THA 2015 International Conference Programme (Draft)

TIME	WEDNESDAY- 28 JANUARY 2015			
08.00	Registration at Le Concorde Ballroom, 2nd floor, Swissôtel Le Concorde			
Venue: Le Concorde Ballroom, Level 2				
09.00-09.10	**Opening Ceremony**			
09.10-09.20	**Conference Report:**	**Dr. Subin Pinkayan** President of Thai Hydrologist Association		
09.20-09.30	**Opening Remarks:** and Group Photo	**XXX**		
09.30-10.15	**Exhibition tour**			
10.15-10.30	**Coffee Break**			
10.30-12.00	**Keynote Addresses** Keynote Speaker: **1. ADB representative** **2. ASEAN Secretariat representative** **3. Thailand NESDB representative**			
12.00-13.00	**Lunch Break**			
Scope session presentation	Venue: Salon A	Venue: Salon B	Venue: Krisana	Venue: Jamjuree
13.00	**Invited paper A**	**Invited paper B**	**Invited paper D**	**Planning presentation** (CU ASEAN Workshop)
13.30	TA1-3	TB1-3	TD1-3	
13.50				
14.10				
14.30	**Coffee Break**			
14.50	**Invited paper C**	**Invited paper B**	**Invited paper D**	**Planning presentation** (CU ASEAN Workshop)
15.20	TC1-5	TB4-8	TD4-8	
15.40				
16.00				16.00-17.00 **Supportive Meeting on academic network setup for water, disaster management and climate change among ASEAN countries**
16.20				
16.40				
18.00	**Reception Dinner** (For registration participant) Venue: Le Lotus 1			

TIME	THURSDAY- 29 JANUARY 2015			
Scope session presentation	Venue: Salon A	Venue: Salon B	Venue: Krisana	Venue: Jamjuree
09.00	**Invited paper C**	**Invited paper B**	**Invited paper D**	**Technical presentation** (CU ASEAN Workshop)
09.30	TC6-8	TB 9-11	TD9-11	
09.50				
10.10				
10.30	**Coffee Break**			
10.50	TC9-12	TA4-7	TD12	**Technical presentation** (CU ASEAN Workshop)
11.10			TA10-12	
11.30				
11.50				
12.10	**Lunch Break**			
13.00	**Invited paper C**	**Invited paper A**	**Invited paper A**	**Technical training by University of California - Irvine with UNESCO's International Hydrological Programme (IHP)** "Satellite-based Rainfall (PERSIANN) for Planning and Management for Natural Disasters in Monsoon Asia"
13.30	TC13-15	TA 8-9	TA13-15	
13.50				
14.10		TC20		
14.30	**Coffee Break**			
14.50	TC16-19	TC21-24	TA16-19	
15.10				
15.30				
15.50				
Venue: Le Concorde Ballroom, Level 2				
16.10	**Summary Plenary session presentation**			
16.30	**- Meeting on collaborative academic network setup for water, disaster management and climate change among ASEAN countries** **- THA Summary Meeting** **- Closing Remarks**			
18.00	**Farewell Party Dinner** (For registration participant) Venue: Le Lotus 1			

(The programs are subject to change without notice.)

Session A Climate Change and Uncertainty in Hydrology and Meteorology

Invited paper: 1. Science knowledge gaps in the prediction of climate change and its impacts on water and the environment by Prof. Tissa Illangasekare, Colorado School of Mines, USA

2. Introduction to Monsoon Asia Integrated Regional Study and possible involvement of Thailand in the regional initiative by Dr. Ailikun, Chinese Academy of Sciences, China

3. Adapting to Climate Change through Effective Risk Assessment and Management in East Asia - An Initiative for International Collaboration by Prof. Jiaguo Qi, Zhejinag University China, China

TA01: Uncertainty in climate change projection and its impact on hydrology of the Nam Ou River Basin (Manisha Maharjan[1, a*], Mukand S. Babel[1, b] and Shreedhar Maskey[3, c] ,Thailand)

TA02: Climate Change Scenario on Surface Water Resource in Bangnampriao District, Chachernsao Province (Dr. Charuvan Kasemsap ,Thailand)

TA03: Uncertainty of rainfall from CMIP3 and CMIP5 climate models downscaling for Bangkok (Seree Supratid[1, a] and Thannob Aribarg[1,2,b*] ,Thailand)

TA04: Forecasting for impact of climate change and land use change on streamflow in the Nakdong river basin in Korea (Ngo Van Quan[1,a*], Gwangseob Kim[2,b] ,Korea)

TA05: Impact of climate change on groundwater recharge in Ho Chi Minh City area (Ha Quang Khai[1, a *], Sucharit Kooltanakulvong [2,b] ,Thailand)

TA06: Comparative evaluation of storm characteristics derived from observed rainfalls and GCM precipitation outputs (Yuan-Fong Su[1,a*] , Jun-Jih Liou[1,b] and Ke-Sheng Cheng[2, c] , Taiwan)

TA07: Introduction to TCCIP: dynamic and statistical downscaling and its applications (Lee-Yaw Lin [1,a*] , Yung-Ming Chen[1, b] , Jung-Lien Chu[1,c] , Chao-Tzuen Cheng [1,d] , Jun-Jih Liou [1,e] , Yun-Ju Chen [1,f] and, Yuan-Fong Su [1,g], Taiwan)

TA08: Urban-induced Rainfall in Chiang Mai, Thailand (KLONGVESSA Pawee[1, a *] and LU Minjiao[1,b] , Japan)

TA09: Bias correction test of simulted rainfall from PRECIS using adjustment factors based on distribution mapping (Kowit Boonrawd[1, a]Chatchai Jothityangkoon[1, b] ,Thailand)

TA10: Hydrological Analysis for Global Climate Change Anticipation at Cimanuk River, West Java - Indonesia (Muh. Fakhrudin[1] and Luki Subehi[1], Indonesia)

TA11: Uncertainty of stream flow under climate change scenarios using statistical downscaling data (Yun-Ju Chen [1], Yuan-Fong Su[1], Jun-Jih Liou[1] and Yung-Ming Chen[1] , Taiwan)

TA12: Application of a Land Surface Model for Bias Correction of Runoff Generation Data from MRI-AGCM3.2S Dataset (DUONG Duc Toan[1, a *], TACHIKAWA Yasuto[1, b] and YOROZU Kazuaki[1, c] , Japan)

TA13: River Discharge Assessment under a Changing Climate in the Chao Phraya River, Thailand by using MRI-AGCM3.2S (Supattana WICHAKUL[1, a *], Yasuto TACHIKAWA[1, b], Michiharu SHIIBA[1, c] and Kazuaki YOROZU [1,d], Japan)

TA14: Detecting Synoptic-Scale Disturbance Associated With Extreme Precipitation In Japan (Kohei Hamaguchi[1, a *], Yoshihiko Iseri[1,b] and Shinjiro Kanae[1,c] , Japan)

TA15: Designed Intensity-duration-frequency (IDF) curves under climate change condition in urban area (Ashish Shrestha [1, a *], Sutat Weesakul[1,b], Mukand Singh Babel[1,c] and Zoran Vojinovic [2,d] ,Thailand)

TA16: Evaluation of Precipitation over Northern Thailand in CMIP5 MRI-CGCM3 Simulations (Parichat Wetchayont [1, 3, a *] and Srilert Chotpantarat [1, 2, b] ,Thailand)

TA17: Climate Change impact on Groundwater Recharge in Plaichumpol Irrigation Project (Mr. chokchai suthidhummajit, Thailand)

TA18: Possibility to achieve 1 %rh uncertainty in meteorological application: Temperature effect of commercial thermo-hygrometers (T. Sinhaneti*, P. Phuauntharo, and T. Keawprasert , Thailand)

TA19: Rainfall-Runoff-Inundation Simulation with Bias-corrected Satellite Based Rainfall: Case Study Yom River Basin (Teerawat Ram-Indra [1, a], Anurak Sriariyawat [1,b *] and Piyatida Hosisungwan [1,c], Thailand)

Session B Participatory Management for Water and Irrigation Project

Invited paper: 1. Mitigation Climate Change in Urban Environments: The water and Energy Nexus by Dr. Tamim Younos, Virginia Polytechnic Institute and State University, USA

2. Drought Analysis and Projections at some SE Asia's Agriculture Fields by Prof. LIONG, Shie- Yui, National University of Singapore,Singapore

3. Integrated study of the water-ecosystem-economy in the Heihe River Basin and its implication for water resource management in world's inland river basins by Prof. Xin Li, Chinese Academy of Sciences (CAS),China

TB01:Participatory Approach on Management of Communal Irrigation Systems in Upland Areas: *Case Studies of Water Governance in Three Provinces of Northern Luzon* (Agnes M. Ramos[1,a,], Orlando F. Balderama[2,b,*] , Philippines)

TB02: Assessment of Water Requirement of Chulsa Rice by using CROPWAT model (Mrs. Men Nareth, Cambodia)

TB03: Impacts of Dam Operation on Downstream Flow Regimes and Livelihoods: A Case Study in the Upper Srepok River Basin, Central Highlands of Vietnam (TRAN Van Ty, Vietnam)

TB04: Participatory Assessment of Climate Change Impacts on Water Resources of Pranburi Basin, Thailand (Watcharapong Noimunwai [1, a *], Patama Singhruck [2,b] and Penjai Sompongchaiyakul [2,c] , Thailand)

TB05: Analysis of Hydrologic Variables Changes related to Large Scale Reservoir Operation by Using Mann-Kendall Statistical Tests in Thailand (MANEE Donpapob[1, a *], TACHIKAWA Yasuto[2, b] and YOROZU Kazuaki[3, c], Japan)

TB06: Effect of AWDI Practices on GHG Emission in a Small Scale Lysimeter (Mr. Ishwar Pun, Japan)

TB07: Irrigation Demand and the Flood Retention Potential by Changing of Cropping Calendar of the In-season Rice and Off-season Rice in Chao Phraya River Basin Area.
(Songsak Puttrawutichai[1, a *], Buncha Kwanyeun[2, b] and Thongplew Kongjun[3, c], Thailand)

TB08: Potential of Irrigation Pond Management for Flood Control
(Yutaka Matsuno[1, a *], Nobumasa Hatcho[1,b], and Kentaro Fujiwara[1,c], Japan)

TB09: Farmers' Managed Irrigation System: Case of Gujarat (Asst.Prof. Garima Srivastava, India)

TB10: Benchmarking for Performance Assessment of Irrigation Schemes: Comparison of National Irrigation Systems(NIS) and Communal Irrigation System(CIS) in Cagayan River Basin
(Prof. Dr. Orlando Balderama , Philippines)

TB11: Effect of depth and spacing of subsurface drains on salinity of drainage water from rice paddy fields
(Mehdi Jafari-Talukolaee[1, a,*], Ali Shahnazari[2,b], Abdullah Darzi-Naftchali[2,c] ,Iran)

Session C Emerging Technologies in Water and Environment Management

Invited paper: 1. IWRM for Mekong River Basin by Prof. Stefan Uhlenbrook Vice Rector UNESCO-IHE ,Netherlands

2. Assessment of climate change impact on large scale flooding – a case study in the Chao Phraya River Basin via new modeling technology by Dr. Takahiro Sayama, ICHARM, Public Works Research Institute, Japan

3. Artificial intelligence technologies for urban flood control by Prof. Fi-John Chang, National Taiwan University, Taiwan

TC01: Aerobic Rice Technology(ART) in the Philippines and Southeast Asia: *Improving Productivity and Enhancing Technology Adaption towards Rice Sufficiency and Climate Change Resiliency*
(Orlando F. Balderama[1,a,*], Philippines)

TC02: Autonomous Surface Vehicle for Bathymetric and Environmental Survey: Implementation and Result
(Pasan Kulvanit[*], Thailand)

TC03: Applying satellite communication for weather data to improve the efficiency of telemetry system in the upstream area. (Wasukree Sae-tia[1, a *], Thakolpat Khampuengson[2,b], Piyamarn Sisomphon[3,c] and Surajate Boonya-aroonnet[4,d], Thailand)

TC04: EOF Analysis of Ocean Surface Currents In the Inner Gulf of Thailand (SIROD Sirisup[1,a,*],SATABAN Srisuriyatada[2,b],SAIFHON Tomkratoke[1,c] and PHITHAK Thaenkaew[1,d], Thailand)

TC05: Assessment of climate change impact on large scale flooding - a case study in the Chao Phraya River Basin via new modeling technology (Takahiro Sayama, Yusuke Yamazaki, Yuya Tatebe, Akira Hasegawa, Yoichi Iwami, Japan)

TC06: The Evaluation of Hydrological Models Application in Phee River basin, Thailand
(Suchada Siwtongkam[1], Kritsanat Surakit[2], Thailand)

TC07: Development of a User-Friendly Web-based Rainfall Runoff Model
(Khin Htay Kyi[1,a *], Minjiao Lu[2,3,b] and Xiao Li[4,c], Japan)

TC08: Strategy to Automatically Calibrate Parameters of a Hydrological Model: A Multi-step Optimization Scheme and its Application to Xinanjinag Model (Minjiao Lu[1, 2,a*] and Xiao Li[3,b], Japan)

TC09: Characteristics of Fluctuation in Air and Water temperatures at Kracak Dam, West Java – Indonesia
(Luki Subehi[1], Indonesia)

TC10: Detection of paddy fields in sub-state level by combined use of MODIS and Landsat imagery
(Assoc.Prof. Dr. Takanori Nagano , Japan

TC11: Estimation of Sediments Volume Using Mathematical Model: A Case Study of Klong Phan Thong Catchment Area, Thailand. (Niti Jitphan[1, a *], Kritsanat Surakit[2, b], Thailand)

TC12: Estimation of Evapotranspiration in Lam Ta Kong Basin using Surface Energy Balance Algorithm for Land (SEBAL) Model (Miss. haruetai maskong , Thailand)

TC13: Deep Groundwater and Possible Signals for Human and Climatic Effects UMA Seeboonruang[*] , Thailand

TC14: Improvement of a Kinemative Wave-based Distributed Hydrologic Model to Predict Flow Regimes in Arid Areas (Tomohiro Tanaka, Japan)

TC15: Sensitivity of Snow Covered Area of Brahmaputra River Basin to Temperature
(Swapnali Barman[1,a*], R.K. Bhattacharjya[2,b], India)

TC16: Estimation of urban asset value for natural disaster risk assessment at the macro scale
(Tiratas Suwathep[1, a *], Wee Ho Lim[1,b *], Yoshihiko Iseri[1,c] and Shinjiro Kanae[1,d], Japan)

TC17: Rainfall Prediction with Particle Swarm Optimization as a Data Mining Technique
(Assoc.Prof. Dr. Bipul Talukdar , India)

TC18: Preliminary Study of Water Quality and Heavy Metals in Soil & Water of Arowana (*Scleropages Formosus*) Aquaculture Farm at Bukit Merah, Malaysia.
(NUR ATIQAH AHMAD AWALLUDDIN[1, a *], ISMAIL ABUSTAN[2,b], Malaysia)

TC19: Water quality and hydraulic performances of the HMGDS Drainage Module.
(Nor Amirah A.S[1]., Abustan, I[2]., Remy Rozainy M. A. Z[3]., Salwa M. Z. M[4]., Mahyun A.W[4], Malaysia)

TC20: Zn removal from synthetic wastewater using zeolite modified with oxidizing agent
(SALWA Mohd Zaini Makhtar[1, a *], ISMAIL Abustan[1,b], MAHYUN Ab Wahab[1,c], NOR AMIRAH Abu Seman[1,d], NUR ATIQAH Ahmad Awalluddin[1], Malaysia)

TC21: Study on the Sustainable Sand Removal Capacity on Sand Mining Activities.
(Syamsul Azlan Saleh[1, a]*, Ismail Abustan[2,b], and Mohd Remy Rozainy Mohd Arif Zainol[3,c], Malaysia)

TC22: Investigation of Saltwater Intrusion and Recirculation of Seawater via Two-dimensional Flowfield for Henry Constant Dispersion (Chanyut Kalakan[1] and Louis H. Motz[2] ,Thailand)

TC23: The Study of Relationship between Deciles and VCI in the Northern Part of Thailand
(Aphantree Yuttaphan [1, 2, a *], Sombat Chuenchooklin [2,b] and Somchai Baimoung [3,c] ,Thailand)

TC24: Effect of Particle Size Distribution to Remove Colour and *Escherichia coli* in Groundwater
(Nur Aziemah Abd Rashid[1,a*], Ismail Abustan[2,b], Mohd Nordin Adlan[3,c], Malaysia)

Session D Water Related Disaster Management

Invited paper: 1. Analyses and Strategies for handling climate change impacts on flooding by Dr. Ole Mark, DHI, Denmark

2. Impact assessment of climate change on water-related disasters for building up an adaptation strategy by Prof.Yasuto TACHIKAWA, Graduate School of Engineering, Kyoto University, Japan

3. Mitigating Water Insecurity through Disaster Preparedness in Korea by Prof. Kwansue Jung, Chungnam National University, Korea

TD01: Development of operational flood optimization within the flood forecasting system to determine the optimal release for Ubonrat reservoir for flood mitigation
(Sathit Chantip[1, a *], Piyamarn Sisomphon[2,b] Surajate Boonya-aroonnet[3,c] ,Thailand)

TD02: Hydrodynamics Simulation of An Overland Flow Over Low Lying Flat Land:
A Case Study of The 2011 Severe Flood in Sam-Khok and Khlong Luang Districts
(SAIFHON Tomkratoke[a* and] SIROD sirisup[b] ,Thailand)

TD03: Assessment of River Bank Erosion and Vulnerability of Embankment to Breaching: A RS and GIS Based Study in Subansiri River in Assam (BIPUL TALUKDAR[1,a*], RANJIT DAS[2,b], India)

TD04: Development of Technology for Monitoring, Evaluation and Prediction of Global and Local Water Related Disaster using Various Observation System (Dr. LEE Eulrae ,Korea)

TD05: Meteorological Drought Mapping under Climate Change Perspective: A case study in the Srepok River Basin, Central Highlands of Vietnam (TRAN Van Ty, Vietnam)

TD06: Quasi-real-time satellite monitoring for assessing agronomic flood damage
(Akihiko KOTERA[1, a *], Youtaro UENO[1] and Takanori NAGANO[1] ,Japan)

TD07: Technology Assisted Flood Management (Surajate Boonya-aroonnet[1, a], Peraya Tantianuparp.[1,b] Sutat Weesakul[1,2,c*] and Royol Chitradon[1,d], Thailand)

TD08: Derivation Of Optimal Rule Curves For Flood Control Study Of Ubolratana Reservoir, Thailand
(Pich Hirun[1, a *] and Areeya Rittima[1,b], Thailand)

TD09: The basin-wide flooding loss assessments under extreme climate scenario
(Hsin-Chi Li[1], Hsiao-Ping Wei[1] ,Tingyeh Wu[1], Hung-Ju Shih[1] ,Wei-Bo Chen[1], Yuan-Fong Su[1] and Yung-Ming Chen[1], Taiwan)

TD10: Impact of Climate Change on Urban Flood Management: A Case Study in Mae Sot Municipality in Tak Province (Assoc.Prof. Sombat CHUENCHOOKLIN, Thailand)

TD11: Drought Monitoring using the Normalized Difference Infrared Index (NDII) for the Upper Ping River Basin (Assoc.Prof. Dr. Nutchanart Sriwongsitanon , Thailand)

TD12: Mainstreaming Disaster Risk Management in the Governance of Cagayan River Basin: Institutional Design and Stakeholder Participation towards Development of Integrated River Basin Masterplan
(Prof. Dr. Orlando Balderama, Philippines)

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Climate Change Scenario on Surface Water Resource in Bangnampriao District, Chachernsao Province

Charuvan Kasemsap [1, a *] and Suppakorn Chinvanno [2,b]

Abstract Agriculture including paddy field, fruit farm and aquaculture, in Bangnampriao District, Chachernsao Province, are affected from drought, saline intrusion during January to May and also flood during October to November. The climate change scenario was forecasted by Global Circulation Model (GCM) as ECHAM4 under A2 greenhouse gas scenario and was downscaled using PRECIS regional climate model as base year of 1990 – 2009 and future year of 2040 – 2059. It was estimated that the average minimum temperature at nighttime has trend to increase from 25.14 to 25.6 degree Celsius whereas the average maximum temperature at daytime tends to increase from 34.88 to 35.37 degree Celsius during 2040 – 2059. Mean monthly minimum and maximum temperatures have possibly to increase in the range of 0.35 – 1.83 Degree Celsius. The simulation was indicated that the rainfall during wet season (May – October) contributes to step up whereas that of dry season (November – April) leads to decline. In addition, the sea level rise along inner Thailand gulf, affected saline intrusion in this area through Bangpakong River, was likely to intensify. The increasing of annual sea level are 9.41 and 20.02 centimeter during 2010 – 2029 and 2030 – 2049, respectively. The area along the Bangpakong River exhibits a flat topography in low-lying alluvial plains and tends to be flooding due to plentiful runoff but also prone to drought as a result of climate change. The appropriate adaptation strategies should be applied to minimize the impact of climate change.

Keywords *Climate Change, Scenario, Surface Water Resource, Bangnampriao District*

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Introduction

Climate Change refers to any systematic change in the long-term statistics of climate elements (such as temperature, precipitation, or winds) sustained over several decades or longer time periods (http://glossary.ametsoc.org/wiki/Climate_change). It is mentioned in the IPCC report that increased evaporation (resulting from higher temperatures), combined with regional changes in precipitation characteristics (e.g., total amount, variability, and frequency of extremes), has the potential to affect mean runoff, frequency and intensity of floods and droughts, ground water, soil moisture, and water supplies for irrigation. Climate change analyses are based on simulations derived from large-scale Global Circulation Models (GCMs) which are mathematical formulations of atmospheric, ocean and land surface processes, both for historical and future periods. For modeling future periods, the GCMs are run under 'SRES' emissions scenarios representing various alternatives as to how society and technology will develop through the 21st century and the impacts this will have on greenhouse gas emissions (Nakićenović et al., 2000). Although this methodology is widely practiced, there are some limitations: (a) uncertainty resulting from the use of multiple GCMs, scenarios, and downscaling models is seldom considered; (b) local changes (e.g., urbanization, population growth, deforestation) which affect directly the hydrology of a region are considered in a very limited number of studies (Ghosh, S., and Misra, C., 2010).

The South East Asia region is vulnerable to climate change and its variability, including sea level rise, shift of weather pattern and more frequent occurrence of floods and droughts. These kinds of changes on climate characteristics will have direct effect on surface water resource and water management in basin scale. Facing to risks related to climate change, flood-prone area such as Ho Chi Minh City, Dhaka, and Manila, potential sea level rise up to 0.6 meters or more by 2100 (Nicholls et al. 2007). The precipitation projected for a high emissions scenario, there will be approximately a 30 percent increase in the flood-prone area (The International Bank for Reconstruction and Development, 2010). Consequently, water demand for each activity in the downstream also faces considerable uncertainties in the future and availability of water supply, particularly in the irrigation system. Furthermore, urban expanding of commercial areas and residential areas from Bangkok

Metropolitan Region has been launched over the year, especially the eastern industrial areas, including Chachernsao Province, Chonburi Province and Rayong Province, which plays a key role in Thailand's economy would substantially increase water demand. This study will analyze impact of climate change on hydrological regime of Bangnampriao District in Chachernsao Province.

Study area

Bangnampriao District is located in the eastern sub-region of Thailand as shown in Fig 1. The mainly land uses almost comprise of agricultural area such as paddy field, orchard and aquaculture farming.

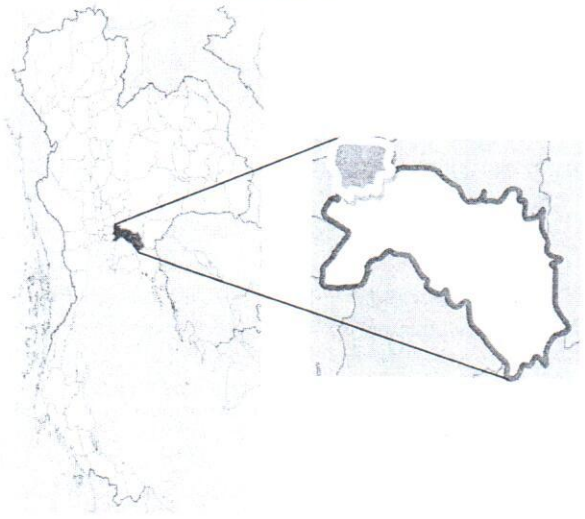

Fig. 1 The study area of Bangnampriao District

The weather of this area is of a tropical monsoon type with summer season (March – June), rainy season (July – October) and winter season (November – February). The average monthly temperature during the period of 2006 – 2010 is 30 degree Celsius and also annual rainfall of 1,462 millimeter. Its area is a river basin higher than mean sea level around 1 – 9 meters. It situated in the irrigation area of South Rangsit Irrigation Project, Phra-ong Chaiyanuchit Operation and Maintenance Project, and also Chonlahan Phichit Irrigation Project. Nowadays, the water management of this area to cope with drought problem during January to May is only the propaganda of water storage. In addition, flood protection planning during October to November is only excavation for water draining management (www.bangnampriao.go.th).

Methodology

This study assesses impact of climate change on hydrological regime of the Bangnampriao District over the year in the future. The climate change scenario were obtained from the Global Circulation Model (GCM) as ECHAM4 which developed by Max-Planck-Institute for Meteorology under A2 greenhouse gas scenario provide the local (station-scale) which developed by IPCC Special Report on Emissions Scenario in Regional Circulation model (RCM) were downscale using PRECIS regional climate model analyzed by Southeast Asia START Regional as base year of 1990 – 2009 and future year of 2040 – 2059. The analysis was based on relative change in climate variables, including precipitation of the lower Chao Phraya River basin and Pasak basin, maximum temperature and minimum temperature. For specific trends in rainfall intensity, the inspection was done rely on the average monthly temperature of Bangnampriao District (http://en.climate-data.org/location/713196/), Chachernsao Province (http://www.ccs.brrd.in.th/km/index.php?option=com_content&view=article&id=44#ccs2.2) and also the relative future change in 2040 – 2059.

Besides, climate change will have effect on sea level change by causing sea level rise (IPCC, 2007). The primary factors driving current sea level rise include: the expansion of ocean water caused by warmer ocean temperatures; melting of Antarctic Ice Sheet and also the change in wind speed and wind direction, especially the monsoon system in Asia. The development of sea level rise scenario for the Gulf of Thailand was estimated by combining the effects of sea level rise and changing sea surface fluctuations. Global mean sea level rise was assessed with the Dynamic Interactive Vulnerability Assessment (DIVA) tool, and sea surface fluctuations caused by changing wind conditions were simulated with the Princeton Ocean Model (POM), which is a community general circulation numerical (computer) ocean model that can be used to simulate and predict oceanic currents, temperatures, salinities and other water properties.

Results and discussion

Future climate data from Global Circulation Models, over the period of 2040 – 2059 show that the minimum temperature (nocturnal) and minimum temperature (diurnal) in the future have trend to increase from 25.14 to 25.6 degree Celsius whereas the maximum temperature (diurnal) during 2040 – 2059 tend to increase from 34.88 to 35.37 degree Celsius. Mean monthly maximum temperature trends to increase about 0.35 – 1.83 Degree Celsius whereas the mean minimum monthly temperature trends to increase about 0.92 – 1.59 Degree Celsius as shown in Fig 2. The minimum temperature was found in January whereas that of maximum temperature was found in May. The map of monthly minimum and maximum temperature comparison between present (1990 – 2009) and future (2040 – 2059) were shown in Fig 3 and Fig 4. The higher temperature in the future may influence on the increasing of water evaporation of surface water resource and the transpiration of plant. This climate change might lead to the dramatic drought and lower productivity of paddy field, fruit farm, and aquaculture.

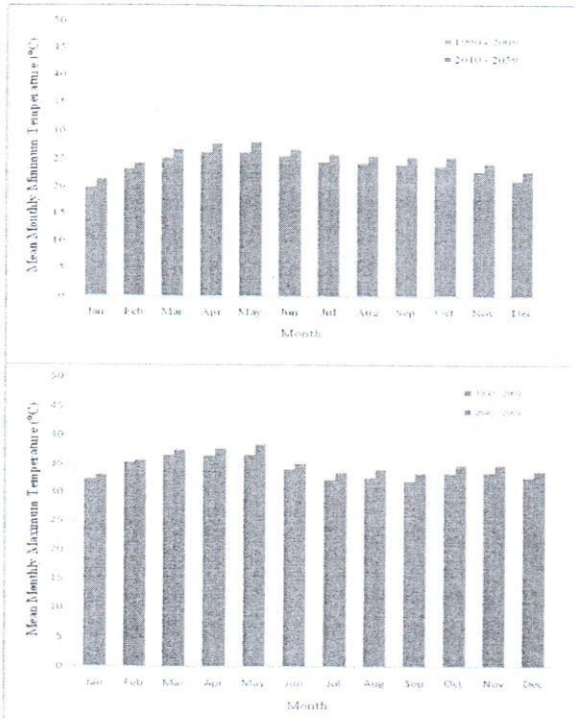

Fig. 2 Mean monthly minimum temperature and maximum temperature comparison between present and future

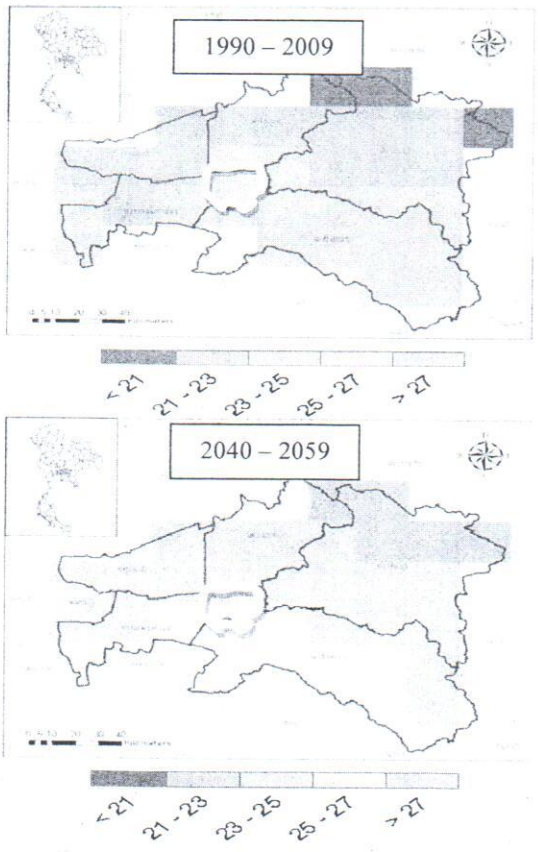

Fig.3 Map showing the average minimum annual temperature comparison between present and future

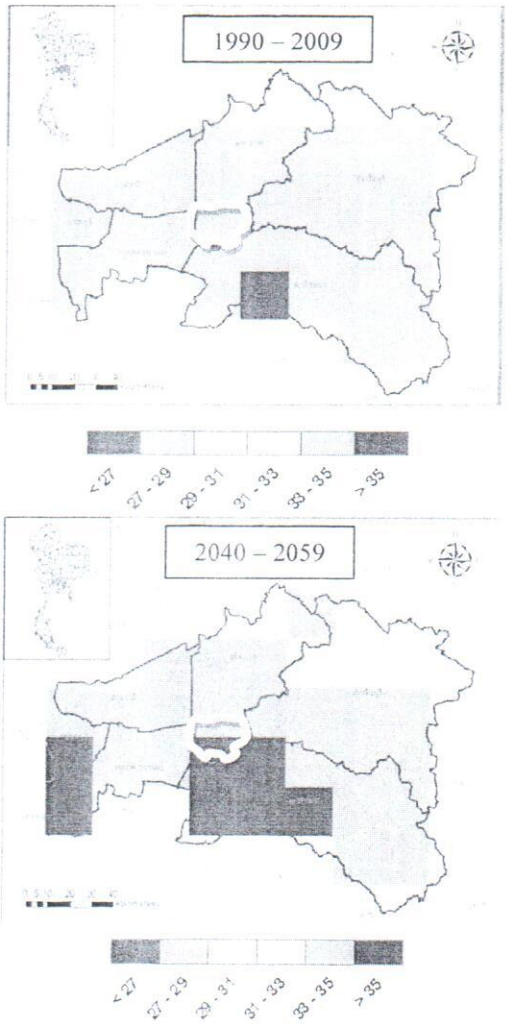

Fig.4 Map showing the average maximum annual temperature comparison between present and future

Future climate data, precipitation data from Global Circulation Models, show that the mean annual rainfall of the Bangnampriao District tends to steady approximately 840 mm during 2006 – 2059. However, the rainfall during wet season (June – September) tends to rise whereas that of dry season (January – May) tends to decrease as shown in Fig. 5. Dry spell occurred in July – August might less affected on plant during of 2040 – 2059. The mean annual rainfall of Chachernsao Province tends to decrease from 545 millimeter 525 millimeter or approximately 3.5 percent as shown in Fig 6. The rainfall during dry season (November – April) tends to decrease whereas that of wet season (June – October) tends to rise. The mean monthly rainfall during July – September around 100 mm might be limitation of irrigation system in Bangnampriao District. In addition, the mean annual rainfall of the lower Chao Phraya River basin and Pasak basin tend to increase from 1,374 millimeter to 1,439 millimeter or approximately 5 percent as shown in Fig 7. The rainfall during wet season (May – October) tends to rise whereas that of dry season (November – April) tends to decrease.

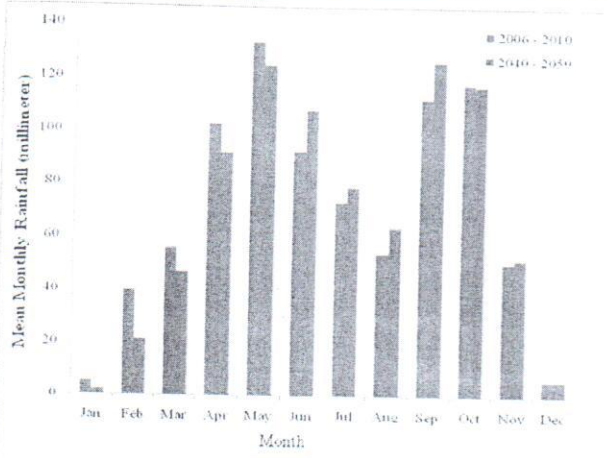

Fig.5 Mean monthly rainfall comparison between present and future of Bangnampriao district

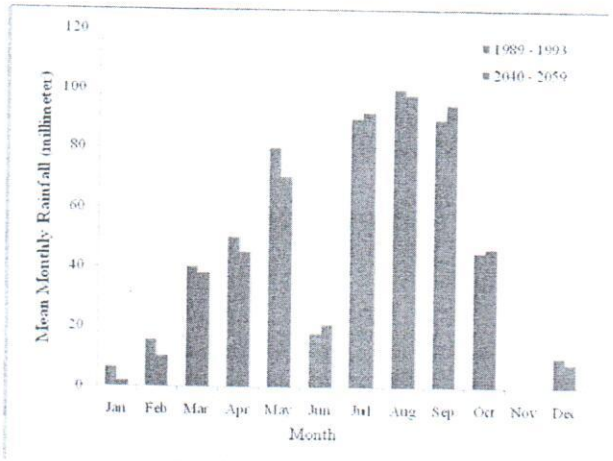

Fig. 6 Mean monthly rainfall comparison between present and future of Chachernsao Province

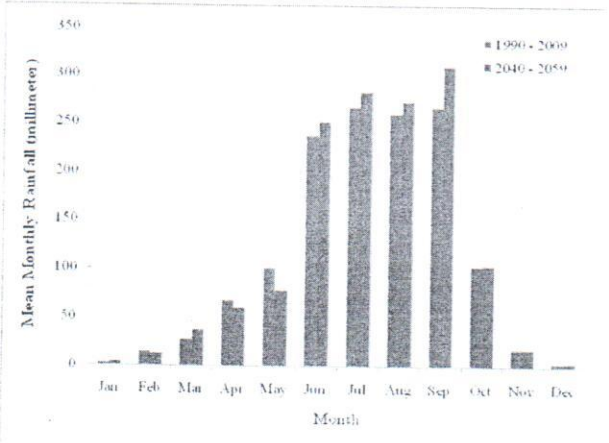

Fig. 7 Mean monthly rainfall comparison between present and future of the lower Chao Phraya River basin and Pasak basin

The rainfall response of runoff along Bangpakong River, which is crooking river via socio-economic land use patterns may be bottleneck in irrigation system and lead to the flood zone thoroughly Bangpakong River. Moreover, flood zone of Bangnampriao District located at the low land, near the intersection of Nakorn Nayok River and Prachinburi River as shown in Fig. 8 (http://www.haii.or.th/wiki/index.php). The above reason can promote flooding in the area along Bangpakong River of Bangnampriao District during wet season.

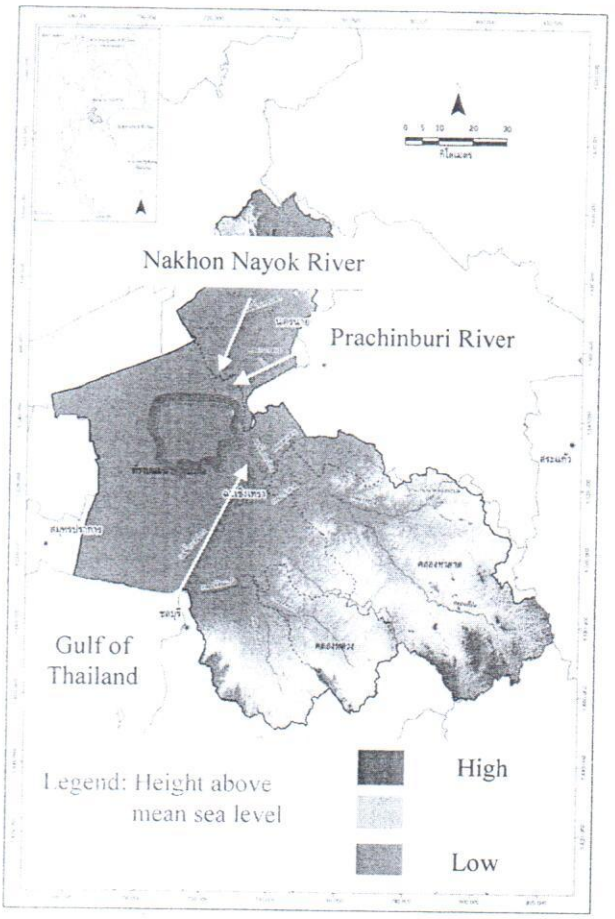

Fig. 8 Watershed of Bangpakong Ramsar

The sea level change in the inner Gulf of Thailand from the expansion of seawater, the glacier melting in Antarctic Polar region and the increasing of wind velocity especially Asia monsoon. The input data of wind velocity and wind direction obtained from PRECIS model (ECHAM A2) were simulated by DIVA (Dynamic Interactive Vulnerability Assessment) and POM (Princeton Ocean Model) (compare to average sea level of 1985-2000). The sea level rise along inner Thailand gulf, affected saline intrusion in this area through Bangpakong River, was likely to rise 9.41 and 20.02 centimeter during 2010 – 2029 and 2030 – 2049, respectively as shown in Fig. 9. The increasing of evaporation (resulting from higher temperatures), combined with regional changes in precipitation characteristics especially dry season has the potential to affect intensity of drought. Furthermore, the lower runoff of Bangpakong River can stimulate the saline intrusion from the Gulf of Thailand into Bangpakong River as shown in Fig. 8. Extended period of drought can lead to the salinization of water resource and sediment in slow-flowing streams (Sangmanee, C. et al, 2013).

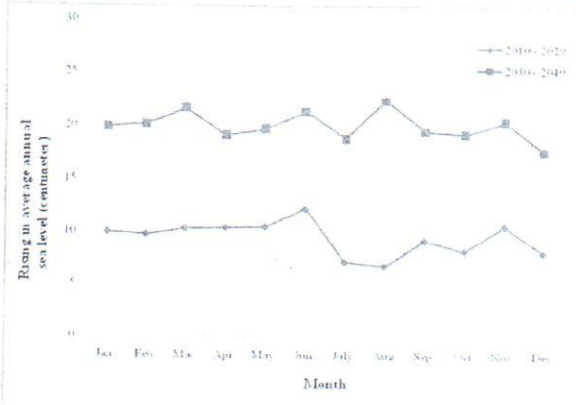

Fig. 9 Mean monthly rising sea water level of the inner gulf of Thailand in the future (2010 – 2049)

Summary and conclusions

The climate change scenario was forecasted by Global Circulation Model (GCM) as ECHAM4 under A2 greenhouse gas scenario and was downscaled using PRECIS regional climate model as base year of 1990 – 2009 and future year of 2040 – 2059. It was estimated that the average minimum temperature at nighttime has trend to increase from 25.14 to 25.6 degree Celsius whereas the average maximum temperature at daytime tends to increase from 34.88 to 35.37 degree Celsius during 2040 – 2059. Mean monthly minimum and maximum temperatures have possibly to increase in the range of 0.35 – 1.83 Degree Celsius. The simulation was indicated that the annual rainfall of the lower Chao Phraya River basin and Pasak basin as the watershed of this area have inclination to rise from 1,374 millimeter to 1,439 millimeter or approximately 5 percent. However, the rainfall during wet season (May – October) contributes to step up whereas that of dry season (November – April) leads to decline. In addition, the sea level rise along inner Thailand gulf, affected saline intrusion in this area through Bangpakong River, was likely to intensify. The increasing of annual sea level are 9.41 and 20.02 centimeter during 2010 – 2029 and 2030 – 2049, respectively.

The area along the Bangpakong River exhibits a flat topography in low-lying alluvial plains and tends to be flood due to plentiful runoff during October to November but also prone to drought during January to May. Floods and shortage of water as a result of climate change greatly diminishes agricultural production, which consequently affects the agriculture including paddy field, fruit farm and aquaculture, in Bangnampriao District, Chachernsao Province. The appropriate adaptation strategies should be applied to minimize the impact of climate change.

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