the effort of those lecturers.

Table 5-4 and Figure 5-4 indicate that this year's percentage of students who considered the course period to be "Appropriate" is equal to the average of the past six years. This master's course is intended for officials of an administrative body at the working level, and therefore, with a system established for students to acquire a master's degree as quickly as possible, the course is designed for them to resume their duties as soon as possible so they can apply what they have learned in Japan to their jobs. As such, this one-year master's course is very tough on students. Nevertheless, many of them evaluated it as "Appropriate," a fact that implies that the students understand why the master's course is designed like it is. Table 5-5 and Figure 5-5 indicate that the students considered the number of participants (12) to be "Appropriate" as a whole. Past results also indicate that 10 to 12 students is considered to be just the right number. This number is also regarded to be the right number in terms of site visits and other aspects of the course on the organizer's part.

Lastly, the results are shown in Table 5-6 and Figure 5-6 for the most important question for this course as its emphasis is placed on application in the students' home countries: "Do you think the knowledge and experience you acquired through the program in Japan was useful?" The number of participants who answered "A. Yes, it can be directly applied to work" was only at the 3rd highest in the last six years. However, all the other participants answered "B. Not directly, but it should prove useful," and accordingly all participants gave favorable evaluations. The objective of this master's course for acquisition of practically useful knowledge and experience is considered to be by and large achieved. Looking ahead, it is necessary to continue to improve the training so that it can satisfy all students who spend a full year away from their families and home. In conclusion, although this year's evaluation hasn't reached the highest level in the past six years, a positive evaluation was obtained as a whole. We believe that these results were achieved as a result of the cumulative improvements to the course made year after year.

5.1.2 Course Specifics

An anonymous questionnaire survey was taken of the students by ICHARM in April when most lectures were completed.

The questionnaire provided open-ended questions to obtain feedback, and the feedback that was considered especially important was categorized and summarized in Table 5-7 on the following page with responses from ICHARM. It happens every year that many students request more time for the practical exercises.

A possible outcome of the effort made by ICHARM to improve the conditions of daily life of students every year, there weren’t many comments made about this aspect again this year.

Figure 5-7 Feedback from students and ICHARM's proposed improvement in response to them.

		Feedback from M.Sc. Students	Response by ICHARM
Q1. The structure of the course curriculum	1	More lecture on computer programming are needed. (4 students responded.)	ICHARM won't increase the number of the lecture. But ICHARM is seeking for an alternative means.
	2	Fukuoka's lecture should be earlier than professor Huang. (3 students responded)	ICAHRM will draw up the curriculum with reference to the feedback.
	3	This lecture with Prof. Koike gives more time and teach in the first part of this course.	
	4	The Lecture with Prof. Huang would be very easy to understand if it comes after a hydraulics lecture by Watanabe (and Fukuoka). (2 students)	
Q2. Lecture			
2.1 Disaster Mitigation-Recovery Policy	1	Include more about flood disaster mitigation. (6 students responded)	We would like to ask each lecturer to consider their feedbacks as appropriate.
	2	Students should be requested to get data for this course since it was difficult for some students to get information.	
2.2 Disaster Risk Management	1	To increase the number of classes related to flood disaster instead of earthquake engineering class. (9 students responded)	
	2	If possible more example of disasters not only in Japan, but other countries especially the developing one.	

		Feedback from M.Sc. Students	Response by ICHARM
2.3 hydrology	1	There will be more discussions about frequency analysis and rain fall analysis. (3 students responded)	We would like to ask each lecturer to consider their feedbacks as appropriate.
	2	Contents of handouts were no in details.	We would like to ask each lecturer to consider their feedbacks as appropriate.
2.4 Hydraulics	1	Contents of handouts might have been more in detail.	
2.5 Basic Concepts of Integrated Flood Risk Management	1	More hours to discuss about Japanese's experiences and field visited with the Sensei.	
2.6 Urban Flood Management and Flood Hazard Mapping	1	It takes more practice in mapping flood risk.	
	2	Numerical exercise during the class to understand kinematic and dynamic wave methodology.	
2.7 Flood Hydraulics ad Sediment Transport	1	The contents of handouts were not much in detail.	
2.8. Mechanics of Sediment Transportation and Channel Changes	1	Increase to more lectures to do exercises in class.	The lecturer is considering what we could do.
	2	I haven't got any data for carrying out it at this stage.	We told them what kind of the data the course would require. However, we are going to reconsider how to instruct in order to prepare properly.
2.9 Sustainable Reservoir Development & Management	1	In my country, Dams have less importance.	ICHARM decided this course would be closed next period.
2.10 Control Measures for Landslide & Debris Flow	1	Lectures on the example of soft measures here in Japan could also be added.	We would like to ask each lecturer to consider their feedbacks as appropriate.
	2	I need more numerical example.	
2.11 River Ecohydraulics	1	This subject should introduce on the first part of the study phase.	ICAHRM will draw up the curriculum with reference to the feedback.

		Feedback from M.Sc. Students	Response by ICHARM
2.12 Computer Programming	1	The material for this course should be sent to students in advance before their arrival. (2 students)	The lecturer is considering what we could do.
	2	Classes are less in number.	
2.13 Basic Practice on Flood Forecasting & Inundation Analysis	1	More lectures required	ICHARM won't increase the number of the lecture. But ICHARM is seeking for an alternative means.
	2	The material for this course, especially Fortran subject, should be sent to students in advance before their arrival	The lecturer is considering what we could do in response to this feedback.
2.14 Advanced Practice on Flood Forecasting & Inundation Analysis	1	Increase classes and laboratory practice.	
	2	It would be helpful if before coming to Japan, ICHARM give an advance lecture material to read and study.	
2.15 Site Visit of Water related Disaster Management Practice in Japan	1	There should be a previous explanation of the site visit to understand the travel.	We'd like to ask each lecturer to consider their feedbacks as appropriate.
	2	We would like to make an interaction/conversation to the ordinary citizen who experienced the past disaster.	
Q3 Individual Study	1	It is aver important for us to know in advance what sort of researches we can carry out at the institution and the type of data needed for them. (3 students)	We told them what kind of the data the course would require. However, we are going to reconsider how to instruct in order to prepare properly.

5.1.3 This year's point for improvement and their results

5.1.3.1 Points for improvement

<Appropriate number of students>

The number of students this year was 12. With this number of students attending classes, exercises and field trips, lecturers and staff giving explanations were better able to pay attention to all the members, which helped refine and enrich the contents of the course. As previously mentioned, according to past questionnaires, when there were 10 to 12 students, all of them considered the number to be appropriate, and it would seem that empirically the right number of students for the design, specifics and method of instruction of the course is 10 to 12.

<Change in the number of subjects>

The contents and number of subjects are revised every year to respond to requests from students. Changes made to subjects in the past seven years are shown in Figure 5-7. The number of subjects remained at 19 from the 2nd to 4th year, after which the subjects were reduced by two in the 5th year to 17, and last year (the 6th year) with a reduction of three subjects the total was 14 subjects. This year subjects were integrated and new subjects established as follows:

- "Basic Hydrology" and "Advanced Hydrology" were unified into "Hydrology."
- "Practice on Flood Forecasting & Local Disaster Management Plan" was divided into the two subjects "Basic PRACTICE on Flood Forecasting & Inundation Analysis" and "Advanced PRACTICE on Flood Forecasting & Inundation Analysis."
- "River Ecohydraulics" was newly established.

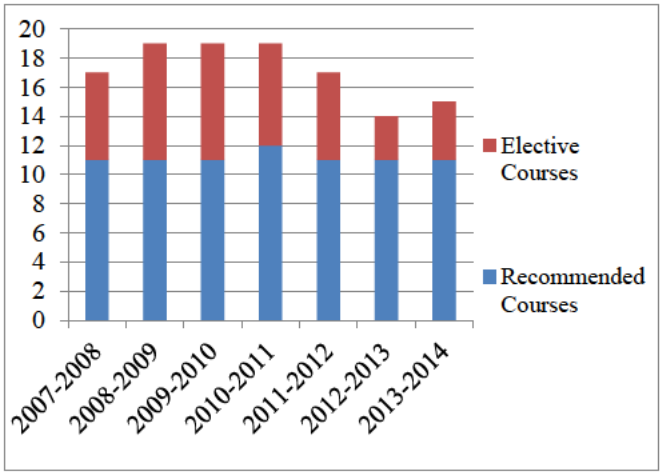


Figure 5-7 Changes in the number of subjects of the course

Practical subjects that are often requested were enriched, and "River Ecohydraulics" was newly established taking into account the fact that in developing countries the impact of infrastructural development on the environment has not been negligible in recent years.

As a result, the number of subjects this year was 15 which is the second lowest so far, and an increase by one from last year. We will continue to establish, abolish and integrate subjects in a flexible manner considering the needs of students and the international situation, and would like to secure sufficient time for writing theses.

<Master's thesis proofreading editor>

Some of the students weren't familiar with writing papers in English. English proofreading was conducted intensively with an English proofreader hired for this purpose in the approximate three-week period from the beginning of August prior to submission of theses. GRIPS directly employed Ms. Nakamori as an English proofreader. Students were given ample opportunities to consult with the proofreader face to face, and efficient guidance tuned to the characteristics of each student's English was successfully provided.

5.2 Future Issues

As mentioned earlier, we realized the following points for improvement in this year's course and intend to improve them for next year's course:

<Reorganization of subjects>

Some countries do not need dams. For this reason, "Sustainable Reservoir Development & Management" will not be held next year. Instead, a renowned lecturer will be invited several times to deliver special lectures on dams so as to provide knowledge on dams to the students who need it.

Chapter 6: Conclusion

At ICHARM, training is regarded as one of three main pillar activities, along with research and information networking.

Now that the seventh year of the course has been successfully completed, ICHARM has accumulated more know-how on training planning and administration. With students working on their master's theses, we have also contributed to solving water-related problems in the corresponding countries. These activities have given momentum to "localism," one of the keywords for ICHARM activities.

This course also makes a considerable contribution to information networking activities. That is to say, connections with the students' home organizations are becoming stronger each year, and this provides better visibility of local situations in numerous ways. This worldwide information networking through students will definitely be helpful to other ICHARM activities, and we need a system allowing us to keep close contact with the students after they have graduated.

A year may seem like a long time but is in fact quite short. However, if at least some of what the students have learned during this year-long master's course is of use in their work, then by extension it will have contributed to reducing water-related damage in their home countries. It may take several years or a few decades, but, through the implementation of this course, we expect to make a steady contribution to the mitigation of damage due to water-related disasters in our students' home countries.

- Acknowledgment -

This course has now completed its seventh year, over which we revised the overall schedule and curriculum based on past experiences and have worked to enhance both the educational content and environment for the students. There is, however, room for still more improvement, and we appreciate your opinions and suggestions.

Finally, we would also like to express our gratitude to instructors and administration officials who devoted their valuable time to providing lectures and exercises on this course, and to the MLIT offices, local government officials, and local government who warmly welcomed our field trips.

Student List （2013－2014）

No.	Photo (写真)	Country (国名)	Name (呼び名)	Position(役職) /Organization(所属先)
1		**Bangladesh** バングラデシュ D1303219	Mr. ALAM Muhammad Jahangir **アラム ムハンマド ジャハンギール**	Sub Divisional Engineer/ Bangladesh Water Development Board
2		**Bangladesh** バングラデシュ D1303220	Mr. ISLAM Md. Khairul **イスラム エムディー カイル**	Sub Divisional Engineer/ Bangladesh Water Development Board
3		**China** チャイナ D1302724	Ms. HAO Ying **ハオ, イン**	Deputy sector chief, Meteorogical senior engineer/ Anhui Meteorological Observatory
4		**El Salvador** エルサルバドル D1302627	Ms. ALFARO LOPEZ Ingrid Altagracia **アルファロ ロペズ イングリド アルタグラシア**	Technician of Construction Department/Planning Office of the San Salvador Metropolitan Area
5		**Kenya** ケニヤ D1302578	Ms. ONJIRA Pauline Ingado **オンジラ ポリーン インガド**	Water Conservation Officer/ Water Resources Management Authority
6		**Myanmar** ミャンマー D1303218	Mr. ZAW Myo Khaing **ザウ ミョウ カイン**	Deputy Superintendent (Assistant Forecaster) of the Hydrological Section/ Department of Meteorology and Hydrology , Ministry of Transport
7		**Sri Lanka** スリランカ D1303216	Mr. GUNASENA Muthubanda Appuhamige Sanath Susila **グナセナ ムツバンダ アップハミジェ サナス スシラ**	Divisional Irrigation Engineer, in-charge of Ampara Division/ Irrigation Department
8		**Sri Lanka** スリランカ D1303217	Mr. MOUFAR Mohamed Mashood Mohamed **モウファー モハメド マシュード モハメド**	Special Project Division, Senior Engineer/ Sri Lanka Land Reclamation & Development Corporation
9		**Pakistan** パキスタン D1304855	Mr. Muhammad Afzal **アフザル ムハンマド**	Meteorologist, National Weather Forecasting Center/ Pakistan Meteorological Department
10		**Philippines** フィリピン D1303636	Mr. BASILAN, Emar Guevara **バシラン エマー グエバラ**	Laborarory Technician II/ Mines and Geosciences Bureau,
11		**Philippines** フィリピン D1303637	Ms. FERRER Santy Bumali **ファラー サンティ ブマリ**	Senior Engineer A/ National Irrigation Administration - Upper Pampanga River Integrated Irrigation System (NIA-UPRIIS) Dam & Reservoir Division
12		**Venezuela** ベネズエラ D1305237	Mr. CABRITA Alfonzo Raul Figuera **カブリタ ラウル アルフォンゾ**	Conventional Time Professor, Department of Hydraulic Engineer/ Universidad Central de Venezuela

2013-2014 Water-related Disaster Management Course　Time Table

Lecture(Lecturer)

- (1) Basic Concepts of Integrated Flood Risk management (FRM)
- (2) Flood Hydraulics and Sediment Transport
- (3) Hydrology
- (4) Hydraulics
- (5) Urban Flood Management and Flood Hazard Mapping
- (6) Mechanics of Sediment Transportation and River Changes
- (7) Sustainable Reservoir Development & Management
- (8) Control Measures for Landslide & Debris Flow
- (9) River Ecohydraulics
- (10) Disaster Mitigation - Recovery Policy
- (11) Disaster Risk Management

Excercise(Lecturer)

- (1)P Computer Programming
- (2)P Basic Practice on Flood Forecasting & Inundation Analysis
- (3)P Advanced Practice on Flood Forecasting & Inundation Analysis
- (4)P Site Visit of Water-related Disaster Management Practice in Japan

		Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
October		9/29	9/30	10/1	2	3	4	5
	1st period 9 00-10 30				**Entrance Ceremony at GRIPS**	(Guidance at JICA)	9:00-9:30 Opening Ceremony (M.Sc) at ICHARM 9:40-10:00 Joint Entrance Ceremony at ICHARM (Ph.D & M.Sc) 10:15-11:00 Course Orientation(Ph.D & M.Sc) 11:00-11:40 PWRI tour	
	2nd period 10 45-12 15						11:45-12:35 Welcome meeting (Ph.D & M.Sc)	
	3rd period 13 15-14 45						Visit to Tsukuba Research Institute Geospatial Information Authority of Japan (GSI) 13:00-14:30	
	4th period 15 00-16 30						National Research Institute for Earth Science and Disaster Prevention (NIED) 15:00-16:30	
		6	7	8	9	10	11	12
	1st period 9 00-10 30		(2)P-1 Geographic Information System (GIS) (1) Dr. Kwak (ICHARM)	Meeting about student life	(2)P-3 Geographic Information System (GIS) (3) Dr. Kwak (ICHARM)	(4)-6 Systematic classification of water surface profiles Prof. HUANG (Sophia Univ)	Site Visit (1) Tour of flood countermeasures around Tsukuba 9 30-12:00 A: Tsukuba 14:00-16:00 B: Kokai River	
	2nd period 10 45-12 15		(2)P-2 Geographic Information System (GIS) (2) Dr. Kwak (ICHARM)	(4)-1 Basic mathematics and fundamental equations in Hydraulics Asso.Prof. Yorozuya (ICHARM)	(2)P-4 Geographic Information System (GIS) (4) Dr. Kwak (ICHARM)	(4)-7 Hydraulic jump and ts application Prof. HUANG (Sophia Univ)		
	3rd period 13 15-14 45		Introduction of ICHARM research activities by chief researchers 13:15-14:00 Mr. Iwami 14:05-14:45 Mr. Okazumi 14:50-15:20 Mr. Kamoto	(4)-2 Flow resistance in open channel, Flow resistance calculation in engineering practice Asso.Prof. Yorozuya (ICHARM)	Self Study	Self Study		
	4th period 15 00-16 30			Self Study	(4)-3 Basics of water surface prof les of open channel flow, Basics of flood wave Asso.Prof. Yorozuya (ICHARM)	(1)P-1 Introduction of Computer Programming with Fortran90 Asso. Prof. Sayama (ICHARM)		
		13	14	15	16	17	18	19
	1st period 9 00-10 30			(1)-1 Introduction What is natural disaster? Risk, Hazard and Vulnerability Prof. Takeuchi (ICHARM)	(2)-1 Outlines of characteristics and management of Japanese rivers Prof. Fukuoka (Chuo Univ.)	*9:00-10:30 lecture* Principle of Disaster Management Prof. Takeuchi (ICHARM)	(2)-3 Propagation of hydrographs of water level and discharge in flood flows Prof. Fukuoka (Chuo Univ.)	
	2nd period 10 45-12 15			Self Study	(2)-2 Occurrence of flood flows Prof. Fukuoka (Chuo Univ.)	**10:50 11:55 Tour of PWRI experimental facilities River experimental facility (NILIM), Dam experimental facility (PWRI)**	(2)-4 Flow resistance in rivers with compound channels Prof. Fukuoka (Chuo Univ.)	
	3rd period 13 15-14 45			(1)-2 PAR Model (1) Prof. Takeuchi (ICHARM)	Explanation of Online Journal	Move to Building Research Institute	(5)-1 Laws for Flood risk management in Japan Prof. Tanaka (Kyoto Univ.)	
	4th period 15 00-16 30			(1)-3 PAR Model (2) Prof. Takeuchi (ICHARM)	Self Study	Lecture at Building Research Institute	R&D Seminar	
		20	21	22	23	24	25	26
	1st period 9 00-10 30		(2)-5 Pred ction method of low res stance in compound channels and application to river course design Prof. Fukuoka (Chuo Univ.)	Feedback meeting with ICHARM staff	(1)-6 IFRM and traditional FRM Prof. Takeuchi (ICHARM)	(1)P-2 Variables Asso. Prof. Sayama (ICHARM)	(2)-7 Unsteady quasi-two dimensional analysis of flood flows Prof. Fukuoka (Chuo Univ.)	
	2nd period 10 45-12 15		(2)-6 Steady quasi-two dimensional analysis of flood flows in rivers with vegetat ons Prof. Fukuoka (Chuo Univ.)	(1)-4 ACCESS Model Prof. Takeuchi (ICHARM)	(1)-7 Concept of IWRM (1) Prof. Takeuchi (ICHARM)	(1)P-3 Arithmetic Calculation Asso. Prof. Sayama (ICHARM)	(2)-8 Relationship between dimensionless width, depth and discharge in rivers Prof. Fukuoka (Chuo Univ.)	
	3rd period 13 15-14 45		Medical Checkup by JICA (JICA)	(1)-5 Disaster management cycle Prof. Takeuchi (ICHARM)	(2)P-9 Runoff analysis with IFAS (1) Dr. Shrestha (ICHARM)	Explanation of Site visit (2)	Preparation of Inception Report	
	4th period 15 00-16 30			(5)-4 Flood control structure Asso. Prof. Kamoto (ICHARM)	(2)P-10 Runoff analysis with IFAS (2) Dr. Shrestha (ICHARM)	(1)P-4 Program Structure (f) Dr. Hasegawa (ICHARM)		
		27	28	29	30	31	1	2
	1st period 9 00-10 30		(2)-9 River cross-sections harmonizing flood control and river environment Prof. Fukuoka (Chuo Univ.)	(1)-8 Concept of IWRM (2) Prof. Takeuchi (ICHARM)	**Site Visit (2)**	**Site Visit (2)**	**Site Visit (2)**	
	2nd period 10 45-12 15		Self Study	(1)-9 Japanese experiences (1) Prof. Takeuchi (ICHARM)	**9:30-11:45 Lecture at Tone river work office, Kurihahi Town** **14:00-16:00 Watarase Retarding Basin**	**Dam in Kanto** **Yunishigawa Dam, Kawaji Dam**	**Sabo in Kanto** **Nikko sabo works, Ashio sabo works**	
	3rd period 13 15-14 45		13:00-16:15 Presentation of Inception Report (1 student * 15 min)	(7)-1 Outline of Dam Engineering Prof. Yasuda, ICHARM				
	4th period 15 00-16 30			(8)-1 Outline of sediment-related disasters and Sabo projects Prof. Kondo, SABO Technical Center	stay at Utsunomiya City	stay at Utsunomiya City		

Annex 2

Annex Ⅱ-1

Annex 3

November

	3	4	5	6	7	8	9
1st period 9 00-10 30			(2)P-11 Runoff analysis with IFAS (3) Dr. Shrestha (ICHARM)	Elementary school visit led by JICA	(4)-8 Numerical solution of the gradually-varied flow equation Prof. HUANG (Sophia Univ)	(6)-1 Introduction (1) Prof. Egashira (ICHARM)	
2nd period 10 45-12 15			(3)-1 Water properties and their roles in climate system Prof. Koike (Tokyo Univ.)		(4)-9 Unsteady flow models Prof. HUANG (Sophia Univ)	(1)-10 Japanese experiences (2) Prof. Takeuchi (ICHARM)	
3rd period 13 15-14 45			(3)-2 Characteristics of moist air and precipitation Prof. Koike (Tokyo Univ.)	(2)P-5 Rainfall-runoff-inundation modeling (1) Asso.Prof. Sayama (ICHARM)	14:15-14:45 Special lecture by Prof. Jaya	(1)-11 Japanese experiences (3) (Tentative) Prof. Takeuchi (ICHARM)	
4th period 15 00-16 30			(3)-3 Global energy and water cycle Prof. Koike (Tokyo Univ.)	(2)P-6 Rainfall-runoff-inundation modeling (2) Asso.Prof. Sayama (ICHARM)	(1)P-5 Program Structure (f) Dr. Hasegawa (ICHARM)	Self Study	
	10	11	12	13	14	15	16
1st period 9 00-10 30		(5)-2 Flood Control Planning(1) Prof. Tanaka (Kyoto Univ.)	Self Study	(2) Examination	(4)-10 Numerical methods for unsteady flow simulation(1) Prof. HUANG (Sophia Univ)	Discussion with ICHARM educational staff	
2nd period 10 45-12 15		(5)-3 Flood Control Planning(2) Prof. Tanaka (Kyoto Univ.)	(3)-4 River basin hydrological processes Prof. Koike (Tokyo Univ.)	Self Study	(4)-11 Numerical methods for unsteady flow simulation(2) Prof. HUANG (Sophia Univ)	(1)-12 Global trends (1) Impact of climatic change Prof. Oki (Tokyo Univ.)	
3rd period 13 15-14 45		(5)-6 Flood Hazard Map Prof. Tanaka (Kyoto Univ.)	(3)-5 Atmosphere-land interaction Prof. Koike (Tokyo Univ.)	(2)P-7 Rainfall-runoff-inundation modeling (3) Asso.Prof. Sayama (ICHARM)	(1)P-6 I/O Statement Dr. Hasegawa (ICHARM)	(6)-2 Introduction (2) Prof. Egashira (ICHARM)	
4th period 15 00-16 30		(5)-7 Evacuation Plan with Flood Forecast(1) Prof. Tanaka (Kyoto Univ.)	(3)-6 Soil moisture and ground water Prof. Koike (Tokyo Univ.)	(2)P-8 Rainfall-runoff-inundation modeling (4) Asso.Prof. Sayama (ICHARM)	(1)P-7 Program Structure (do loop) Dr. Hasegawa (ICHARM)	(6)-3 Mechanics of sediment transportation (1) Prof. Egashira (ICHARM)	
	17	18	19	20	21	22	23
1st period 9 00-10 30		(2)-10 Outline of sediment transport Prof. Watanabe (Ktami Institute of Technology)	Self Study	Self Study	(4)-12 Channel design Prof. HUANG (Sophia Univ)	Discussion of Thesis	
2nd period 10 45-12 15		(2)-11 1-D bed deformation, computing model Prof. Watanabe (Ktami Institute of Technology)	(3)-7 Runoff Prof. Koike (Tokyo Univ.)	Self Study	(6)-4 Mechanics of sediment transportation (2) Prof. Egashira (ICHARM)	(1)-13 Global trends (2) Impact of climatic change Prof. Oki (Tokyo Univ.)	
3rd period 13 15-14 45		(5)-8 Evacuation Plan with Flood Forecast(2) Prof. Tanaka (Kyoto Univ.)	(3)-8 Snow hydrology Prof. Koike (Tokyo Univ.)	Self Study	(6)-5 Mechanics of sediment transportation (3) Prof. Egashira (ICHARM)	Self Study	
4th period 15 00-16 30		(5)-9 Local disaster management plan Prof. Tanaka (Kyoto Univ.)	(3)-9 River basin hydrological modeling Prof. Koike (Tokyo Univ.)	Discussion of Thesis	Discussion of Thesis	(4) Briefing of Experimental study Asso.Prof. Yorozuya (ICHARM)	

December

	24	25	26	27	28	29	30
1st period 9 00-10 30		(2)-12 2-D bed deformation, sand waves and bars, meandering Prof. Watanabe (Ktami Institute of Technology)	(move)	(1)P-9 Quiz(1) Dr. Hasegawa (ICHARM)	(1)P-10 Hydrologic Application Exercise (1) Asso. Prof. Sayama (ICHARM)	Thesis Work	
2nd period 10 45-12 15		(2)-13 River disaster due to channel movement Prof. Watanabe (Ktami Institute of Technology)	(4)-4 Experimental study of flow resistance and water surface profiles(1) Asso.Prof. Yorozuya (ICHARM)	Self Study	(2)P Preparation of BTOP model Dr. Gusyev (ICHARM)		
3rd period 13 15-14 45		Self Study	(4)-5 Experimental study of flow resistance and water surface profiles(2) Asso.Prof. Yorozuya (ICHARM)	(6)-6 Mechanics of sediment transportation (4) Prof. Egashira (ICHARM)	(1)P-11 Arrays Dr. Ushiyama (ICHARM)		
4th period 15 00-16 30		(1)P-8 Program Structure (do loop) Dr. Hasegawa (ICHARM)	(move)	(6)-7 Mechanics of sediment transportation (5) Prof. Egashira (ICHARM)	(1)P-12 Arrays Dr. Ushiyama (ICHARM)		
	1	2	3	4	5	6	7
1st period 9 00-10 30		Self Study	(2)P-12 Large-scale Runoff analysis with BTOP (1) Dr. Gusyev (ICHARM)	(move)	(5)-5 9 30-10 30 Case study of comprehensive flood control measures -Tsurumi river- Mr. Imbe (ARSIT)	Site visit (3)	
2nd period 10 45-12 15		Explanation of Site Visit to Tokyo	(2)P-13 Large-scale Runoff analysis with BTOP (2) Dr. Gusyev (ICHARM)		**Site Visit (4) Integrated flood management (Tsurumi River) ※including 1.5h lecture by Mr.Imbe**	10:00-11:30 Lecture at Japan Meteorological Agency	
3rd period 13 15-14 45		Self Study	Self Study	14 30-16 00 Lecture at Kanto Regional Bureau of MLIT			
4th period 15 00-16 30		Self Study	Self Study	move to Yokohama stay at Yokohama	stay at Tokyo	14:00-16:30 Shirako River (Tokyo)	
	8	9	10	11	12	13	14
1st period 9 00-10 30		(2)-14 Flows in vegetated zone and stabilized bars Prof. Watanabe (Ktami Institute of Technology)	(2)P-14 Large-scale Runoff analysis with BTOP (3) Dr. Gusyev (ICHARM)	Self Study	Self Study	(6)-8 Mechanics of sediment transportation (6) Prof. Egashira (ICHARM)	
2nd period 10 45-12 15		(2)-15 River restoration based on sediment transport Prof. Watanabe (Ktami Institute of Technology)	Self Study	Self Study	(5)-14 Developments in social sciences on people's reactions and responses to disasters Prof. Hayashi (Kyoto Univ.)	(6)-9 Mechanics of debris flow (1) Prof. Egashira (ICHARM)	
3rd period 13 15-14 45		Self Study	Junior high school visit led by JICA	(1) Basic Concepts of Integrated Flood Risk management (IFRM)	(1)P-13 Procedures and Structured Programming (subroutine, function) Dr. Ushiyama (ICHARM)	R&D Seminar	
4th period 15 00-16 30		Self Study		(1) Basic Concepts of Integrated Flood Risk management (IFRM)	(1)P-14 Quiz(2) Dr. Ushiyama (ICHARM)		
	15	16	17	18	19	20	21
1st period 9 00-10 30		(5)-15 Examination	Self Study	Self Study	(4)-15 Final exam	(6)-10 Mechanics of debris flow (2) Prof. Egashira (ICHARM)	
2nd period 10 45-12 15		Self Study	(3)-10 Electromagnetic theory as a basis of remote sensing Prof. Koike (Tokyo Univ.)	Self Study	Groundwater and contaminant transport (1) Dr. Duminda (ICHARM)	(6)-11 Bed forms and flow resistance (1) Prof. Egashira (ICHARM)	
3rd period 13 15-14 45		(1) Basic Concepts of Integrated Flood Risk management (IFRM)	(3)-11 Ground-based remote sensing - radar Prof. Koike (Tokyo Univ.)	Self Study	Self Study	Self Study	
4th period 15 00-16 30		Self Study	(3)-12 Space-based remote sensing – satellite Prof. Koike (Tokyo Univ.)	Self Study	(1)P-15 Hydrologic Application Exercise (2) Asso. Prof. Sayama (ICHARM)	Discussion with ICHARM educational staff	
	22	23	24	25	26	27	28
1st period 9 00-10 30			Self Study	Self Study	Self Study	(1) Examination (Tentative)	
2nd period 10 45-12 15			(5)-12 Geomorphology around rivers and alluvial plain (1) Prof. Sugai (Tokyo Univ.)	(3)-13 Frequency and time series analysis Prof. Koike (Tokyo Univ.)	Self Study	Groundwater and contaminant transport (2) Dr. Duminda (ICHARM)	
3rd period 13 15-14 45			(5)-13 Geomorphology around rivers and alluvial plain (2) Prof. Sugai (Tokyo Univ.)	(3)-14 Cost-benefit analysis and optimization Prof. Koike (Tokyo Univ.)	(2) Discussion of the result of experimental study Asso.Prof. Yorozuya (ICHARM)	Self Study	
4th period 15 00-16 30			Self Study	(3)-15 Climate change impact assessment and adaptation Prof. Koike (Tokyo Univ.)	Self Study	Self Study	

Annex Ⅱ-1

Annex 4

January		29	30	31	1	2	3	4
	1st period 9 00-10 30							
	2nd period 10 45-12 15							
	3rd period 13 15-14 45							
	4th period 15 00-16 30							
		5	6	7	8	9	10	11
	1st period 9 00-10 30		Thesis Work	9 15-12 00 Project Cycle Management (PCM) (1)	9 15-12 00 Project Cycle Management (PCM) (3)	9 15-12 00 Project Cycle Management (PCM) (5)	(6)-12 Bed forms and flow resistance (2) Prof. Egashira (ICHARM)	
	2nd period 10 45-12 15						(6)-13 Prediction of channel changes (1) Prof. Egashira (ICHARM)	
	3rd period 13 15-14 45			13 30-16 15 Project Cycle Management (PCM) (2)	13 30-16 15 Project Cycle Management (PCM) (4)	13 30-16 15 Project Cycle Management (PCM) (6)	(3)P-1 Advanced Geographic Information System (GIS) (1) Dr. Kwak (ICHARM)	
	4th period 15 00-16 30						(3)P-2 Advanced Geographic Information System (GIS) (2) Dr. Kwak (ICHARM)	
		12	13	14	15	16	17	18
	1st period 9 00-10 30			Self Study	Thesis Work	Self Study	(8)-3 Sabo planning and control of sediment transport Prof. Sasahara, Kouchi Univ.	
	2nd period 10 45-12 15			(7)-2 Planning and Operation of Flood Control Mr. Umino, PWRI		R&D Seminer	(8)-4 Planning and design of Sabo facilities Prof. Sasahara, Kouchi Univ.	
	3rd period 13 15-14 45			(7)-3 Dam construction (1) Dr. Sasaki, NILIM		Self Study	(6)-14 Prediction of channel changes (2) Prof. Egashira (ICHARM)	
	4th period 15 00-16 30			Self Study		(8)-2 Sediment yield, transport and deposition in a river basin Prof. Sasahara, Kouchi Univ.	(6)-15 Method to predict sediment transport process in drainage basins Prof. Egashira (ICHARM)	
		19	20	21	22	23	24	25
	1st period 9 00-10 30					Self Study	Examination Prof. Egashira (ICHARM)	
	2nd period 10 45-12 15		Thesis Work	Thesis Work	Tour of model experiment	(8)-5 Restoration of vegetation on wasteland and its effects Dr. Osanai, PWRI	Self Study	
	3rd period 13 15-14 45				(3)P-5 Advanced Remote Sensing (1) Dr. Kwak (ICHARM)	(8)-6 Countermeasures for earthquake-induced natural Dams Dr. Osanai, PWRI	Self Study	
	4th period 15 00-16 30				(3)P-6 Advanced Remote Sensing (2) Dr. Kwak (ICHARM)	Self Study	Self Study	
February		26	27	28	1/29	30	31	1
	1st period 9 00-10 30	10:20 Gather at JICA obby	Guidance	Disaster Risk Management Prof. Ando (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)	Site Visit (6) by GRIPS Tentative	
	2nd period 10 40-12 10	10:30- move to GR PS by JICA bus	Disaster Risk Management Prof. Ando (GRIPS)	Disaster Mitigation - Recovery Policy Prof. Ando (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)		
	3rd period 13 20-14 50	(You have to check out, you can leave your baggage at TBIC)	Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)	Disaster Mitigation - Recovery Policy (Special Lecture) Prof. HORI Muneo Earthquake Research Institute, University of Tokyo	Disaster Mitigation - Recovery Policy (Special Lecture) o KUSAKABE takaaki Research Center o Disaster Risk Management National Institute o and and In ast ucture Management	Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)		
	4th period 15 00-16 30		Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)			Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)		
		2	3	4	5	6	7	8
	1st period 9 00-10 30		Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)	Disaster Mitigation - Recovery Policy (Special Lecture) Prof.KUME Hidetoshi Osaka Bay Regional Offshore Environmental Improvement Center	Disaster Mitigation - Recovery Policy (Special Lecture) Prof. SANO Kazushi Nagaoka University of Technology	Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)	10 00-11 30 Disaster Risk Management (Examination) Prof. Ando (GRIPS)	
	2nd period 10 40-12 10		Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)			Disaster Mitigation - Recovery Policy Prof.Morichi (GRIPS)	11 40-12 10 【Instruction on Course Evaluations】	
	3rd period 13 20-14 50		Disaster Risk Management (Special Lecture) Prof. IKEYA (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)	13:20-1 :15 D saster Mitigation - Recovery Policy Prof.Ando 1 :30-16:30 (Site Visit and Experience Learning) Roppongi Hills Prof. Ando (GRIPS)		
	4th period 15 00-16 30		Disaster Risk Management Prof. Ando (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)	Disaster Risk Management Prof. Ando (GRIPS)			
		9	10	11	12	13	14	15
	1st period 9 00-10 30		(9)-1 Dynamic equilibrium of rivers and effective discharges for geomorphic work Asso. Prof. Kelly Kibler, ICHARM		Self Study	(7)-5 Hydraulic structure for dam management Mr. Umino, PWRI	(7)-7 Community relocation and life-rebuilding efforts Prof. Yasuda, ICHARM	
	2nd period 10 45-12 15		(9)-2 Physical aquatic habitat of lotic ecosystems Asso. Prof. Kelly Kibler, ICHARM		Self Study	(8)-7 Introduction of landslides Dr. Tsunaki, SABO Technical Center	(3)P-8 Advanced hydrological model (RRI/BTOP/IFAS) (1) Asso. Prof. Sayama (ICHARM)	
	3rd period 13 15-14 45		Self Study		13:15-16:00 1st Interim Presentation (12 min. (7 min: presentation, 5 min: Q&A))	(8)-8 Survey and emergency response for landslides Dr. Tsunaki, SABO Technical Center	Self Study	
	4th period 15 00-16 30		(7)-6 Effective use of existing dams and new technology in dam management in the world Prof. Yasuda, ICHARM		16:00-16:30 Homeroom	Self Study	Self Study	

Annex II-1

Annex 5

March		16	17	18	19	20	21	22
1st period	9 00-10 30		Self Study	(7)-14 Tour of dam laboratory of PWRI Mr. Umino, PWRI	(9)-3 Specialized use of hydraulic habitats by aquatic organisms (I) Asso. Prof. Kelly Kibler, ICHARM	Thesis Work	Self Study	
2nd period	10 45-12 15		(8)-9 Permanent measures for landslide damage reduction Dr. Tsunaki, SABO Technical Center	Self Study	(9)-4 Specialized use of hydraulic habitats by aquatic organisms (II) Asso. Prof. Kelly Kibler, ICHARM		Self Study	
3rd period	13 15-14 45		(7)-4 Dam construction (2) Dr. Sasaki, NILIM	Self Study	(2)P-15 Remote Sensing for Inundation Mapping (RS) Asso.Prof. Yorozuya (ICHARM)		(3)P-10 Advanced hydrological model (RRI/BTOP/IFAS) (3) Dr. Gusyev (ICHARM)	
4th period	15 00-16 30		Self Study	Self Study	(7)-8 Effective maintenance for concrete structures (1) Dr. Uomoto, PWRI		(3)P-11 Advanced hydrological model (RRI/BTOP/IFAS) (4) Dr. Gusyev (ICHARM)	
		23	24	25	26	27	28	1
1st period	9 00-10 30		(9)-5 Natural flow regimes and hydrologic alteration Asso. Prof. Kelly Kibler, ICHARM	Self Study	(7)-9 Effective maintenance for concrete structures (2) Dr. Uomoto, PWRI	Self Study	Self Study	
2nd period	10 45-12 15		(9)-6 Flow restoration and environmental flows Asso. Prof. Kelly Kibler, ICHARM	(3)P-3 Advanced Geographic Information System (GIS) (3) Dr. Kwak (ICHARM)	(3)P-9 Advanced hydrological model (RRI/BTOP/IFAS) (2) Asso. Prof. Sayama (ICHARM)	(8)-11 Hazard mapping for sediment-related disasters Dr. Takanashi, Asia Air Survey CO.,LTD	Self Study	
3rd period	13 15-14 45		(3)P-12 Advanced hydrological model (RRI/BTOP/IFAS) (5) Dr. Shrestha (ICHARM)	Self Study	Self Study	(8)-12 Training of hazard mapping for sediment-related disasters (1) Dr. Takanashi, Asia Air Survey CO.,LTD	(3)P-14 Advanced hydrological model (RRI/BTOP/IFAS) (7) Asso. Prof. Sayama (ICHARM)	
4th period	15 00-16 30		(3)P-13 Advanced hydrological model (RRI/BTOP/IFAS) (6) Dr. Shrestha (ICHARM)	Self Study	Self Study	(8)-13 Training of hazard mapping for sediment-related disasters (2) Dr. Takanashi, Asia Air Survey CO.,LTD	(3)P-15 Advanced hydrological model (RRI/BTOP/IFAS) (8) Asso. Prof. Sayama (ICHARM)	
		2	3	4	5	6	7	8
1st period	9 00-10 30		(9)-7 Aquatic-terrestrial ecosystem linkages Asso. Prof. Kelly Kibler, ICHARM	Site visit (9) Shirako River	Thesis Work	Thesis Work	Self Study	
2nd period	10 45-12 15		(9)-8 Ecosystem disturbance Asso. Prof. Kelly Kibler, ICHARM				(7)-10 Practice on planning of concrete dam (1) Prof. Yasuda, ICHARM	
3rd period	13 15-14 45		(8)-10 Warning and evacuation system for sediment-related disasters Dr. Hara, Sabo Technical Center				(7)-11 Practice on planning of concrete dam (2) Prof. Yasuda, ICHARM	
4th period	15 00-16 30		Self Study				Self Study	
		9	10	11	12	13	14	15
1st period	9 00-10 30		Self Study	Self Study	Thesis Work	Self Study	(1)-14 Application of Sabo Works and landslide countermeasures to overseas countries Mr. Watanabe	
2nd period	10 45-12 15		(9)-9 Environmental Impacts of Dams Mr. Iwami, ICHARM	Self Study		(3)P-4 Advanced Geographic Information System (GIS) (4) Dr. Kwak (ICHARM)	Self Study	
3rd period	13 15-14 45		Self Study	(7)-12 Practice on planning of rock fill dam (1) Prof. Yasuda, ICHARM		(7)-15 Presentation Prof. Yasuda, ICHARM	Self Study	
4th period	15 00-16 30		Self Study	(7)-13 Practice on planning of rock fill dam (2) Prof. Yasuda, ICHARM		Self Study	Self Study	
		16	17	18	19	20	21	22
1st period	9 00-10 30		(9)-10 Hydrogeomorphic interaction river response to flow and sediment Asso. Prof. Kelly Kibler, ICHARM	Self Study	Self Study	Self Study		
2nd period	10 45-12 15		(9)-11 Ecosystem services and river restoration Asso. Prof. Kelly Kibler, ICHARM	(9)-12 Environmental Impacts of Dams Prof. Sumi, Kyoto Univ	Self Study	Self Study		
3rd period	13 15-14 45		Self Study	(9)-13 Sediment Management in Reservoirs Prof. Sumi, Kyoto Univ	(8)-14 Application of Sabo/landslide projects to other countries (1) Prof. Kondo, Dr. Osanai	13:15-15:52 2nd Interim Presentation		
4th period	15 00-16 30		Self Study	(9)-14 Sediment Management in Reservoirs Prof. Sumi, Kyoto Univ	(8)-15 Application of Sabo/landslide projects to other countries (2) Prof. Kondo, Dr. Osanai	15:52-16:20 Homeroom		
		23	24	25	26	27	28	29
1st period	9 00-10 30		Thesis Work	Thesis Work	Thesis Work	Thesis Work	(9)-15 Exam	
2nd period	10 45-12 15						Self Study	
3rd period	13 15-14 45						Self Study	
4th period	15 00-16 30						Self Study	

Annex II-1

Annex 6

April		30	31	1	2	3	4	5
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM							
		6	7	8	9	10	11	12
	AM		Thesis Work (Lunch: Cherry-Viewing Party)	Thesis Work	Thesis Work	Self Study	Self Study	
	PM			Site Visit Fukuoka Weir 13:00-15:30		(9)-15 Return Examination 13:15-13:45 Asso. Prof. Keiji Kobler, ICHARM	(3)P-7 Advanced Remote Sensing (3) 13:15-14:45 Asso.Prof. Yorozuya (ICHARM)	
		13	14	15	16	17	18	19
	AM		Thesis Work	Thesis Work	Self Study	Thesis Work	ICHARM Open Day	
	PM				(3)P Explanation about the River Discharge Measurement in Uono River on 25th April 15:00-16:30 Asso.Prof. Yorozuya (ICHARM)			
		20	21	22	23	24	25	26
	AM		Explanation of Site Visit 10:00-10:30	Thesis Work	11:00-12:00 Special Lecture by Dr. Omachi	Site Visit (8) Niigata	Site Visit (8) Niigata	Site Visit (8) Niigata
	PM		Self Study		Self Study		(4)-13,14 On site flow measurement(2) (Tentative) Asso.Prof. Yorozuya (ICHARM)	
		27	28	29	30	1	2	3
	AM		Thesis Work		Thesis Work	Thesis Work	Thesis Work	
	PM							
May		4	5	6	7	8	9	10
	AM				Thesis Work	Thesis Work	Thesis Work	
	PM						3rd Interim Presentation (Tentative)	
		11	12	13	14	15	16	17
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM						Review and discussion about the River Discharge Measurement in Uono River on 25th April Asso.Prof. Yorozuya (ICHARM)	
		18	19	20	21	22	23	24
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM							
		25	26	27	28	29	30	31
	AM		Thesis Work	Self Study	Thesis Work	Thesis Work	Thesis Work	
	PM			Thesis Writing Seminar 13:15-14:45 Asso Kelly Kibler Asso Sayama				
June		1	2	3	4	5	6	7
	AM		High school visit led by JICA	Thesis Work	Site visit (7) Kinki Region (Yodo River Basin)			
	PM							
		8	9	10	11	12	13	14
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM							
		15	16	17	18	19	20	21
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM							
		22	23	24	25	26	27	28
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM							
July		29	30	1	2	3	4	5
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Deadline of submission of the 1st draft thesis	
	PM							
		6	7	8	9	10	11	12
	AM	Site visit (5) Flood Fighting Drill in Joso-City	Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM			4th Interim Presentation				
		13	14	15	16	17	18	19
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM							
		20	21	22	23	24	25	26
	AM			Thesis Work	Thesis Work	Thesis Work	Deadline of submission of the 2nd draft thesis	
	PM							
		27	28	29	1/30	31	1	2
	AM		Thesis Work	Thesis Work	Thesis Work	Thesis Work	Thesis Work	
	PM							

Annex II -1


August
September
AM
PM
3
4
Thesis Work
5
Thesis Work
6
Thesis Work
7
Thesis Work
8
Final Presentation (Fixed)
9
10
11
Thesis Work
12
Thesis Work
13
Thesis Work
14
Thesis Work
15
Thesis Work
16
17
18
Thesis Work
19
Thesis Work
20
Thesis Work
21
Thesis Work
22
Thesis Work
23
24
25
Submission of Master Thesis to GR PS
26
Makig Action Plan
27
Makig Action Plan
28
Makig Action Plan
29
Visit of Sontoku Museum (Tentative)
30
31
1
Makig Action Plan
2
Makig Action Plan
3
Makig Action Plan
4
Makig Action Plan
5
Makig Action Plan
6
7
8
Presentation on action plan(P.M.)
9
(Move to Osaka)
10
The 16th International Summer Symposium in 2014 (Move to Tsukuba)
11
Closing Ceremony at JICA
12
Graduation Ceremony at GRIPS
13
Retrun to home country
14
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Curriculum (Recommended course)

Lecture	Disaster Mitigation - Recovery Policy		Disaster Risk Management		Hydrology	
Number	DMP2000E		DMP2010E		DMP2800E	
Instructor	Prof. Shigeru MORICHI		Prof. Shoichi ANDO		Prof. Toshio KOIKE	
Period	Winter		Winter		Fall through Winter	
	Lecture	Lecturer	Lecture	Lecturer	Lecture	Lecturer
1	Introduction Coverage of this class Disaster mitigation policy	Prof Morichi, GRIPS	Introduction Disasters in the world	Prof Ando, GRIPS	Water properties and their roles in climate system	Prof Koike, Tokyu Univ
2	Social systems against disaster	Prof Morichi, GRIPS	International activities for disaster mitigation	Prof Ando, GRIPS	Characteristics of moist air and precipitation	Prof Koike, Tokyu Univ
3	Education on basic knowledge for disasters (1)	Prof Morichi, GRIPS	Japan's policy making	Prof Ando, GRIPS	Global energy and water cycle	Prof Koike, Tokyu Univ
4	Education on basic knowledge for disasters (2)	Prof Morichi, GRIPS	Basics of Disaster Risk Management	Prof Ando, GRIPS	River basin hydrological processes	Prof Koike, Tokyu Univ
5	Lessons from tragedies	Prof Hitoshi IEDA,The University of Tokyo	Disaster risk management policies in Japan -1	Prof Ando, GRIPS	Atmosphere-land interaction	Prof Koike, Tokyu Univ
6	Reliability analysis of transportation network	Prof Morichi, GRIPS	Disaster risk management policies in Japan -2	Prof Ando, GRIPS	Soil moisture and ground water	Prof Koike, Tokyu Univ
7	Policy for Transportation Infrastructure	Prof Morichi, GRIPS	Lessons from Hanshin-Awaji Earthquake Disaster	Prof Ando, GRIPS	Runoff	Prof Koike, Tokyu Univ
8	Policy for road infrastructure	Prof Morichi, GRIPS	Building regulation	Prof Ando, GRIPS	Snow hydrology	Prof Koike, Tokyu Univ
9	Policy for port infrastructure	Prof Morichi, GRIPS	Housing safety	Prof Ando, GRIPS	River basin hydrological modelling	Prof Koike, Tokyu Univ
10	Policy for airport infrastructure	Prof Morichi, GRIPS	Issues of disaster management	Prof Ando, GRIPS	Electromagnetic theory as a basis of remote sensing	Prof Koike, Tokyu Univ
11	Policy for airport infrastructure	Prof Morichi, GRIPS	Urban development and disaster management	Prof Ando, GRIPS	Ground-based remote sensing - radar	Prof Koike, Tokyu Univ
12	Land use and regulations	Prof Morichi, GRIPS	Community based disaster risk management	Prof Ando, GRIPS	Space-based remote sensing – satellite	Prof Koike, Tokyu Univ
13	Policy Making Process	Prof Morichi, GRIPS	Practical risk assessment I	Prof Ando, GRIPS	Frequency and time series analysis	Prof Koike, Tokyu Univ
14	Presentation by students and discussion (1)	Prof Morichi, GRIPS	Practical risk assessment II	Prof Ando, GRIPS	Cost-benefit analysis and optimization	Prof Koike, Tokyu Univ
15	Presentation by students and discussion (2)	Prof Morichi, GRIPS	Special lecture		Climate change impact assessment and adaptation	Prof Koike, Tokyu Univ

Lecture	Hydraulics		Basic Concepts of Integrated Flood Risk management (IFRM)		Urban Flood Management and Flood Hazard Mapping	
Number	DMP2810E		DMP2820E		DMP2870E	
Instructor	Prof. Guangwei HUANG		Prof. Kuniyoshi TAKEUCHI		Prof. Shigenobu TANAKA	
Period	Fall through Winter		Fall through Winter		Fall through Spring	
	Lecture	Lecturer	Lecture	Lecturer	Lecture	Lecturer
1	Basic mathematics and fundamental equations in Hydraulics	Asso Prof Yorozuya ICHARM	Introduction What is natural disaster? Risk, Hazard and Vulnerability	Prof Takeuchi, ICHARM	Laws for flood risk management in Japan	Prof Tanaka, Kyoto Univ
2	Flow resistance in open channel, Flow resistance calculation in engineering practice	Asso Prof Yorozuya ICHARM	PAR Model (1) Root causes, progress of dynamic pressure and unsafe conditions	Prof Takeuchi, ICHARM	Flood control planning (1)	Prof Tanaka, Kyoto Univ
3	Basics of water surface profiles of open channel flow, Basics of flood wave	Asso Prof Yorozuya ICHARM	PAR Model (2) Concrete examples	Prof Takeuchi, ICHARM	Flood control planning(2)	Prof Tanaka, Kyoto Univ
4	Experimental study of flow resistance and water surface profiles (1)	Asso Prof Yorozuya ICHARM	ACCESS Model	Prof Takeuchi, ICHARM	Flood control structure	Mr Kamoto, ICHARM
5	Experimental study of flow resistance and water surface profiles (2)	Asso Prof Yorozuya ICHARM	Disaster management cycle; Hyogo Framework for Action	Prof Takeuchi, ICHARM	Case study of comprehensive flood control measures - Tsurumi river-	Mr Imbe, ARSIT
6	Systematic classification of water surface profiles	Prof Huang, Sophia Univ	IFRM and traditional FRM; IFRM as part of IWRM	Prof Takeuchi, ICHARM	Flood hazard map	Prof Tanaka, Kyoto Univ
7	Hydraulic jump and its application	Prof Huang, Sophia Univ	Concept of IWRM (1) Agenda 21, Global Water Partnership	Prof Takeuchi, ICHARM	Evacuation Plan with Flood Forecast(1)	Prof Tanaka, Kyoto Univ
8	Numerical solution of the gradually-varied flow equation	Prof Huang, Sophia Univ	Concept of IWRM (2) Guideline for IWRM at basin scale	Prof Takeuchi, ICHARM	Evacuation Plan with Flood Forecast(2) Group simulation	Prof Tanaka, Kyoto Univ
9	Unsteady flow models	Prof Huang, Sophia Univ	Japanese experiences (1) Flood damages and flood control investment	Prof Takeuchi, ICHARM	Local disaster management plan	Prof Tanaka, Kyoto Univ
10	Numerical methods for unsteady flow simulation (1)	Prof Huang, Sophia Univ	Japanese experiences (2) Ground subsidence control	Prof Takeuchi, ICHARM	Emergency operation (1)	Prof Tanaka, Kyoto Univ
11	Numerical methods for unsteady flow simulation (2)	Prof Huang, Sophia Univ	Japanese experiences (3) Comprehensive flood control measures and focus expansion from river to basin	Prof Takeuchi, ICHARM	Emergency operation (2)	Prof Tanaka, Kyoto Univ
12	Channel design	Prof Huang, Sophia Univ	Global trends (1) Impact of climatic change	Prof Oki, Tokyo Univ	Geomorphology around rivers and alluvial plain (1)	Prof Sugai Tokyo Univ
13	On site flow measurement (1)	Asso Prof Yorozuya ICHARM	Global trends (2) International actions	Prof Oki, Tokyo Univ	Geomorphology around rivers and alluvial plain (2)	Prof Sugai Tokyo Univ
14	On site flow measurement (2)	Asso Prof Yorozuya ICHARM	Application of Sabo Works and landslide countermeasures to overseas countries	Mr Watanabe	Developments in social sciences on people ' s reactions and responses to disasters	Prof Hayashi, Kyoto Univ
15	Examination		Examination		Examination	

Lecture	Flood Hydraulics and Sediment Transport		Mechanics of Sediment Transportation and River Changes	
Number	DMP3810E		DMP3820E	
Instructor	Prof. Shoji FUKUOKA		Prof. Shinji EGASHIRA	
Period	Fall through Winter		Fall through Winter	
	Lecture	Lecturer	Lecture	Lecturer
1	Outlines of characteristics and management of Japanese rivers	Prof Fukuoka, Chuo Univ	Introduction (1) - Characteristics of sediment	Prof Egashira, ICHARM
2	Occurrence of flood flows	Prof Fukuoka, Chuo Univ	Introduction (2) - Sediment transportation and corresponding channel changes - Methods to evaluate channel changes	Prof Egashira, ICHARM
3	Propagation of hydrographs of water level and discharge in flood flows	Prof Fukuoka, Chuo Univ	Mechanics of sediment transportation (1) - Parameters associated with sediment transportation	Prof Egashira, ICHARM
4	Flow resistance in rivers with compound channels	Prof Fukuoka, Chuo Univ	Mechanics of sediment transportation (2) - Critical condition for initiating bed load	Prof Egashira, ICHARM
5	Prediction method of flow resistance in compound channels and application to river course design	Prof Fukuoka, Chuo Univ	Mechanics of sediment transportation (3) - Bed load formulas	Prof Egashira, ICHARM
6	Steady quasi-two dimensional analysis of flood flows in rivers with vegetations	Prof Fukuoka, Chuo Univ	Mechanics of sediment transportation (4) - Bed load formulas	Prof Egashira, ICHARM
7	Unsteady quasi-two dimensional analysis of flood flows	Prof Fukuoka, Chuo Univ	Mechanics of sediment transportation (5) - Extension of bed load formula to non-uniform sediment	Prof Egashira, ICHARM
8	Relationship between dimensionless width, depth and discharge in rivers - Learning from natural rivers	Prof Fukuoka, Chuo Univ	Mechanics of sediment transportation (6) - Suspended load	Prof Egashira, ICHARM
9	River cross-sections harmonizing flood control and river environment	Prof Fukuoka, Chuo Univ	Mechanics of debris flow (1) - Constitutive equations - Debris flow characteristics over erodible beds	Prof Egashira, ICHARM
10	Outline of sediment transport	Prof Watanabe, Kitami Institute of Technology	Mechanics of debris flow (2) - A bed load formula derived from constitutive equations	Prof Egashira, ICHARM
11	1-D bed deformation, computing model	Prof Watanabe, Kitami Institute of Technology	Bed forms and flow resistance (1) - Geometric characteristics of bed forms - Formative domain of bed forms	Prof Egashira, ICHARM
12	2-D bed deformation, sand waves and bars, meandering	Prof Watanabe, Kitami Institute of Technology	Bed forms and flow resistance (2) - Flow resistance	Prof Egashira, ICHARM
13	River disaster due to channel movement	Prof Watanabe, Kitami Institute of Technology	Prediction of channel changes (1) - Governing equations employed in steep areas - Topographic change in steep areas	Prof Egashira, ICHARM
14	Flows in vegetated zone and stabilized bars	Prof Watanabe, Kitami Institute of Technology	Prediction of channel changes (2) - Governing equations employed in alluvial reaches - Topographic change in alluvial reaches	Prof Egashira, ICHARM
15	River restoration based on sediment transport	Prof Watanabe, Kitami Institute of Technology	Method to predict sediment transport process in drainage basins - Sediment management in drainage basin	Prof Egashira, ICHARM

Lecture	Sustainable Reservoir Development & Management		Control Measures for Landslide & Debris Flow		River Ecohydraulics	
Number	DMP3830E		DMP3840E			
Instructor	Prof. Nario YASUDA		Prof. Koichi KONDO		Asso. Prof. Kelly Kibler	
Period	Fall through Winter		Fall through Winter		Winter through Spring	
	Lecture	Lecturer	Lecture	Lecturer	Lecture	Lecturer
1	Outline of Dam Engineering	Prof Yasuda, ICHARM	Outline of sediment-related disasters and Sabo projects	Prof Kondo, SABO Technical Center	Dynamic equilibrium of rivers and effective discharges for geomorphic work	Asso Prof Kelly Kibler, ICHARM
2	Planning and Operation of Flood Control	Mr Umino, Senior Researcher, PWRI	Sediment yield, transport and deposition in a river basin	Prof Sasahara, Kouchi Univ	Physical aquatic habitat of lotic ecosystems	Asso Prof Kelly Kibler, ICHARM
3	Dam construction (1)	Dr Sasaki, Team Leader, NILIM	Sabo planning and control of sediment transport	Prof Sasahara, Kouchi Univ	Specialized use of physical/hydraulic habitats by aquatic organisms	Asso Prof Kelly Kibler, ICHARM
4	Dam construction (2)	Dr Sasaki, Team Leader, NILIM	Planning and design of Sabo facilities	Prof Sasahara, Kouchi Univ	Natural flow regimes and indicators of hydrologic alteration	Asso Prof Kelly Kibler, ICHARM
5	Hydraulic structure for dam management	Mr Umino, Senior Researcher, PWRI	Restoration of vegetation on wasteland and its effects	Dr Osanai, Group Leader, PWRI	Hydrogeomorphic effects interaction of flow and sediment	Asso Prof Kelly Kibler, ICHARM
6	Effective use of existing dams and new technology in dam management in the world	Prof Yasuda, ICHARM	Countermeasures for earthquake-induced natural Dams	Dr Osanai, Group Leader, PWRI	Ecohydrology riparian and hyporheic environments	Asso Prof Kelly Kibler, ICHARM
7	Community relocation and life-rebuilding efforts	Prof Yasuda, ICHARM	Introduction of landslides	Dr Tsunaki, Division chief, SABO Technical Center	Environmental Impacts of Dams	Mr Iwami, Chief Researcher, ICHARM
8	Effective maintenance for river and dam structures (1)	Dr Uomoto, Chief Executive, PWRI	Survey and emergency response for landslides	Dr Tsunaki, Division chief, SABO Technical Center	Environmental Impacts of Dams	Prof Sumi, Kyoto Univ
9	Effective maintenance for river and dam structures (2)	Dr Uomoto, Chief Executive, PWRI	Permanent measures for landslide damage reduction	Dr Tsunaki, Division chief, SABO Technical Center	Sediment Management in Reservoirs	Prof Sumi, Kyoto Univ
10	Practice on planning of concrete dam (1)	Prof Yasuda, ICHARM	Warning and evacuation system for sediment-related disasters	Dr Hara, Advisor, Sabo Technical Center	Sediment Management in Reservoirs	Prof Sumi, Kyoto Univ
11	Practice on planning of concrete dam (2)	Prof Yasuda, ICHARM	Hazard mapping for sediment-related disasters	Dr Takanashi, Advisor, Asia Air Survey CO ,LTD	Aquatic-terrestrial ecosystem linkages	Asso Prof Kelly Kibler, ICHARM
12	Practice on planning of rock fill dam (1)	Prof Yasuda, ICHARM	Training of hazard mapping for sediment-related disasters (1)	Dr Takanashi, Advisor, Asia Air Survey CO ,LTD	Bank erosion and river engineering	Asso Prof Kelly Kibler, ICHARM
13	Practice on planning of rock fill dam (2)	Prof Yasuda, ICHARM	Training of hazard mapping for sediment-related disasters (2)	Dr Takanashi, Advisor, Asia Air Survey CO ,LTD	Ecosystem services and river restoration	Asso Prof Kelly Kibler, ICHARM
14	Tour of dam laboratory of PWRI	Mr Umino, Senior Researcher, PWRI	Application of Sabo/landslide projects to other countries (1)	Prof Kondo, Dr Osanai	Hydraulics of fish passage structures	Asso Prof Kelly Kibler, ICHARM
15	Presentation		Application of Sabo/landslide projects to other countries (2)	Prof Kondo, Dr Osanai	Exam	

Curriculum (Elective course)

Lecture	Computer Programming		Basic Practice on Flood Forecasting & Inundation Analysis		Advanced Practice on Flood Forecasting & Inundation Analysis	
Number	DMP1800E		DMP2860E			
Instructor	Asso. Prof. Takahiro SAYAMA		Asso. Prof. Takahiro SAYAMA		Asso. Prof. Atsuhiro YOROZUYA	
Period	Fall through Winter		Fall through Spring		Fall through Spring	
	Lecture	Lecturer	Lecture	Lecturer	Lecture	Lecturer
1	Introduction of Computer Programming with Fortran90	Asso Prof Sayama, ICHARM	Geographic Information System (GIS) (1)	Dr Kwak, Research Specialist, ICHARM	Advanced Geographic Information System (GIS) (1)	Dr Kwak, Research Specialist, ICHARM
2	Variables	Asso Prof Sayama, ICHARM	Geographic Information System (GIS) (2)		Advanced Geographic Information System (GIS) (2)	
3	Arithmetic Calculation	Asso Prof Sayama, ICHARM	Geographic Information System (GIS) (3)		Advanced Geographic Information System (GIS) (3)	
4	Program Structure (if)	Dr Hasegawa, ICHARM	Geographic Information System (GIS) (4)		Advanced Geographic Information System (GIS) (4)	
5	Program Structure (if)	Dr Hasegawa, ICHARM	Rainfall-runoff-inundation modeling (1)	Asso Prof Sayama, ICHARM	Advanced Remote Sensing (1)	Dr Kwak, Research Specialist, ICHARM
6	I/O Statement	Dr Hasegawa, ICHARM	Rainfall-runoff-inundation modeling (2)		Advanced Remote Sensing (2)	Dr Kwak, Research Specialist, ICHARM
7	Program Structure (do loop)	Dr Hasegawa, ICHARM	Rainfall-runoff-inundation modeling (3)		Advanced Remote Sensing (3)	Asso Prof Yorozuya ICHARM
8	Program Structure (do loop)	Dr Hasegawa, ICHARM	Rainfall-runoff-inundation modeling (4)		Advanced hydrological model (RRI/BTOP/IFAS) (1)	Asso Prof Sayama, ICHARM
9	Quiz(1)	Dr Hasegawa, ICHARM	Runoff analysis with IFAS (1)	Dr Shresta, ICHARM	Advanced hydrological model (RRI/BTOP/IFAS) (2)	Asso Prof Sayama, ICHARM
10	Hydrologic Application Exercise (1)	Asso Prof Sayama, ICHARM	Runoff analysis with IFAS (2)	Dr Shresta, ICHARM	Advanced hydrological model (RRI/BTOP/IFAS) (3)	Dr Gusyev, ICHARM
11	Arrays	Dr Ushiyama, ICHARM	Runoff analysis with IFAS (3)	Dr Shresta, ICHARM	Advanced hydrological model (RRI/BTOP/IFAS) (4)	Dr Gusyev, ICHARM
12	Arrays	Dr Ushiyama, ICHARM	Large-scale Runoff analysis with BTOP (1)	Dr Gusyev, ICHARM	Advanced hydrological model (RRI/BTOP/IFAS) (5)	Dr Shresta, ICHARM
13	Procedures and Structured Programming (subroutine, function)	Dr Ushiyama, ICHARM	Large-scale Runoff analysis with BTOP (2)	Dr Gusyev, ICHARM	Advanced hydrological model (RRI/BTOP/IFAS) (6)	Dr Shresta, ICHARM
14	Quiz(2)	Dr Ushiyama, ICHARM	Large-scale Runoff analysis with BTOP (3)	Dr Gusyev, ICHARM	Advanced hydrological model (RRI/BTOP/IFAS) (7)	Asso Prof Sayama, ICHARM
15	Hydrologic Application Exercise (2)	Asso Prof Sayama, ICHARM	Remote Sensing for Inundation Mapping (RS)	Asso Prof Yorozuya ICHARM	Advanced hydrological model (RRI/BTOP/IFAS) (8)	Asso Prof Sayama, ICHARM

Lecture	Site Visit of Water-related Disaster Management Practice in Japan	
Number	DMP3900E	
Instructor	Asso. Prof. Kelly Kibler	
Period	Fall through Summer	
	Lecture	Lecturer
1	Diversion channel	MLIT local office
2	Super levee	MLIT local office
3	Wire, Water gate	MLIT local office
4	Disaster management station	MLIT local office
5	River administration in normal time	MLIT local office
6	Awareness enlightening activities for flood (Flood mark, Water level indication tower, etc)	MLIT local office
7	Retarding basin	MLIT local office
8	Metropolitan area outer underground discharge channel	MLIT local office
9	Integrated flood management in Tsurumi River	MLIT local office
10	Dam	MLIT local office
11	Sabo work	MLIT local office
12	Discontinuous levee	MLIT local office
13	Pumping station	MLIT local office
14	(others)	MLIT local office
15	(others)	MLIT local office

Subject: Computer Programming

Course number：DMP1800E
Instructor：Assoc. Prof. Takahiro SAYAMA
Term / Time：Fall through Winter

1 Course Description

This course provides general knowledge on Fortran90 computer programming and its skills for solving water-related problems covered in Course No. DMP2800E “Hydrology”, No. DMP2810E “Hydraulics”, No. DMP3800E, No. DMP3810E “Flood Hydraulics and Sediment Transport” and No. DMP2860E “Basic Practice on Flood Forecasting & Inundation Analysis”.

2 Course Outline (Course Topics)

Week

1 ：Introduction of Computer Programming with Fortran90
2 ：Variables
3 ：Arithmetic Calculation
4 ：Program Structure (if)
5 ：Program Structure (if)
6 ：I/O Statement
7 ：Program Structure (do loop)
8 ：Program Structure (do loop)
9 ：Quiz(1)
10 ：Hydrologic Application Exercise (1)
11 ：Arrays
12 ：Arrays
13 ：Procedures and Structured Programming (subroutine, function)
14 ：Quiz(2)
15 ：Hydrologic Application Exercise (2)

3 Grading

Quiz (50%), Reports (50%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

Reference: Fortran95/2003 for Scientists and Engineers (Third Ed.), by Stephen J. Chapman, McGraw-Hill,

Subject: Hydrology

Course number：DMP2800E
Instructor：Prof. Toshio KOIKE
Term / Time：Fall through Winter

1 Course Description

Water is a key which makes a bridge between the socio benefit areas including agriculture and forestry, health, energy and human settlement and the geophysical and bio-geochemical water cycle processes in atmosphere, land and oceans. To establish a physical basis on water cycle, this course aims to introduce important roles of water in climatological and meteorological processes and the basic concepts of hydrology including understanding, observing and modeling of hydrologic processes. Remote sensing and statistic and stochastic approaches are introduced as advanced facets of hydrology.

2 Course Outline (Course Topics)

(1) Climate System and Water Cycle
1) Water properties and their roles in climate system
2) Characteristics of moist air and precipitation
3) Global energy and water cycle

(2) Hydrological Processes, In-situ Observations and Modeling
1) River basin hydrological processes
2) Atmosphere-land interaction
3) Soil moisture and ground water
4) Runoff
5) Snow hydrology
6) River basin hydrological modelling

(3) Remote Sensing of Hydrology
1) Electromagnetic theory as a basis of remote sensing
2) Ground-based remote sensing - *radar*
3) Space-based remote sensing – *satellite*

(4) Water Resources Planning and Management
1) Frequency and time series analysis
2) Cost-benefit analysis and optimization
3) Climate change impact assessment and adaptation

3 Grading

Active participation(25%), Short Reports(25%), Final Examination(50%)

4 Reference

(1) Roland B.Stull: An Introduction to Boundary Layer Meteorology, KLUWER ACADEMIC PUBLISHERS.
(2) J.R.Holton: An Introduction to Dynamic Meteorology, Academic Press.
(3) Dingman, R.: Physical Hydrology, Prentice-Hall, Inc.

Subject: Hydraulics

Course number：DMP2810E
Instructor：Prof. Guangwei HUANG
Term / Time：Fall through Winter

1. Course Description

Analysis of open channel flows and the characterization of flood wave propagation with step-by-step explanation of related computational techniques. Laboratory flume experiment and on-site training will help students better understand the theories and its applications.

Course Goal:

To enable students to conduct professional channel flow analysis and applications and to develop independent learning and problem solving skills. After completing this course, you will be able to…

1. set up systems of equations representing flow through channel systems
2. perform 1-D steady and unsteady flow analysis of open channel systems
3. apply solution approaches to levee design
4. conduct flow discharge measurement
5. present technical information effectively

2. Course Outline (Course Topics)

I. Basic principles of open channel flows

- Mathematics for Hydraulics
- Introduction & Fundamental equations
- Flow resistance in open channel
- Flow resistance calculation in engineering practice
- Basics of water surface profiles of open channel flow
- Basics of flood wave

II. Experimental study

- Experimental study about flow resistance and varied flows

III. Detailed tutorials on open channel flows

- Systematic classification of water surface profiles
- Numerical solution of the gradually-varied flow equation
- Hydraulic jump and its application
- Unsteady flow models
- Preissmann scheme for unsteady flow
- Explicit Forward-Time-Centre-Space scheme for unsteady flow
- Channel design

IV. Flow measurement

- Different types of flow measurements
- On site measurement of flow measurement

Final exam

3. Grading:

Class participation (30%), Quiz and exercise (30%), Examination (40%)

4. Reference books

Open-channel Hydraulics, Ven Te Chow;

Practical aspects of computational river hydraulics, J.A. Cunge, F.M. Holly, Jr., A. Verwey.

Fluid Mechanics and Hydraulics, R. V. Giles, J. B. Evett, and C. Lin.

Handouts will be distributed.

Subject　Basic Concepts of Integrated Flood Risk management (IFRM)

Course number：DMP2820E
Instructor：Prof. Kuniyoshi Takeuchi
Term / Time：Fall through Winter

1　Course Description

This course provides the basic concepts of “Integrated Flood Risk Management (IFRM)” as part of Integrated Water Resources Management (IWRM). The mechanism of disaster risk development with natural hazard, societal vulnerability, exposure and coping capacity will be emphasized. New concepts of IWRM at basin scale will be introduced and, as concrete examples, Japanese flood management experiences and global activity trends will be introduced emphasizing good practices and key for success. Anticipated future direction of risk management to cope with societal changes and global climate changes will also be covered.

2　Course Outline (Course Topics)

1. Introduction: What is natural disaster? Risk, Hazard and Vulnerability
2. PAR Model (1) Root causes, progress of dynamic pressure and unsafe conditions
3. PAR Model (2) Concrete examples
4. ACCESS Model
5. Disaster management cycle; Hyogo Framework for Action
6. IFRM and traditional FRM; IFRM as part of IWRM
7. Concept of IWRM (1): Agenda 21, Global Water Partnership
8. Concept of IWRM (2): Guideline for IWRM at basin scale
9. Japanese experiences (1) Flood damages and flood control investment
10. Japanese experiences (2) Ground subsidence control
11. Japanese experiences (3) Comprehensive flood control measures and focus expansion from river to basin
12. Global trends (1) Impact of climatic change
13. Global trends (2) International actions
14. Application of Sabo Works and landslide countermeasures to overseas countries
15. Examination

3　Grading

Active participation(25%), Reports(25%), Final Examination(50%)

4　Textbooks

4-1 Required

1. Ben Wisner, Piers Blaikie, Terry Cannon and Ian Davis, At Risk -natural hazards, people’s vulnerability and disasters- (Routledge, London & NY, 2004)
2. UNESCO IWRM guidelines steering committee, IWRM Guidelines at River Basin Level: Part 1-1 Principles, 2-1 Part 2-1 Coordination, 2-2 Flood Management, 2-3 Irrigation. (UNESCO, 2009)

Subject: Urban Flood Management and Flood Hazard Mapping

Course number：DMP2870E
Instructor：Prof. Shigenobu TANAKA
Term / Time：Fall through Spring

1 Course Description

This course is specifically designed to study urban flood management. In the first stage of the course, students will learn about Japan's basic legal systems for flood risk management, river planning, flood control structures and comprehensive flood control measures for urban areas. The second stage aims to acquire knowledge required to promote early public evacuation. Students will also study topography psychological aspects underlying public behavior during disaster.

2 Course Outline (Course Topics)

Week

1	Laws for flood risk management in Japan	Prof. TANAKA
2	Flood control planning (1)	Prof. TANAKA
3	Flood control planning(2)	Prof. TANAKA
4	Flood control structure	Mr. Kamoto
5	Case study of comprehensive flood control measures -Tsurumi river-	Mr. Imbe
6	Flood hazard map	Prof. TANAKA
7	Evacuation Plan with Flood Forecast(1)	Prof. TANAKA
8	Evacuation Plan with Flood Forecast(2) Group simulation	Prof. TANAKA
9	Local disaster management plan	Prof. TANAKA
10	Emergency operation (1)	
11	Emergency operation (2)	
12	Geomorphology around rivers and alluvial plain (1)	
13	Geomorphology around rivers and alluvial plain (2)	
14	Developments in social sciences on people's reactions and responses to disasters	
15	Examination	

3 Grading

Reports (40%), Final Exam (60%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required

"Local Disaster Management and Hazard Mapping" (2009), ICHARM

4-2 Others

Subject: Basic Practice on Flood Forecasting & Inundation Analysis

Course number：DMP2890E
Instructor：Assoc. Prof. Takahiro SAYAMA
Term / Time：Fall through Spring

1 Course Description

The objective of this course is to introduce the basic technique for undertaking flood forecasting and inundation analysis in poorly-gauged basins using state-of-the-art global information and technologies. The course consists of five components: practice on the basic of Geographic Information System (GIS), introduction of Rainfall-Runoff-Inundation (RRI) modeling, practice on Integrated Flood Analysis System (IFAS) and Block-wise use of TOPMODEL (BTOP) for runoff analysis, followed by Remote Sensing (RS) for inundation mapping.

2 Course Outline (Course Topics)

Week

1 ：Geographic Information System (GIS) (1) Basic concept
2 ：Geographic Information System (GIS) (2) Working with ArcGIS
3 ：Geographic Information System (GIS) (3) ArcGIS surface analysis
4 ：Geographic Information System (GIS) (4) ArcGIS hydrology analysis
5 ：Rainfall-runoff-inundation modeling (1) Basic Concept
6 ：Rainfall-runoff-inundation modeling (2) Model run with tutorial data
7 ：Rainfall-runoff-inundation modeling (3) Topographic data preparation
8 ：Rainfall-runoff-inundation modeling (4) Parameter setting
9 ：Runoff analysis with IFAS (1) Data import, Model building
10 ：Runoff analysis with IFAS (2) Parameter estimation
11 ：Runoff analysis with IFAS (3) Validation of calculated discharge
12 ：Large-scale Runoff analysis with BTOP (1) Basic concept
13 ：Large-scale Runoff analysis with BTOP (2) Data preparation
14 ：Large-scale Runoff analysis with BTOP (3) Running model
15 ：Remote Sensing for Inundation Mapping (RS) Basic concept & case study

3 Grading

Reports (100%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required

4-2 Others

Material made by the instructors

Subject: Advanced Practice on Flood Forecasting & Inundation Analysis

Course number：DMP3802E
Instructor：Adjunct Prof. Atsuhiro YOROZUYA
Term / Time：Fall through Spring

1 Course Description

The objective of this course is to build deeper capacities for undertaking hydrological tools, which are expecting to be applied in the individual study. Students are expected to preliminarily take Basic Practice on Flood Forecasting & Inundation Analysis.

The course consists of three components; practice on the Advanced Geographic Information System (GIS), the Advanced Remote Sensing, and the Advanced hydrological models. The Advanced hydrological models are composed with three different topics, such as learning of Rainfall-Runoff-Inundation modeling (RRI), Block-wise use of TOPMODEL (BTOP), Integrated Flood Analysis System (IFAS). The Students need to select one topic depending on their individual study.

2 Course Outline (Course Topics)

Week

1 ：Advanced Geographic Information System (GIS) (1) ArcGIS Data management
2 ：Advanced Geographic Information System (GIS) (2) ArcGIS Data processing
3 ：Advanced Geographic Information System (GIS) (3) ArcGIS Spatial analysis
4 :Advanced Geographic Information System (GIS) (4) Model-builder window in ArcGIS
5 ：Advanced Remote Sensing (1) Satellite image preparation
6 ：Advanced Remote Sensing (2) Image analysis with tutorial data with ArcGIS
7 ：Advanced Remote Sensing (3) Application of image analysis with ArcGIS
8 ：Advanced hydrological model (RRI/BTOP/IFAS) (1)
9 ：Advanced hydrological model (RRI/BTOP/IFAS) (2)
10 ：Advanced hydrological model (RRI/BTOP/IFAS) (3)
11 ：Advanced hydrological model (RRI/BTOP/IFAS) (4)
12 ：Advanced hydrological model (RRI/BTOP/IFAS) (5)
13 ：Advanced hydrological model (RRI/BTOP/IFAS) (6)
14 ：Advanced hydrological model (RRI/BTOP/IFAS) (7)
15 ：Advanced hydrological model (RRI/BTOP/IFAS) (8)

3 Grading

Reports (100%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required

4-2 Others

Material made by the instructors

Subject: Flood Hydraulics and Sediment Transport

Course number：DMP3810E
Instructor：Prof. Shoji FUKUOKA
Term / Time：Fall through Winter

1 Course Description

This course provides the basic knowledge necessary for planning and designing the structural measures for Integrated Flood Risk Management (IFRM). The course first describes the river administration and planning for application of IFRM. Especially the methodology of comprehensive river management will be emphasized that includes planning of flood hydraulics, flood control, and sediment movement to river channels. This will be followed by specific technologies of channel control and channel improvement.

2. Course Outline (Course Topics)

Week

1. Outlines of characteristics and management of Japanese rivers.
2. Occurrence of flood flows.
3. Propagation of hydrographs of water level and discharge in flood flows.
4. Flow resistance in rivers with compound channels.
5. Prediction method of flow resistance in compound channels and application to river course design.
6. Steady quasi-two dimensional analysis of flood flows in rivers with vegetations.
7. Unsteady quasi-two dimensional analysis of flood flows.
8. Relationship between dimensionless width, depth and discharge in rivers
   - Learning from natural rivers
9. River cross-sections harmonizing flood control and river environment
10. Outline of sediment transport
11. 1-D bed deformation, computing model
12. 2-D bed deformation, sand waves and bars, meandering
13. River disaster due to channel movement
14. Flows in vegetated zone and stabilized bars
15. River restoration based on sediment transport

3 Grading

Reports (20%) Final examination (80%)

4 Textbooks

4-1 Required

4-2 Others

Subject: Mechanics of Sediment Transportation and Channel Changes

Course number：DMP 3820E
Instructor：Prof. Shinji EGASHIRA
Term / Time：Fall through Winter

1 Course Description

Sediment transportation takes place in various forms such as bed-load, suspended load, debris flow etc. and its spatial imbalance causes river bed degradation and aggradation, side bank erosion, sand bar formation and channel shifting. Such channel changes will be suitable for ecological systems, if they are within an allowable level. However, if these are over some critical level, flood and sediment disasters will happen. This course provides methods for evaluating sediment transportation and associated channel changes with attention focused on basic principles of sediment mechanics. In addition, methods of sediment management are discussed for disaster mitigation as well as for developing a suitable channel condition.

2 Course Outline (Course Topics)

Week

1 : Introduction (1)
- Characteristics of sediment

2 : Introduction (2)
- Sediment transportation and corresponding channel changes
- Methods to evaluate channel changes

3 : Mechanics of sediment transportation (1)
- Parameters associated with sediment transportation

4 : Mechanics of sediment transportation (2)
- Critical condition for initiating bed load

5 : Mechanics of sediment transportation (3)
- Bed load formulas

6 : Mechanics of sediment transportation (4)
- Bed load formulas

7 : Mechanics of sediment transportation (5)
- Extension of bed load formula to non-uniform sediment

8 : Mechanics of sediment transportation (6)
- Suspended load

9 : Mechanics of debris flow (1)
- Constitutive equations
- Debris flow characteristics over erodible beds

10 : Mechanics of debris flow (2)
- A bed load formula derived from constitutive equations

11 : Bed forms and flow resistance (1)
- Geometric characteristics of bed forms
- Formative domain of bed forms

１２：Bed forms and flow resistance (2)
- Flow resistance

１３：Prediction of channel changes (1)
- Governing equations employed in steep areas
- Topographic change in steep areas

１４：Prediction of channel changes (2)
- Governing equations employed in alluvial reaches
- Topographic change in alluvial reaches

１５：Method to predict sediment transport process in drainage basins
-Sediment management in drainage basin

３ Grading

50 points for reports and short quizzes

50 points for the examination at the end of semester

Notice: Either a report or a short quiz is assigned every two weeks, regarding questions illustrated at the end of each chapter in Lecture Note.

４ Textbooks

4-1 Required

- Egashira, S. (2009): Mechanics of Sediment Transportation and River Changes, Lecture Note

4-2 Others

- Sturm, T. W. (2001): Open Channel hydraulics, McGraw-Hill.
- Graf, W. H. (1997): Fluvial Hydraulics, Wiley.
- Julien Pierre: River Mechanics, Cambridge University Press
  (Website: http://www.cambridge.org/us/catalogue/catalogue.asp?isbn=9780521529709)
  (http://www.amazon.co.jp/River-Mechanics-Pierre-Y-julien/dp/0521529700)
- Albert Gyr and Klaus Hoyer: Sediment Transport, A Geophysical Phenomenon, Springer Netherlands
  (http://www.springerlink.com/content/q0x656/)
- Ashida K., Egashira S. and Nakagawa H. (2008), River Morphodynamics for the 21st Century, Kyoto University Press (in Japanese)

Subject: Sustainable Reservoir Development & Management

Course number：DMP 3830E
Instructor：Prof. Nario YASUDA
Term / Time：Fall through Winter

1 Course Description

Dams play important roles as major flood countermeasures in Japan. This course provides the basic ideas of dam reservoir design, construction and operation & maintenance. The lecture covers not only dam itself, but also its social aspects such as community relocation.

2 Course Outline (Course Topics)

Week

1: Outline of dam engineering
2: Planning and operation of flood control
3: Dam construction (1)
4: Dam construction (2)
5: Hydraulic structure for dam management
6: Effective use of existing dams and new technology in dam management in the world
7: Community relocation and life-rebuilding efforts
8: Effective maintenance for river and dam structures (1)
9: Effective maintenance for river and dam structures (2)
10: Practice on planning of concrete dam (1)
11: Practice on planning of concrete dam (2)
12: Practice on planning of rock fill dam (1)
13: Practice on planning of rock fill dam (2)
14: Tour of dam laboratory of PWRI
15: Presentation

3 Grading

Class participation 50%, Reports 30% Presentation 20%

If you miss the deadline for reports, your reports will only be evaluated for a certain percentage of what they are supposed to be:

Up to seven days: 70%, Eight days or more: 50%

4 Textbooks

4-1 Required

Japan Commission on Large Dams, “Dams in Japan ---Past, Present and Future”
A Balkema Book, CRD Press 2009

4-2 Others

Subject: Control Measures for Landslide & Debris Flow

Course number：DMP 3840E
Instructor：Prof. Koichi KONDO
Term / Time：Fall through Winter

1 Course Description

This course provides the necessary knowledge and understanding of landslide and debris flow phenomena and their control measures necessary to exercise the IFRM. The lecture will illustrate the devastating phenomena and the causes of landslides and debris flows and provide the basic concepts of the measures for sediment-related disasters, so-called Sabo Works which is executed in the hill slopes and the channels. It will cover the important role of hazard mapping for sediment-related disasters in both structural and non-structural measures.

2 Course Outline (Course Topics)

Week

１． Outline of sediment-related disasters and Sabo projects	Prof. Kondo
２． Sediment yield, transport and deposition in a river basin	Prof.Sasahara
３． Sabo planning and control of sediment transport	Prof.Sasahara
４． Planning and design of Sabo facilities	Prof. Sasahara
５． Restoration of vegetation on wasteland and its effects	Dr.Osanai
６． Countermeasures for earthquake-induced natural Dams	Dr. Osanai
７． Introduction of landslides	Dr. Tsunaki
８． Survey and emergency response for landslides	Dr.Tunaki
９． Permanent measures for landslide damage reduction	Dr. Tsunaki
１０． Warning and evacuation system for sediment-related disasters	Dr.Hara
１１．Hazard mapping for sediment-related disasters	Dr. Takanashi
１２． Training of hazard mapping for sediment-related disasters (1)	Dr. Takanashi
１３．Training of hazard mapping for sediment-related disasters (2)	Dr. Takanasi
１４． Application of Sabo/landslide projects to other countries (1)	Prof.Kondo Dr. Osanai
１５． Application of Sabo/landslide projects to other countries (2)	Prof.Kondo Dr. Osanai

3 Grading

Class participation (30%) Report and final examination (70%)

4 Textbooks

4-1Required

4-2 Others

Subject: River Ecohydraulics

Course number：DMP3870E
Instructor：Assoc. Prof. Kelly Kibler
Term / Time：Winter through Spring

1 Course Description

Modification of natural rivers is often necessary to protect against losses of human lives and property related to water and sediment-related hazards. However, without careful planning, river modification may lead to ecosystem degradation. To support sustainable and multi-objective management of rivers and aquatic resources, this course investigates fundamental linkages between physical processes, management actions, and ecological responses. Students will explore processes relevant to low- and high-gradient river systems, gaining knowledge at the intersection of fluvial geomorphology, river engineering, and stream ecology theory.

2 Course Outline (Course Topics)

Week

1 ：Dynamic equilibrium of rivers and effective discharges for geomorphic work
2 ：Physical aquatic habitat of lotic ecosystems
3 ：Specialized use of physical/hydraulic habitats by aquatic organisms
4 ：Natural flow regimes and indicators of hydrologic alteration
5 ：Hydrogeomorphic effects: interaction of flow and sediment
6 ：Ecohydrology: riparian and hyporheic environments
7 ：Environmental Impacts of Dams (Dr. Iwami, MLIT)
8 ：Environmental Impacts of Dams (Professor Sumi, Kyoto University)
9 ：Sediment Management in Reservoirs (Professor Sumi, Kyoto University)
10 ：Sediment Management in Reservoirs (Professor Sumi, Kyoto University)
11 ：Aquatic-terrestrial ecosystem linkages**
12 ：Bank erosion and river engineering
13 ：Ecosystem services and river restoration
14 ：Hydraulics of fish passage structures
15 ：Exam

** Supplement activity to Lecture 11: Extra credit viewing of film *Riverwebs* in evening, outside of class time.

3 Grading

60% Assignments and short quizzes
40% Exam

4 Textbooks

4-1 Required
4-2 Other- Primary academic literature, provided by the instructor

Subject: Site Visit of Water-related Disaster Management Practice in Japan

Course number：DMP3900E
Instructor：Asso. Prof. Kelly Kibler
Term / Time：Fall through Summer

1 Course Description

This course provides opportunities for students to actually visit and study flood control structures in Japan, which are introduced in other courses. The structures include river levees, flood retarding basins, dams, and sabo structures. After each study visit, students will be required to submit a report comparing the target structures in Japan and those in their countries.

2 Course Outline (Course Topics)

1 ：Diversion channel
2 ：Super levee
3 ：Wire, Water gate
4 ：Disaster management station
5 ：River administration in normal time
6 ：Awareness enlightening activities for flood (Flood mark, Water level indication tower, etc.)
7 ：Retarding basin
8 ：Metropolitan area outer underground discharge channel
9 ：Integrated flood management in Tsurumi River
10 ：Dam
11 ：Sabo work
12 ：Discontinuous levee
13 ：Pumping station

3 Grading

Attendance (60%), Report (40%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required
4-2 Others

Visit to Tsukuba Research Institutes (GSI & NIED)

[4th October (Fri)]

12:40 Leave PWRI

↓

(JICA bus)

↓

13:00-14:30 Geospatial Information Authority of Japan (GSI)

(Assemble at the entrance of "The Science Museum of Map and Survey")

- 13:00-13:25 Lecture on disaster-related activities by GSI
- 13:30-13:55 GEONET
- 14:00-14:30 Site visit of the museum

↓

(JICA bus)

↓

15:00-16:30 National Research Institute for Earth Science and Disaster Prevention (NIED)

- 15:00-15:15 Introduction of NIED
- 15:15-15:45 Lecture on MP radar
- 15:50-16:05 Site visit of calculation room
- 16:10-16:30 Site visit of rainfall laboratory

17:00 Leave NIED

↓

(JICA bus)

↓

17:45 Arrive at TBIC

Site Visit
Tsukuba area and Kokai River

Time table

[11th October (Fri)]

8:15　Departure from TBIC

↓ (JICA Bus)

9:30-10:30 Lecture by Urban Renaissance Agency

- Town development along the Tsukuba Express (TX) line
- Outline of rainwater drainage measures

↓ (JICA bus)

10:45-11:45　Field Survey in Katsuragi Area (Kenkyu-gakuen Area)

Regulating pond, Infiltration facility, etc

↓ (JICA bus)

12:00-12:50 Lunch at iias-tsukuba　（イーアスつくば）

↓ (JICA bus)

14:00-16:00 Hakojima Retarding Basin, Kurogo observatory

母子島遊水地・黒子水位観測所※旭ヶ丘団地入り口 集合

↓ (JICA bus)

17:30 Arrival at TBIC

Joint Class
Public Works Research Institute and Building Research Institute

Time table

[17th October (Thu)]

8:00 Departure from TBIC

↓ (JICA Bus)

9:00-10:30 Lecture by Prof. Takeuchi

- Principle of Disaster Management

↓ (JICA bus)

10:45-11:55 Tour of PWRI experimental facilities

- 10:50-11:20 River experimental facility (NILIM)
- 11:25-11:55 Dam experimental facility (PWRI)

↓ (JICA bus)

12:00-13:00 Lunch at PWRI

↓ (JICA bus)

13:05-17:05 Lecture at Building Research Institute

↓ (JICA bus)

17:45 Arrival at TBIC

Visit to Nikko

Awareness raising activities for flood, Retarding basin, Dam, Sabo

[30th October (Wed)]

7:30 Leave JICA Tsukuba

↓

(JICA bus) via Tsukuba sta.

↓

9:30-11:45 Lecture at Tonegawa Joryu work office, MLIT and site visit at Kurihashi town

[Lecture]

Flood forecasting and early warning system

[Site visit]

Flood marks on utility poles (Marugoto Machigoto Hazard Map)

Display tower indicating water level of Tone River

↓

(JICA bus)

↓

12:15-13:30 Lunch (at roadside restaurant "Michi-no-eki")（道の駅きたかわべ）

↓

(JICA bus)

↓

14:00-16:00 Site visit at Watarase Retarding basin

↓

(JICA bus)

↓

17:30 Utsunomiya City (CHISUN Hotel Utsunomiya)

[31th October (Thu)]

8:00 Departure from hotel

↓

(JICA bus)

↓

8:30-10:00 Lecture on collaboration of dams along Kinu River

(at Kinu Gawa Integrated Dam Control Office of MLIT in Utsunomiya City)

↓

(JICA bus)

↓

Lunch at a restaurant in Kinugawa hot spring district

↓

(JICA bus)

↓

13:00-14:15 Site visit at Kawaji Dam

↓

(JICA bus)

↓

14:30-16:00 Site visit at Yunishigawa Dam

↓

(JICA bus)

↓

18:30 Utsunomiya City (CHISUN Hotel Utsunomiya)

[1st November (Fri)]

7:30 Depart from hotel

↓

(JICA bus)　Buy your lunch at convenience store

↓

9:00-11:00 Lecture of Nikko Sabo works

↓

(JICA bus) Lunch on the way

↓

13:30-15:30 Lecture of Ashio Sabo works

↓

(JICA bus)　 via Tsukuba sta.

↓

19:00 Arrival at TBIC

Site Visit

Urban River in Japan

[4th December (Wed)]

11:00 Leave from TBIC
Hitachino Ushiku Sta. 11:39 -> 12:40 Ueno Sta. 12:50 -> 13:14 Saitama Shintoshin Sta.
Lunch at Kanto Regional Bureau of MLIT

14:30-16:00 Lecture at Kanto Regional Bureau of MLIT
Flood forecasting and early warning system

Saitama Shintoshin Sta. 16:20 -> 16:43 Ueno 16:49 -> 17:39 Kannai Sta.
(On foot)
Daiwa Roynet Hotel Yokohama-Koen (Yokohama-City)

[5th December (Thu)]

Buy your lunch at convenience store
8:30 Daiwa Roynet Hotel Yokohama-Koen
(On foot)
Kannai Sta. 8:51 -> 9:12 Kozukue Sta.

9:20 Tsurumi River Basin Information Center
9:30-10:30 Lecture on Integrated River Basin Management by Mr. Imbe
10:30-11:30 Site visit at the Information Center
11:30-12:30 Lunch at the Information Center
move by bus
13:00-14:00 Kawawa River Retarding Basin
(Under subway train depot, Yokohama-city)
move by bus
14:20-14:30 Kirigaoka Regulating Pond
(Kirigaoka, Midori-ku, Yokohama-city)
move by bus

14:50-16:00 Onmawasi Park Underground Tunnel-type Reservoir
(Miwa-machi, Machida-city, Tokyo)

move by bus

16:50-17:20 Rainwater storage and infiltration system in individual house
(Prof. Takahashi's house : Todoroki, Setagaya-ku, Tokyo)

move by bus

18:00 Diamond Hotel (Tokyo)

[6th December (Wed)]

9:00 Diamond Hotel (Tokyo)

Hanzomon Sta. 9:35 -> 9:42 Otemachi Sta.

10:00-11:30 Lecture at JMA

Otemachi Sta 13:03 -> 13:19 Kitasenju Sta 13:44 -> 14:31 Hitachino Ushiku Sta.

Site Visit

Shirako River

[4th March (Tue)]

12:00 Leave from TBIC

move by bus

13:30-14:40 Lecture at the administrative office of underground regulating reservoir

14:40-16:25 Site visit at underground regulating reservoir of Shirako River

move by bus

18:20 TBIC

Site Visit　Niigata(Shinano River)
Schedule

【24th April (Thu)】

TBIC 7:15 -> (JICA bus) -> Hitachi-no-ushiku Sta. 7:37 -> (JR Joban Line)
-> 8:38 Ueno Sta. 8:58 -> (Shinkansen "MAX Toki 311") -> 11:04 Niigata Sta.

(JICA Bus)

11:30-12:30　**Lecture on Outline of Shinano River and Flood in the basin**
(at Shinano River Downstream Work Office, MLIT)

(JICA Bus)

12:45-13:30　Lunch (AEON Niigata Nishi)

(JICA Bus)

14:30-17:00　**Visiting at Ohkouzu Diversion Channel**

- Museum of Ohkouzu Diversion Channel
- River mouth of the Channel

(JICA Bus)

18:00　Arrival at Hotel in Nagaoka City

[Stay in Nagaoka City]

【25th April (Fri)】

8:30　Leave from hotel

(JICA Bus)

10:30-12:00　**Sagurigawa Dam, MLIT**

(JICA Bus)

Lunch

(JICA Bus)

14:00-19:00　**Exercise on River Discharge Measurement at Uono River**

19:40　Arrival at Hotel (the same hotel)

[Stay in Nagaoka City]

【26th April (Sat)】

7:50　Leave from hotel

Nagaoka Sta. 8:09 -> (Shinkansen "MAX Toki 308") ->9:58 Ueno Sta. 10:17 ->
(JR Joban Line) -> 11:18 Ushiku Sta. 11:30 -> (Bus) -> TBIC

Site Visit
Yodo River Basin

4th June (Wed)

TBIC 7:35－（JICA Bus）→7: 55 Hitachi-no-Ushiku Sta. 8:05→（JR）→8:58Nippori Sta. 9:17→（JR）→9:30 Tokyo Sta. 10:00→（Shinkansen Nozomi221《having a lunch in the car》）→12: 33Shi-Osaka Sta. 12:51→（Subway）→13:02Honcho Sta. 13:08→（Subway）→13:11Tanimachi 4 Chou-me

13:15-14:45	**Osaka Museum of History 90 min.** ● The outline of Yodo Basin ● The history of flood control	
		On foot (10 min.)
15:00-16:30	**Lecture by Kinki Regional Development Bureau　90 min.** **（Lecture）** ● **Damages caused by typhoon 18** ● **Flood Prediction**	
	Tenmanbshi Sta.17: 02---(Subway Tanimachi line) --- 17:08Higasi-Umeda Sta. --(On foot) --- Hotel	Subway, On foot
Stay in Osaka	Hearton Hotel Nishi Umeda	

5th June (Thu)

Leave at 8:00	Hearton Hotel Nishi Umeda	
		JICA Bus (60 min.)
9:00-10:00	**Yodogawa museum** **（Yodogawa river office in MLIT）　60 min.** （Lecture 60 min.　: The out line of Yodo baisin）	
10:00-11:30	**Site Visit（Yodogawa river office in MLIT）90 min.** ● High-standard levee ● The Machines for countermeasures against natural	

	disaster	
	《Lunch in the car》	JICA Bus (60 min.)
12:30-13:00	**Site Visit （Yodogawa river office in MLIT） 30 min.** ● The point damaged by typhoon 18 (Kuga bridge over Katsura river)	
		JICA Bus (30 min.)
13:30-14:30	**Site Visit (Yodogawa river office MLIT) 30 min.** ● The area damaged by typhoon 18 (Togetsu bridge in Arashiyama Area)	
		JICA Bus (30 min.)
15:00-16:00	**Kinkakuji --- The Present from JICA**	
		JICA Bus (30 min.)
Stay in Kyoto	El Inn Kyoto	

6th June (Fri)

Leave at 9:45	El Inn Kyoto	
		JICA Bus (35 min.)
10:30-11:30	**Yodogawa Integrated Dam Control Office 60 min.** （Lecture : Dam Operation for Typhoon No.18 in 2013）	
	Lunch in the car Via Uji Sta.	JICA Bus (90 min.)
13:00-14:15	**Amagase Dam 75 min.** （Site Visit）	
		JICA Bus (35 min.)
15:00-16:30	**Biwako River Office in MLIT 90 min.** （Lecture: Outline of Otsu Floodway Program, Site Visit; Aqua Biwa）	
		JICA Bus (35min.
Stay in Kyot	El Inn Kyoto	

7th June (Sat)

Leave at 8:30	El Inn Kyoto	
		JICA Bus 60min.
9:30-12:30	**Biwako Musium 120 min.** （Lecture by curators, Site visit）	
	Lanch around Lake Biwa	
		JICA Bus 60min.
14:00-15:00	**Lake Biwa canal museum 60 min.** （Site Visit）	
		JICA Bus 30min.

Kyoto Sta. 16:05→（Shinkansen Nozomi 238）→18:23Tokyo Sta. →（JR,TX）→ Tsukuba sta. → TBIC

土木研究所資料
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本資料の転載・複写の問い合わせは

国立研究開発法人土木研究所 企画部 業務課
〒305－8516 茨城県つくば市南原1－6 電話029－879－6754