

Water Environment Partnership in Asia (WEPA)

Questionnaire Results and Observations

Summary Report

Climate Change and the Water Environment

March 2011

Institute for Global Environmental Strategies (IGES)

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1. Background and Objectives of the WEPA Questionnaire Survey

A sound water environment is a key element in securing safe water access and a sound environment. However, many Asian countries face serious water pollution problems and the destruction of aquatic ecosystems, creating obstacles to sustainable development in these countries. Recognizing that the improvement of water environmental governance is essential to solve such problems, the Water Environment Partnership in Asia (WEPA) was launched in 2004 by the Ministry of the Environment, Japan. Thirteen countries participate in WEPA as of March 2011. Utilizing the knowledge accumulated and the human network developed in the first phase, the second phase of WEPA will further promote knowledge sharing on water environment issues.



Figure 1. WEPA Partner Countries

“Adaptation to Climate Change in the Water Environment Sector” is one of the priority topics of the WEPA second phase, identified through discussions in the first phase of WEPA. Water quality and aquatic ecosystems will be affected by climate change; however, scientific knowledge on this issue is insufficient. Considering this fact, WEPA will conduct activities to promote knowledge sharing to help WEPA partner countries consider how to reflect climate change concerns into the future water environmental management of each WEPA country.

In the first international workshop of the WEPA second phase, held in March 2010, representatives of WEPA partner countries identified three areas that require future consideration related to this topic, namely “estimation of the future impacts of climate change on the water environment”, “identification of observed impacts of climate change on the water environment”, and “identification of necessary adaptation options and their outcomes in the water environment sector”. To gain information in the identified areas for consideration, WEPA conducted the following questionnaire surveys.

- (1) Questionnaire on Climate-Water Related Information to Investigate Impacts of Climate Change on the Water Environment
- (2) Perception Survey on Climate Change Impacts on the Water Environment
- (3) Questionnaire on Policy Responses to Climate Change in Water Resource/Environment Sector

The results of the questionnaires will serve as a reference for future WEPA discussions.

2. Outline of the Questionnaires

2.1 Questionnaire 1: Questionnaire on Climate-Water Related Information to Investigate Impacts of Climate Change on the Water Environment

1) Objective

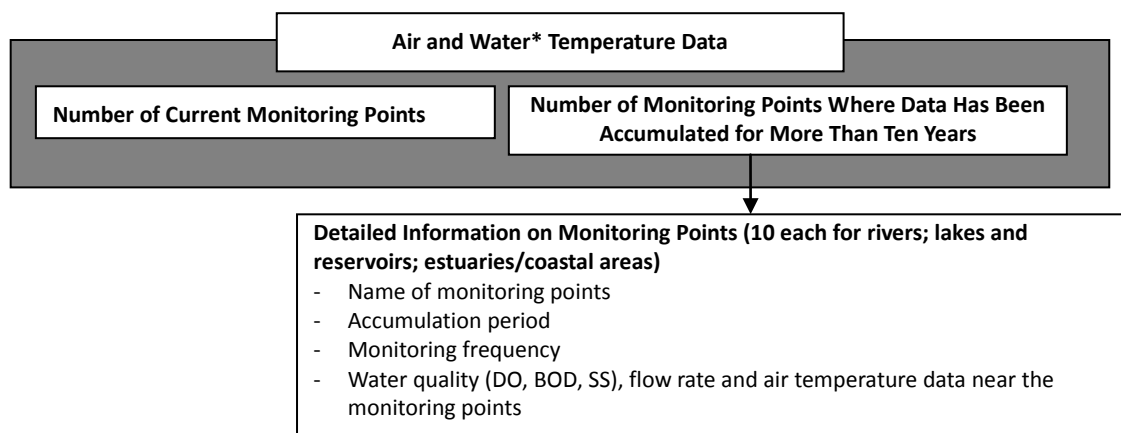
It is important to identify relevant information and data availability not merely for identification, but also for estimation of climate change impacts on the water environment. This questionnaire aimed to identify the availability of relevant data related to water and climate, which will be necessary to identify climate change impacts on the water environment.

2) Target

The questionnaire was sent to the focal point person of each WEPA country (13 countries).

3) Contents

Considering the methodology used in an investigation on climate change impacts on water quality conducted in Japanese FY 2009 (April 2009 – March 2010) by the Ministry of the Environment, Japan, this questionnaire primarily focused on the availability of longer-term data to reveal the relationship between air and water temperature. In addition, the questionnaire asked about the availability of water quality data at monitoring points for which longer-term water temperature data is available.



* public water bodies (rivers, lakes and reservoirs, and estuaries and coastal areas)

Figure 2. Flow of Questionnaire 1

4) Questions

Q1. Please give us the following information on air temperature monitoring in your country.

- (1) Number of current monitoring points of air temperature
- (2) Number of monitoring points that have accumulated data for more than 10 years
- (3) Name of organization (section) that have the above data

Q2. Please give us the following information on water temperature monitoring in public waters, namely in rivers, lakes/reservoirs and estuaries/coastal areas in your country.

2-1. Rivers

- (1) Number of monitoring points where average water temperature data for every month is available and the name of organization that has the monitored information
- (2) Number of monitoring points where water temperature data has been accumulated more than 10 years among the monitoring points in (1)
- (3) Number of monitoring points where average/representative water temperature data for both dry and rainy seasons is available and the name of organization that has the monitored information
- (4) Number of monitoring points where water temperature data has been accumulated more than 10 years among the monitoring points in (3)

2-2. Lakes/Reservoirs

- (1) Number of monitoring points where average water temperature data for every month is available and the name of organization that has the monitored information
- (2) Number of monitoring points where water temperature data has been accumulated more than 10 years among the monitoring points in (1)
- (3) Number of monitoring points where average/representative water temperature data for both dry and rainy seasons is available and the name of organization that has the monitored information
- (4) Number of monitoring points where water temperature data has been accumulated more than 10 years among the monitoring points in (3)

2-3. Estuaries/Coastal Areas

(1) Number of monitoring points where average water temperature data for every month is available and the name of organization that has the monitored information

(2) Number of monitoring points where water temperature data has been accumulated more than 10 years among the monitoring points in (1)

(3) Number of monitoring points where average/representative water temperature data for both dry and rainy seasons is available and the name of organization that has the monitored information

(4) Number of monitoring points where water temperature data has been accumulated more than 10 years among the monitoring points in (3)

Q3. Regarding the points where water temperature data has been accumulated more than 10 years (monthly average or average of dry/rainy seasons), please provide more details on the 10 sites that have the longest data accumulation period for rivers, lakes/reservoirs, and estuaries/coastal areas respectively.

Note: Water quality monitoring may be conducted by different governmental sectors with different purposes. If there are no monitoring points which have monitoring data for over 10 years, you do not need to answer the following questions.

	Name of water bodies	Water Temp. Data			Years of Accumulation of Water Quality Parameters *1			Organisation that keeps (has) the monitored data	Other Related Parameters	
		Monitoring Point Number/Name If any	Data accumulation period (please show the year of start)	Frequency of Monitoring (please tick)	DO	BOD/COD	SS		Flow*	Temperature
1			()Years from to	() Daily () Annual Average () Average in Dry Season () Average in Rainy Season () Others (pls. specify)	Years	Years	Years		() Yes () No	() Yes () No

*water level for lakes/reservoirs

2.2 Questionnaire 2: Perception Survey on Climate Change Impacts on the Water Environment (Water Quality and Aquatic Ecosystems) in WEPA Countries

(1) Objective

Scientific research and other information related to climate change impacts on the water environment are scarce. To understand the potential impacts of climate change on the water environment, this survey aimed to investigate the views of different stakeholders on the subject.

(2) Target

The questionnaire was sent to stakeholders working in the water sector in WEPA countries including governmental officials, academics, and local NGO members who participated in past WEPA related meetings (except Japan).

(3) Contents

The content of the questionnaire is shown in Figure 3.

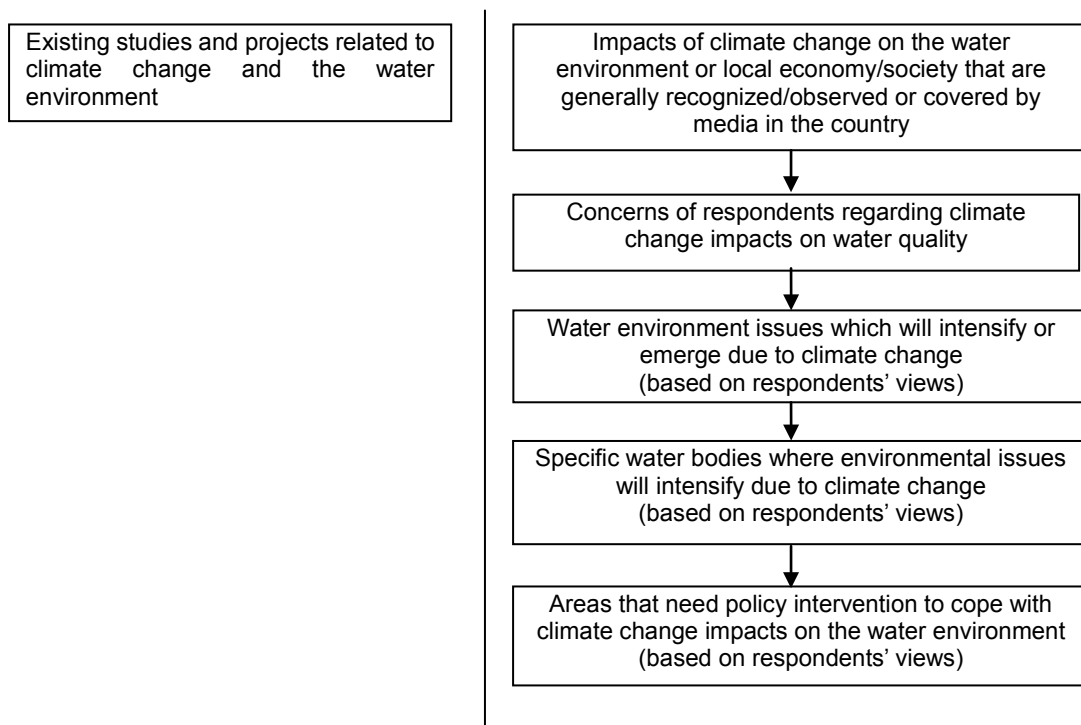


Figure 3. Content of Questionnaire 2

2.3 Questionnaire 3: Questionnaire on Policy Responses to Climate Change in Water Resource/Environment Sector

(1) Objective

This questionnaire aimed to investigate to what extent water resources and water environment concerns are reflected in climate change adaptation strategies, as well as to what extent climate change impacts are considered in current national plans or strategies for water resources and the water environment. This survey is a follow-up to the 2009 questionnaire survey.

(2) Target

The questionnaire was sent to the focal point person of each WEPA country (13 countries).

(3) Content of the Survey:

- a) Official reports on climate change and the water environment in your country
- b) Strategy or plan on climate change impact(s) on water resources or the water environment
- c) Incorporation of climate change concerns in current water policy and/or water resource management/development strategy in your country
- d) Current water quality management strategies or any other policy documents for water quality conservation that include(s) any reference to or consideration of potential climate change impacts on the water environment
- e) Authority responsible for the coordination of potential climate change impacts and adaptation in the water sector.

3. Results of Questionnaires

3.1 Questionnaire 1: Questionnaire on Climate-Water Related Information to Investigate Impacts of Climate Change on the Water Environment

3.1.1 Respondents

The WEPA secretariat received answers from 10 out of 13 countries. The countries that responded are Cambodia, Indonesia, Republic of Korea, Lao PDR, Malaysia, Myanmar, Nepal, Philippines, Thailand, Viet Nam and Japan.

3.1.2 Results of Questionnaire

Question 1: Accumulation of Data on Air Temperature

	No. of Monitoring Points		Contact for the Data
	Current	Points with data accumulation more than 10 years	
Cambodia	11	20	Department of Meteorology, MoRM
ROK	539	539	Korea Meteorological Administration
Lao PDR	23	17	Dept. of Meteorology and Hydrology, Water and Environment Administration
Indonesia	139	109	Meteorological Climatological and Geophysical Agency
Philippines	56	56	PAG ASA, Department of Science and Technology
Malaysia	39	35	Malaysian Meteorological Dept.
Myanmar	114	113	
Nepal	--	--	
Thailand	124	124	Meteorological Dept.
Viet Nam	176	176	
Japan*	157	157	Meteorological Agency

* Japan's data is as of 2007. Number of monitoring points with data accumulated more than 30 years.

Q2-(1): Water Temperature Data - Rivers

	Monthly		Twice/year (dry and rainy seasons)	
	Current	Points with data accumulation more than 10 years	Current	Points with data accumulation more than 10 years
Cambodia	17	19	0	0
ROK	1482	521	0	0
Lao PDR	0	0	0	0
Indonesia	--	--	105	0
Philippines	14	14	(14)	--
Malaysia	1063	908	0	0
Myanmar	--	--	--	--
Nepal	0	0	--	--
Thailand	39 (automatic)	4	0	0
Viet Nam	>100	>100	--	--
Japan	6,053	3,121	--	--

* Japan's data is as of 2007. Number of monitoring points with data accumulated more than 30 years.

Q2-(2): Water Temperature Data - Lakes and Reservoirs

	Monthly		Twice/year (dry and rainy seasons)	
	Current	Points with data accumulation more than 10 years	Current	Points with data accumulation more than 10 years
Cambodia	2	1	0	0
ROK	189	150	0	0
Lao PDR	--	--	--	--
Indonesia	--	--	--	--
Philippines	14	14	(14)	(14)
Malaysia*	0	0	0	0
Myanmar	--	--	--	--
Nepal	0	0	--	--
Thailand	0	4	0	0
Viet Nam	--	--	--	--
Japan**	529	265	--	--

*Lakes and reservoirs in Malaysia are managed and monitored by different organizations or owners.

** Japan's data is as of 2007. Number of monitoring points with data accumulated more than 30 years.

Q2-(2): Water Temperature Data – Estuaries/Coastal Areas

	Monthly		Twice/year (dry and rainy seasons)	
	Current	Points with data accumulation more than 10 years	Current	Points with data accumulation more than 10 years
Cambodia	--	--	--	--
ROK	0	0	0	0
Lao PDR				
Indonesia	--	--	--	--
Philippines	14	14	(14)	(14)
Malaysia	158	(could not obtain at this time)	0	0
Myanmar	--	--	--	--
Nepal	--	--	--	--
Thailand	0	4	0	0
Viet Nam	--	--	--	--
Japan*	2,174	1,091	--	--

* Japan's data is as of 2007. Number of monitoring points with data accumulated more than 30 years.

Questionnaire 3: More detailed information on monitoring points where data has been accumulated more than 10 years

Results are attached in Annex 1.

3.2 Questionnaire 2: Perception Survey on Climate Change Impacts on the Water Environment (Water Quality and Aquatic Ecosystems) in WEPA Countries

(1) Respondents

A total of 43 persons (out of 202 persons) responded to the questionnaire.

(2) Respondent Profiles

a) Countries of Origin

Figure 4 shows the country of origin of respondents. More responses came from Nepal than other countries as the questionnaire was distributed and collected at the WEPA Dialogue in Nepal held in December 2010.

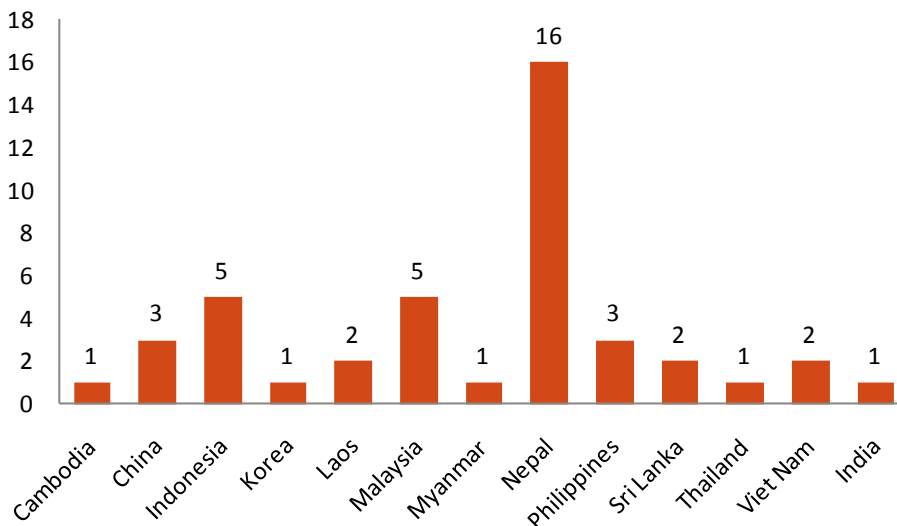


Figure 4. Country of Origin of Respondents

b) Professional Background of Respondents

There were more responses from governmental sectors as the secretariat received many responses from WEPA focal points and participants in the WEPA Dialogue in Nepal. See Figure 5 for details.

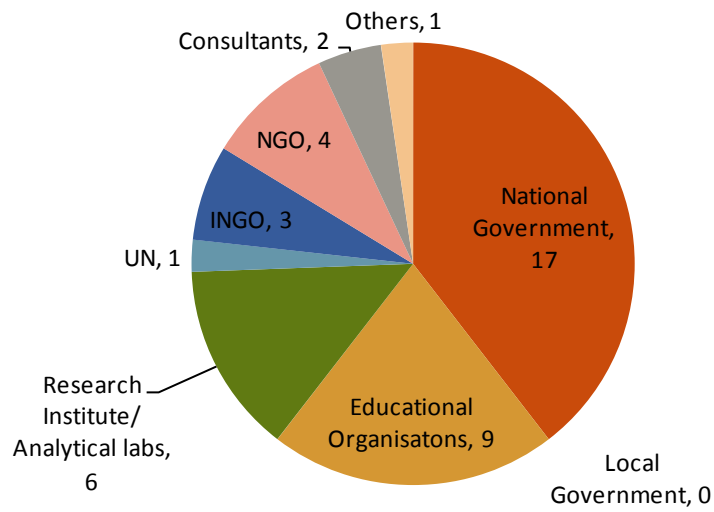


Figure 5. Professional Background of Respondents

3.2.2 Results

(1) **What kinds of impacts of climate change on the water environment or local economy/society are generally shared with local people or covered by media/research in your country?**

The result is shown in Table 1.

**Table 1: Observed Impacts of Climate Change on Water Environment
or Local Economies/Societies**

	Impacts observed	No. of responses	Notes
1	Prolonged dry seasons	16	
	Floods		
2	Impacts on agriculture	9	
3	Change in precipitation	7	
	Water shortage		
	Salt water intrusion into groundwater		
4	Surface water quality degradation	6	Answers from Cambodia, China, ROK, Nepal, and Sri Lanka
5	Destruction of ecosystems (including coastal ecosystems)	5	
6	Groundwater quality degradation (other than salt water intrusion)	4	
	Salt water intrusion into surface water		Most responses from respondents of Malaysia
	Negative impacts on human health (including epidemics)		
	Melting glaciers	3	Only from Nepal respondents
	Low flow rate		
	Sedimentation	1	
	Impact on fisheries		
	Depletion of groundwater		

(2) Will water quality degradation intensify/emerge in your country because of climate change?
Why you think so?

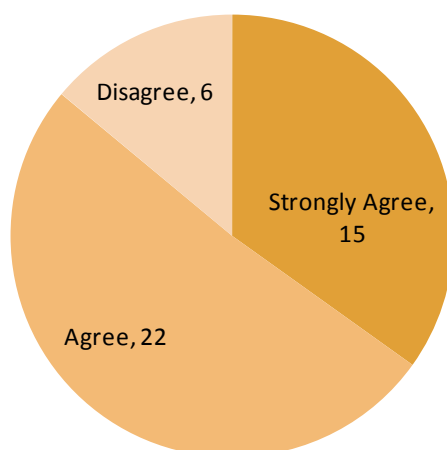


Figure 6. Perception of the Impacts of Climate Change on the Water Environment (quality)

Reasons behind “strongly agree” and “agree” responses

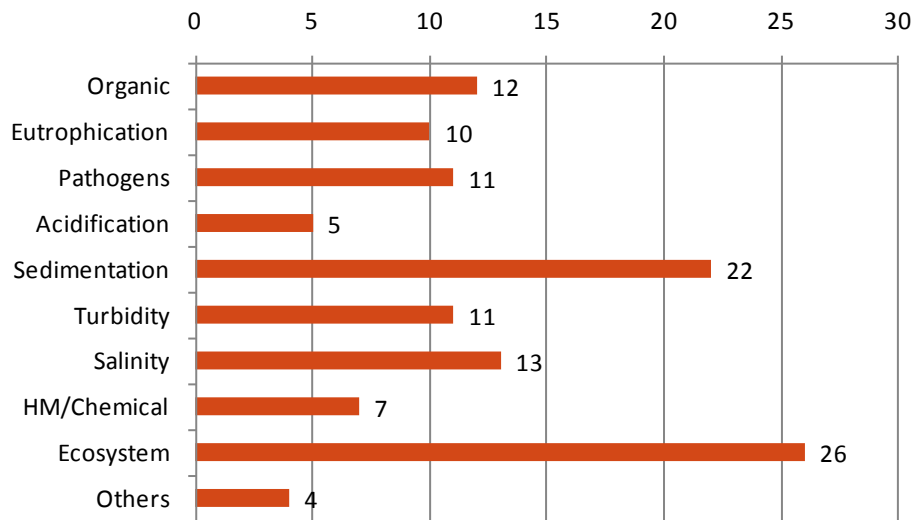
Top three reasons for “strongly agree” and “agree” responses

1. Change of water quantity (flood and drought): 16
2. Increase of air and water temperature: 6
3. Non-climatic reasons such as urbanization and insufficient sanitation facilities: 6

The reason behind “disagree” and “strongly disagree” responses was that human impacts are greater than climate change impacts.

**(3) What kinds of water environment issues will intensify or emerge due to climate change?
(Please choose up to three items)**

See Figure 7 for results.



(note) Others: Ammonia-nitrogen, trace metals and POPs, environmental issues in dry seasons, loss of habitats, change in agricultural patterns, changes in energy use

Figure 7. Issues Related to Water Environment

(4) Specific water bodies (rivers, lakes, reservoirs, coastal areas and groundwater) for which you think water environment issues (e.g. water quality degradation) will intensify due to climate change impacts, if any.

●Indonesia:

Sumatra (Musi, Batan Hari)

Jawa (Ciadane, Ciliwung, Citram, Citanduy, Progo, Bengawan Solo, Bratanas)

Kalimantan (Barito)

Sulawesi (Saddang Mamasa)

●Sri Lanka:

Beira Lake, Kandy Lake

●Viet Nam:

Red River (water shortage);

Hai Phon, Nam Dinh, Ninh Thuan, Binh Thuan, Ca Mau (salt water intrusion)

●China:

Water bodies in Northwest China

●Nepal:

Bagmati River

(5) **Are there any areas that require policy interventions to cope with climate change impacts on the water environment (water quality and conservation of aquatic ecosystems)?**

- ♦ Strengthening of water quality monitoring
- ♦ Strengthening of climate change related studies
- ♦ Regional adaptation plans
- ♦ Strengthening current water quality management (including classification of water bodies)
- ♦ Public awareness raising
- ♦ Management of related sectors – forest, wetlands and solid waste

(6) **Existing Studies Related to Climate Change Impacts on the Water Environment**

There are answers from 20 respondents. The following table shows a summary of answers. Some responses mentioned only the name of a resource person, but are also included in the table. The information provided is not only related to the water environment but also includes other fields.

	Research and Project Name	Implementation organizations or contacts
1		<i>Setiwan Wangsaatmaja, West Jawa EPA</i> <i>Arief Sudrajat, Faculty of Civil and Environmental Engineering</i>
2	<i>1. An Analysis On The River Water Quality- Climate Change Effect Phenomena In Tuaran River, Sabah, Malaysia</i>	<i>1 School of Science and Technology, Universiti Malaysia Sabah, MALAYSIA (UMS)</i> <i>2 College of Forest & Environmental Sciences, Kangwon National University, KOREA</i> <i>3 Faculty of Environmental Studies, Universiti Putra Malaysia, MALAYSIA (UPM)</i>

	Research and Project Name	Implementation organizations or contacts
	2. "Regional collaborative research on climate change impacts on surface water quality in eastern Monsoon Asia: Towards sound management of climate risks"	Regional Collaboration : China:Lei Duan(TsinghuaUniversity) Korea:Ji-HyungPark (Project Leader; KangwonNational University) Kyoung-Woong Kim (Project Co-PI), Edu Inam & Suthiphong Sthiannopkao(IERC,GwangjuInstitute of Science & Technology) Thailand: Wanpen Wirojanagud (Kohn Kaen University), J. Keith Syers (Mae FahLuangUniversity) Lao PDR: SianouvongSavathvong, SouphanouvongUniversity Cambodia: Vibol Sao (Royal University of Agriculture) Vietnam: My HoaNguyen (CanthoUniversity) Malaysia: MohdHarunAbdullah (University of Malaysia Sabah) Indonesia: Dwi Agustyani (Indonesian Institute of Sciences)
	3. Water Chemistry in Downstream Region of Tuaran River: A Preliminary Assessment on Seawater Intrusion Due to Sea Level Rise.	Universiti Putra Malaysia (UPM)
	4. Water Quality Response To Seasonal Changes Of Disturbed and Harvested Forest in Benum Forest Reserve, Raub, Pahang, Malaysia.	Universiti Putra Malaysia (UPM)
	5. Climate Change Impacts on Water Resources and Quality in Langat and Lower Pahang Basins.	Universiti Kebangsaan Malaysia (UKM)
3	1. Pilot scale studies on water blending as a tool to minimize the effects of salinity water intrusion to large-scale water treatment plants	Asian Institute of technology, Bangkok, Thailand Prof. C. Visvanathan
	2. Industrial wastewater reuse studies for agricultural activities in Ho Chi Minh City Vietnam.	Asian Institute of technology, Bangkok, Thailand Prof. C. Visvanathan
	3. Emergency water supply in flood-like disaster situations due to climate change	Asian Institute of technology, Bangkok, Thailand Amila Abeynayaka
4	World Bank (do not know details as of this moment)	
5	Adaptation of Fishing Communities in the Philippines to Climate Change	Maria Rebecca Campos, De La Salle University Dasmaringas
6	many activities going on	
7	Water pollution control project	MEP
8		Taunggi University

	Research and Project Name	Implementation organizations or contacts
9	<i>impacts of climate change and sea level rise to the integrated agriculture-aquaculture system in Mekong River Basin</i>	<i>Le Anh Tuan, Research Institute of Climate Change - Can Tho University (Dragon institute - Mekong)</i>
10	<i>Hydrology of Nile River for Water Management</i>	<i>Carlos Pascual, (FU-Sudan) Ben Zaitchik (JHU) , John Hopkins University, NASA, RCMRD-Kenya, Future University-Sudan</i>
	<i>Risk mapping of water quality in Khartoum City, Sudan</i>	<i>Carlos Pascual, Future University-Sudan</i>
11	<i>Capacity building on adaptation to climate change in the field of water environment (funded by AusAID)</i>	<i>Feng Xiangzhoo, Policy Research Center for Environment and Economy, MEP</i>
12	<i>Climate Change Modelling</i>	<i>NAHRIM</i>
	<i>Climate Adaptation Strategies</i>	<i>UKM Lestari</i>
	<i>Rice Species and Improvement in Crop Cultivation</i>	<i>MARDI</i>
13	Assessment of climate change impact in watershed scale	Kyunghyun Kim, PhD, Director, National Institute of Environmental Research, Korea
	Effect of climate change on freshwater lake ecosystems	Hyegyung Park, PhD, Senior Researcher, National Institute of Environmental Research, Korea
14	1. Water quality classification in Langkawi Island	Universiti Putra Malaysia (UPM), Faculty of Environmental Studies
	2. Development of forest rehabilitation technology for degraded forest	Universiti Putra Malaysia (UPM), Faculty of Environmental Studies
	3. Azma Hanim Ismail, Mashhor Mansor, Wan Maznah, W. O. 2005. Water quality studies in Malaysian disused man made lakes for suitability of an aquaculture project. <i>Wetland Science</i> 3(4) : 258-268.	Universiti Sains Malaysia (USM), School of Biological Science
15	Groundwater Recharge	Dr. Rabin malla, CREEW
16	water balance studies (only proposed)	KVWSMB
17	groundwater pollution research	Suman K. Shakays, ENPHO
18	(informed later)	Department of Zoology, University of Sri Jayawardhana pura
19	Study on the Impact of Climate Change on Hydrologic Regime and Water Resource in Peninsular Malaysia	NAHRIM (Ir. Mohad Zaki Mat Amin)
	Development of Nutrient Response Model for Lake	NAHRIM (Pauziah Hanum Abdul
20	Spring water festival (festival mata air), Salatiga, Central Java	Titi Permata, Komunitas Tanam Untuk Kehidupan (Community to Plan for living)
	Domestic water treatment	Ninol, Pusdakota –Center for Urban Community Empowerment
	Brantas River Advocacy	Sudarno, Paramitra

3.3 Questionnaire 3: Questionnaire on Policy Responses to Climate Change in the Water Resource/Environment Sector

There were no additions to the 2009 questionnaire results. Details of information provided will be further investigated in future WEPA activities. There were no responses from Nepal and Viet Nam. The following table shows a summary of the questionnaire.

Table : Summary of Questionnaire 3

	Water Resource/Environment Concerns in Climate Change Related Strategies	Climate Concerns in Water Resource Plans/Strategies	Climate Concerns in Water Environment Conservation Plans/Strategies
Cambodia	Yes (NAPA, 2006)	----	----
China	----	----	----
Indonesia	Yes (National Action Plan, 2007)	----	----
ROK	----	Yes (in Four major rivers restoration program)	Yes (Strengthening TP)
Lao PDR	Yes (NAPA)	Yes (drafting)	Yes (drafting)
Malaysia	Yes (Second National Communication)	Yes (National Policy on the Environment, Flood Mitigation & Water Resource Infra. Project)	Yes (National Policy on the Environment)
Philippines	Yes (National Adaptation Strategy Framework)	Yes (National IWRM plan)	Yes (National IWRM plan)
Sri Lanka	Yes (Draft National Adaptation Strategy)	Yes (at implementation level)	Yes (at implementation level)
Thailand	Yes (National Strategies for Management of C.C, 2008-2012)	Yes (4 year plan of water resources management)	Yes (in OEPP document)
Japan	---- (not obviously mentioned in the Basic Environment Plan)	Considered (committee formed)	Considered (committee formed)

4. Observations

[Questionnaire 1: Questionnaire on Climate-Water Related Information to Investigate Impacts of Climate Change on the Water Environment]

- Air temperature data has been monitored and accumulated in most WEPA countries (9 out of 11 countries) that responded to the questionnaire.
- Water temperature in rivers is regularly monitored in seven WEPA countries; long-term data is not available for many monitoring points.
- There are less data available for water temperature in lakes/reservoirs and estuaries/coastal areas in many countries. (It is possible that other organizations obtain such data.)
- In many partner countries of WEPA, longer-term data on water temperature and water quality has not been sufficiently accumulated to see trends in change in water temperature and water quality, especially in lakes/reservoirs and estuaries/coastal areas.
- Data requested by the questionnaire exists in different ministries and organizations in some countries. This presents a barrier to WEPA partners in collection of relevant information.
- Water temperature and water quality monitoring is not conducted regularly in some WEPA countries. In such countries, a regular water quality monitoring system should be established to monitor water quality status for current and future purposes.

[Questionnaire 2: Perception Survey on Climate Change Impacts on the Water Environment (Water Quality and Aquatic Ecosystems) in WEPA Countries]

- Most respondents think there will be impacts on water quality due to climate change (36 of 43 respondents).
- More respondents answered that the water environment would be affected by water quantity related impacts such as low flow rate and floods than air and water temperature change. This may be due to the fact that more people have concerns related to water quantity impacts, including disasters.
- Human impacts on the water environment (water quality) are considered to be a greater factor than climate change. This concern was shared at the WEPA workshop held in February 2011.

[Questionnaire 3: Questionnaire on Policy Responses to Climate Change in the Water Resource/Environment Sector on Climate Change]

- The National Adaptation Programme of Action (NAPA) is the basic policy document for necessary water sector responses, where available.
- It seems that no water environment related strategies clearly address climate change concerns, although some plans and policies refer to the issue.

For Future WEPA activities

Considering the findings from the questionnaires, the following activities are proposed.

- ♦ Information and knowledge available are insufficient to undertake practical action. Thus, it is important for WEPA to provide opportunities to share the latest scientific research information and adaptation actions of each WEPA country on climate change and the water environment.
- ♦ Ensuring and strengthening of current water quality management in each country is a way to increase resilience to potential impacts under scientific uncertainty. Recognizing that strengthening water environmental management is an adaptation option, WEPA needs to further promote knowledge sharing on water environmental governance.
- ♦ To strengthen our capacity to consider future climate change impacts on the water environment, it is necessary to discuss how current and future monitoring plans should include climate change concerns, such as analysis of trends.
- ♦ Data and information management is required, such as strengthening of monitoring systems and data sharing mechanisms among national governments, local governments, and at the community level.

Q.3-1 Monitoring Points with more than 10 year-monitoring data (RIVER)

Country	Name of River	Water Temp. Data				Water Quality Data				Org.	Other related Parameter		
		No. of Mointoring Points	Accumulated Years	Period	Frequency	DO	BOD	SS	Flow		Air Temp.		
Thailand	Ping	20	6	2005-2010	annual ave.					PCD	N	Y	
	Wang	8	6	2005-2010	annual ave.	Y	Y	Y		PCD	N	Y	
	Yom	14	6	2005-2010	annual ave.					PCD	N	Y	
	Nan	13	6	2005-2010	annual ave.					PCD	N	Y	
	Chow Pha Ya	19	10	2000-2009	ave. both in dry and rainy	Y	Y	Y	Y		N	Y	
	Tha Chin	16	10	2000-2009	ave. both in dry and rainy	Y	Y	Y	Y		N	Y	
	Mae Klong	12	10	2000-2009	ave. both in dry and rainy	Y	Y	Y	Y		N	Y	
	Bang Pa Kong	12	10	2000-2009	ave. both in dry and rainy	Y	Y	Y	Y		N	Y	
	Imjin River	1023A20 Imjingang	22	1989-2010	monthly	Y	Y	Y	Y		NIER	N	Y
	Hongcheon River	1014A30 Hongcheon	22	1989-2010	monthly	Y	Y	Y	Y		NIER	Y	Y
Geumho River	2012A20 Geumhogang	22	1989-2010	monthly	Y	Y	Y	Y		NIER	N	Y	
Nakdong River	2022A10 Mulgeum	22	1989-2010	monthly	Y	Y	Y	Y		NIER	Y	Y	
Nakdong River	2001A60 Andong	22	1989-2010	monthly	Y	Y	Y	Y		NIER	N	Y	
Sapgyo stream	3101A30 Gokgyocheon	22	1989-2010	monthly	Y	Y	Y	Y		NIER	Y	Y	
Mangyeong River	3301A55 Gimje	22	1989-2010	monthly	Y	Y	Y	Y		NIER	Y	Y	
Geum River	3012A60 Buyeo	22	1989-2010	monthly	Y	Y	Y	Y		NIER	Y	Y	
ROK													

	Seomjin River	4009A30 Gurye		22	1989-2010	monthly	Y	22 years	Y	22 years	Y	NIER	Y	Y
	Yeongsan River	5004A20 Naju		22	1989-2010	monthly	Y	22 years	Y	22 years	Y	NIER	Y	Y
VietNam	Red	Ha noi		30	1980-2010	daily								
	Red	Thuong Cat		30	1980-2010	daily								
	Red	Son tay		30	1980-2010	daily								
	Da	Hoa binh		30	1980-2010	daily								
	Dao	Nam dinh		30	1980-2010	daily								
	Ma	Hoi Xuan		30	1980-2010	daily								
	Ma	Cam thuy		30	1980-2010	daily								
	Ma	Linh Cam		30	1980-2010	daily								
	Chu	Chu		30	1980-2010	daily								
	Red	Cua Dat		30	1980-2010	daily								
Philippines	Pasig River	14	2	2011 - present	ave. both in dry and rainy season	Y	2	Y	2	Y	2	Pasig River Rehabilitation Irrigation	Y	Y
Myanmar	Ayayrwady	8		2006-2008	seasonal							Irrigation		Y
	Chindwin	3		2006-2008	seasonal							Irrigation		Y
	Sittaung	2		2006-2008	seasonal							Irrigation		Y
	Thanlwin	2		2006-2008	?							Irrigation		Y
	Bago	4		2001-?	monthly	Y	1	Y	1	Y	1	Yangon City Development Committee		Y
	Hlaing	4		?	monthly	Y	1	Y	1	Y	1	Yangon City Development Committee		Y

Q.3-2 Monitoring Points with more than 10 year-monitoring data (LAKES and RESOVIRS)

Country	Name of River	Water Temp. Data				Water Quality Data						Other related Parameter	
		No. of Monitoring Points	Accumulated Years	Period	Frequency	DO	BOD	SS	Org.	Water Leve	Air Temp.		
Thailand	Kwan Pa Yow	6	6	2000-2010	annual ave.	Y	Y	Y	PCD	N	Y		
	Nong Han	7	6	2000-2010	annual ave.	Y	Y	Y	PCD	N	Y		
	Bukg Bora Pet	5	6	2000-2010	annual ave.	Y	Y	Y	PCD	N	Y		
	Song Kla	18	6	2000-2010	annual ave.	Y	Y	Y	PCD	N	Y		
ROK	Keum River	3008B40 Daecheong	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Nam River	2018B30 Jinyangho	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Nakdong River	2001B30 Andong Dam	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Bnabyeon Stream	2002B20 Imhaho	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Hwang River	2016B10 Habcheon Dam	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Seomjin River	4002B10 Okjeongho	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Yeongsan River	5001B20 Damyang Dam	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Soyang River	1012B40 Soyang Dam	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Namhan River	1003B40 Chungju Dam	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Bukhan River	1007B10 Paldang Dam	18	1993-2010	monthly	Y	Y	Y	NIER	Y	Y		
	Philippines	Laguna Rake	5 (lake) points	26	1984-present	monthly	Y	Y	Y	LLDA	Y	Y	

Q.3-3 Monitoring Points with more than 10 year-monitoring data (COASTAL/ESTUARIES)

Country	Name of River	Water Temp. Data				Water Quality Data				Other related Parameter				
		No. of Monitoring Points	Accumulated Years	Period	Frequency	DO	BOD	SS	Org.	Flow	Air Temp.			
Thailand	Chow Pha Ya	3	10	2000-2009	ave. both in dry and rainy	Y	2010	Y	2010	Y	2010	PCD	N	Y
	Tha Chin	3	10	2000-2009	ave. both in dry and rainy	Y	2010	Y	2010	Y	2010	PCD	N	Y
	Mae Khong	3	10	2000-2009	ave. both in dry and rainy	Y	2010	Y	2010	Y	2010	PCD	N	Y
	Bung Pa Kong	3	10	2000-2009	ave. both in dry and rainy	Y	2000-2010	N		Y	2000-2010	PCD	N	Y
Philippines	Manila Bay	14	14	2006-present	monthly	Y	14	Y	14	Y	14	EMB, DENR	Y	Y

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リサイクル適性の表示:紙へのリサイクル可

この印刷物は、グリーン購入法に基づく基本方針における「印刷」に係る判断の基準にしたがい、印刷用の紙へのリサイクルに適した材料[Aランク]のみを用いて作製しています。