ASEAN

Hydroinformatics Data Centre (AHC)

Contents

02

ASEAN

ASEAN Secretariat – S&T Dimension
ASEAN Committee on Science and Technology (COST)
Sub-Committee on Microelectronics and Information Technology (SCMIT)
Structure of STI Cooperation in ASEAN

06

ASEAN
Hydroinformatics Data Centre (AHC)

10

Technology Sharing

21

Good practice
Community Water Resource Management

ASEAN

About ASEAN

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The ASEAN Declaration committed the signatory states to cooperate for the purpose of economic growth, social progress, cultural development, and regional peace and stability. Currently, ASEAN has ten Member States which are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.

ASEAN 2025 : Forging Ahead Together

As the ASEAN Community building is an evolving process, the ASEAN Community Vision 2025 charts the ten years 2016-2025 path for a more rules-based and people-centered ASEAN Community where “our peoples enjoy human rights and fundamental freedoms, higher quality of life and the benefits of community building”. The peoples and stakeholders of ASEAN, including civil society organizations and the private sector, are expected to play a greater role in the development of the ASEAN Community.

Message from ASEAN Secretariat

CHEONG Lee Sing (Alice)

Assistant Director and Head of Science and Technology Division Sectorial Development Directorate, ASEAN Economic Community Department (AEC)

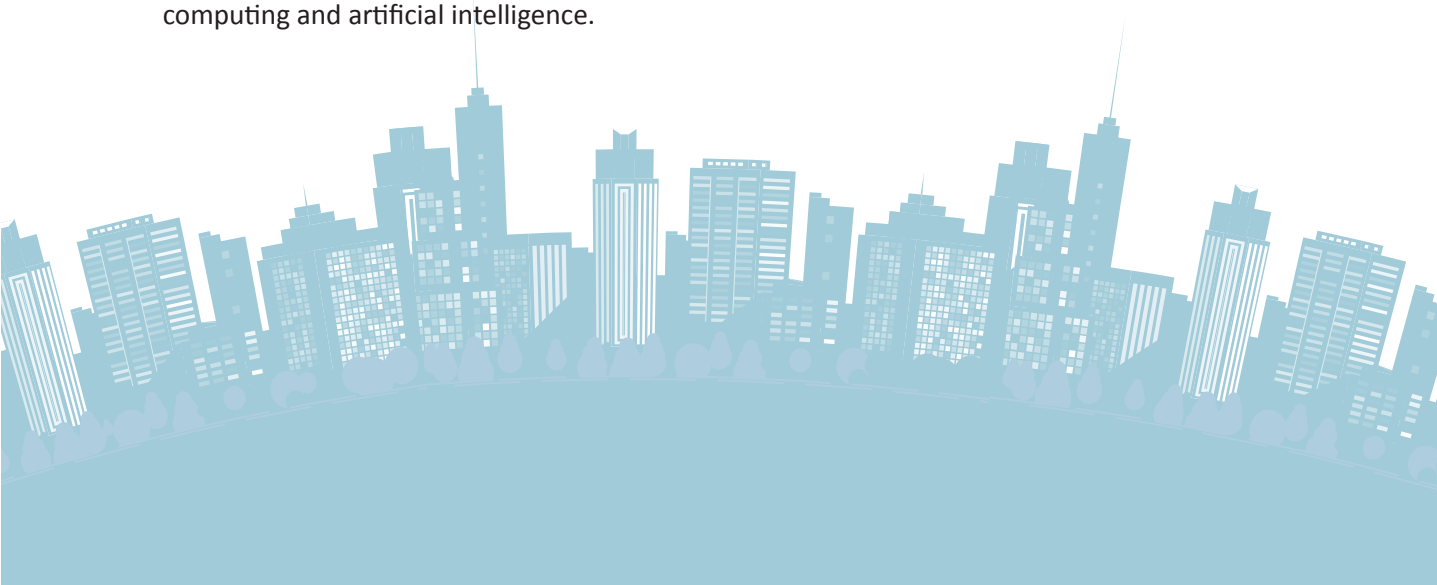
The ASEAN Community Vision 2025 builds upon the foundation of ASEAN’s motto of one vision, one identy, one community. This vision expresses the collective will of ASEAN to be people-centric and among the commitments in various areas, to also undertake actions to enhance the capacity and capability of its people to adapt and respond to social and economic vulnerabilities, disasters, climate change as well as emerging threats and challenges. We currently have many tools in our hands, including big data analytics, internet of things, sensors, and other technologies and innovation. The usage of these tools together with collaborative efforts of sharing and analysing data obtain in the areas of hydrology, meteorology, and geophysics can provide the intelligence and window of opportunity for actions to be taken before floods occurring, crops dying from drought, tsunami reaching the shores and many other scenarios happening. It can also be used for economic benefits such as to optimize the crop types to be planted for higher income. The ASEAN Hydroinformatics Data Center or AHC is the first step to bind us together and work together towards the goal of overcoming the common external threats. You are the hope of our people, for a life that is not only more secure from hydrology, meteorology, and geophysics phenome, but also one that can improve their life.

ASEAN Committee on Science and Technology (COST)

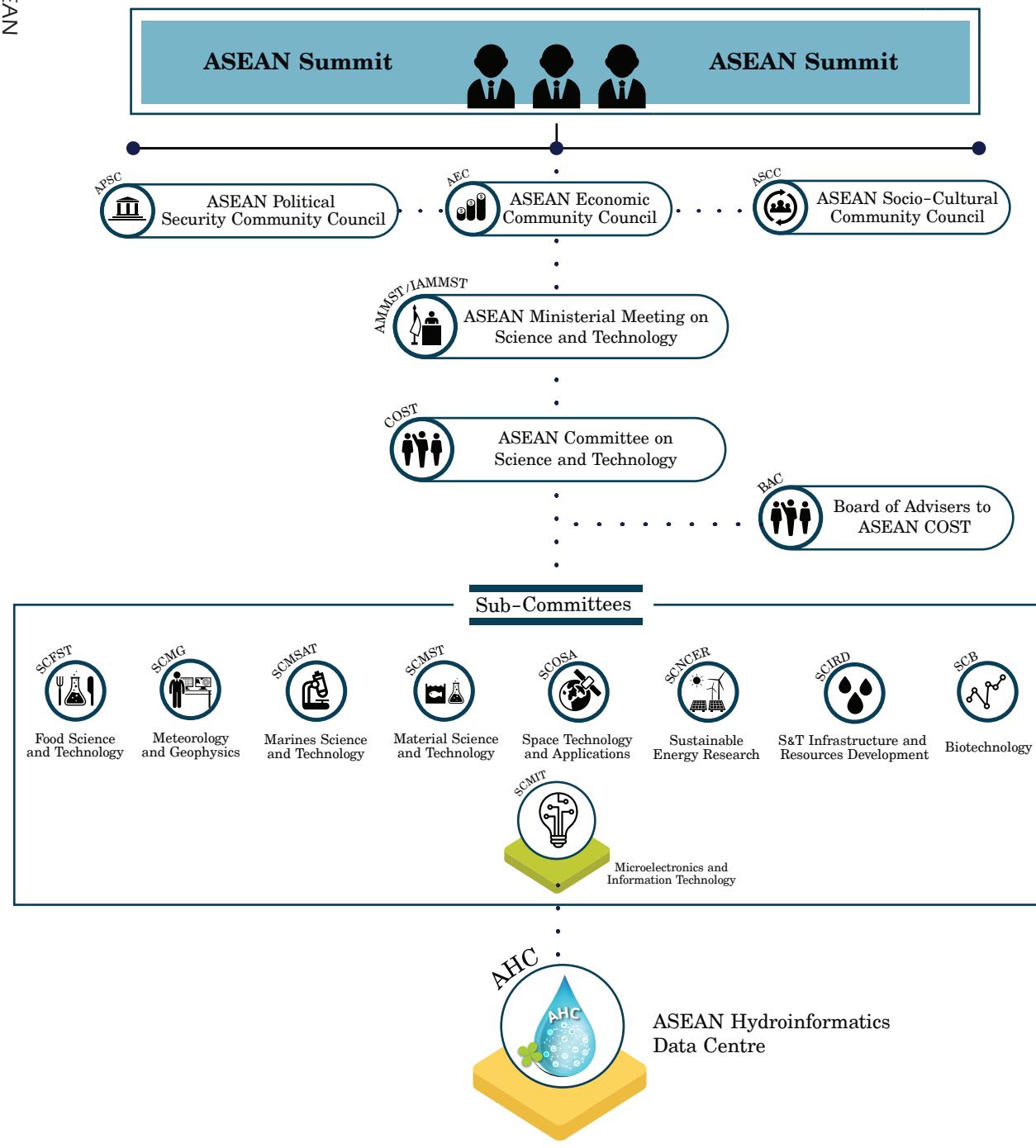
The ASEAN S&T sectoral body is established with the predecessor (ad-hoc Committee on Science and Technology) of ASEAN Committee on Science and Technology (COST) since April 1970 to conduct ASEAN cooperation in the area of science and technology. The area of cooperation was expanded in 2016 to also include innovation. The sectoral body since 1980 is headed by the ASEAN Ministerial Meeting for Science and Technology body which sets the policies, while the ASEAN COST consisting of one representative (up to the level of Vice-Minister) per member state, meets twice a year and also communicate as required to actualize these policies through its subsidiary bodies. The 2016-2025 ten-year plan of the sector commits to strengthen collaboration among stakeholders, enhance mobility of scientists and researchers, support enterprise and raise public awareness. This is aimed at realizing an ASEAN community which is empowered by science, technology and innovation for social and economic benefits.

Sub-Committee on Microelectronics and Information Technology (SCMIT)

The predecessor (ad-hoc Working Group on Microelectronics) of ASEAN COST Sub-Committee on Microelectronics and Information Technology (SCMIT) was established in June 1985. SCMIT is currently represented by one representative per member state, from diverse background from government ministry, academia to research institute. SCMIT's current focus areas are microelectronics, multimedia and mobile communication applications, internet of things, big data processing analytics, cyber security, embedded systems and sensors, robotics and automation, open platforms, cloud computing and artificial intelligence.



Structure of STI Cooperation in ASEAN



Ministry of Science and Technology (MOST)

The Ministry of Science and Technology (MOST) is presently tasked with forwarding the policy and strategic plan for science, technology and innovation and seeing to its effective and substantive implementation, both in terms of research and development as well as in terms of creating cooperative mechanisms between all sectors of society, with a view to promoting economic benefits and enhancing quality of life. Under the vision of "excelling as the steward or main organization in the development of science, technology and innovation" the Ministry of Science and Technology aims to create and enrich the intellect of Thai society, in a manner that will support economic and social development and sustainable competitiveness. There are 16 important supporting agencies to assist in this respect, namely the government agencies, autonomous agencies, state enterprises, and public organizations, which all come under the structure of Ministry of Science and Technology.

For more information, www.most.go.th/en

Hydro and Agro Informatics Institute (HAII)

Hydro and Agro Informatics Institute (HAII), is a public organization under Ministry of Science and Technology, Thailand, focusing on research and promoting used of informatics in Thailand, especially on hydrology, water resource management and agriculture. HAII aims to develop and apply science and technology knowledge for agricultural and water resource management in Thailand, which will enhance partners to be climate change and disaster risk resilience. HAII also expand its collaboration and accomplishment on integrated water resource management nationally and internationally. Official website: www.haii.or.th

In 2011, HAII has established a central ICT platform to integrate online hydrometeorological information from 35 agencies in Thailand and provide services so called "National Hydroinformatics and Climate Data Center (NHC)" (www.thaiwater.net) to collect and analyze data for decision support and water-related crisis management operation. ASEAN Hydroinformatics Data Centre (AHC) (www.aseanwater.net) for water and disaster risk management is an attempt to promote the implementation of hydroinformatics and related S&T for efficient water management and disaster risk reduction within ASEAN.

ASEAN Hydroinformatics Data Centre (AHC)

Background

On 8 March 2017, Ministry of Science and Technology (MOST) of Thailand by Hydro and Agro Informatics Institute (HAII) hosted the Workshop on Establishing ASEAN Hydroinformatics Data Centre (AHC) to support Water Resource Management System in ASEAN. Participants of the workshop agreed in the concept of 1) S&T implementation 2) strategic data sharing related to water data, tools and ICT infrastructures 3) capacity building in transferring S&T for data management and sharing water-related experiences 4) good practices by creating sustainable community water resource management and 5) collaboration network to regional and international level.

Later in May 2017, the ASEAN Hydroinformatics Data Centre (AHC) Project, proposed by HAII, has been approved as a new project under Sub-Committee on Microelectronics and Information Technology (SCMIT) at the 46th SCMIT meeting and endorsed by the 72nd ASEAN Committee on Science and Technology (COST) Meeting in Brunei Darussalam. The project will be a platform to support data connectivity from ASEAN's water, weather and disaster related agencies. ASEAN Member States can also share knowledge and experiences related to water, weather and disaster and also match technology that could support AHC in data sharing toward its future operation and implementation.

What is ASEAN Hydroinformatics Data Centre (AHC)?

ASEAN Hydroinformatics Data Centre (AHC) is a data-driven initiative to enrich the significance of Information Technology (IT) tools for Technology sharing within ASEAN region.The centralized information will enhance the accuracy of existing forecasting system which will benefit to all related partners. The project will create monitoring and modelling system to increase situation awareness for proper decision support. The information derived from this centre will be a data visualization platform in a visual context to provide better preparedness and solution to solve the unprecedented.

AHC also focus on the implementation and dissemination of the outcome by generating actionable learnings and promoting practical use of IT at community level to raise community action on disaster awareness and preparedness. This will also contributes to the inspiring UN's Sustainable Development Goals (SDGs) and ensure a safer forthcoming for ASEAN. For more information, please visit AHC official website at www.aseanwater.net

Toward regional and global agenda

AHC will be the fundamental tools for ASEAN region to accomplish the UN 2030 Sustainable Development Agenda and the ASEAN Vision 2025 by implementing it at the community level. In Thailand, HAII has introduced hydroinformatics concept to the policy level and started the implementation work from the local level by using the concept of Community Water Resource Management (CWRM). The concept included community involvement of learning to utilize hydroinformatics to create efficient water management. Thailand, by HAII, has more than 10 years of expertise in community-based water resource management and has currently expanded their CWRM network to cover more than 1,200 communities within Thailand. The participated communities also find solutions that best suited to each circumstance to cope with the changing climate.

Through trial and error, Thailand has eventually find the right solution for the country. Hence, Thailand would like to share their experiences to other ASEAN fellows in accordance with the ASEAN vision to "Leave No One Behind".

ASEAN Hydroinformatics Data Centre (AHC)

for Water and Disaster Risk Management

What is Hydroinformatics?

The application of information and communications technologies (ICTs) in addressing the increasingly serious problems of the equitable use and efficient management of water for various purposes including social context and related disasters.

www.aseanwater.net

a first step to NEXUS ready

FROM

Climate Change
Water-Related Disasters
Losses in Environmental
Economy and Society

BY

Information Technology
Data Integration
Decentralized Information
Hydroinformatics

TO

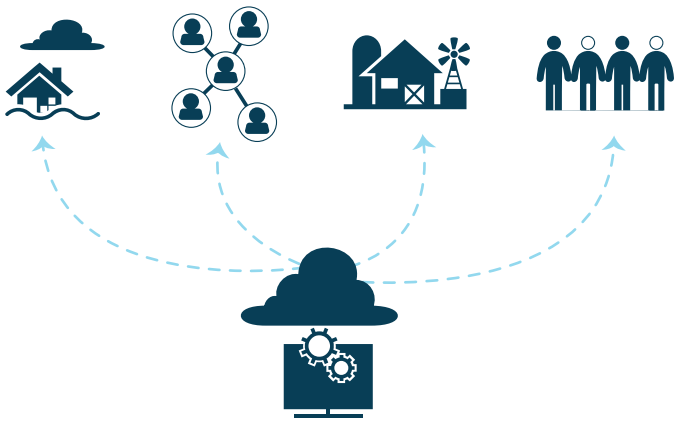
Awareness
Preparedness
Implementation
Actionable Learnings
and Practices
Development

We aim

» ASEAN Centre of hydroinformatics and related technologies for water and disaster risk management

» A platform for Information and knowledge sharing and collaboration in collecting, integrating and sharing relevant information among ASEAN

» A networking of partners determining to strengthen ASEAN capacity in water and disaster risk management, and climate change adaptation



We do

» To promote the implementation of hydro-informatics and related technologies for efficient water management and disaster risk reduction within ASEAN

» To share and broaden country's learnings, experiences and good practices through active networking and collaboration

» To strengthen capacity in applying hydro-informatics among ASEAN member states

Beneficial to all ASEAN

• Economic •
cost-effective method to reduce losses in water and disaster recovery

• Social •
community-based organization and learning network

• Environmental •
solve the future water scarcity and ensure sustainability

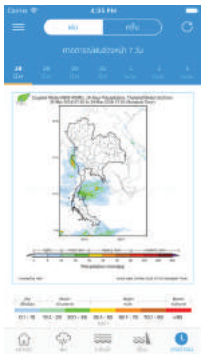
Technology Sharing

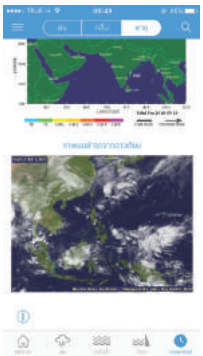
HAII
Hydro and Agro Informatics Institute
Thailand

ThaiWater Mobile Application

Thitiporn Meeprasert
(thitiporn@haii.or.th)

ThaiWater
Mobile Application





The application is available on both iOS and Android platform.

App Store Google Play

Abstract:

ThaiWater Mobile Application, designed and developed by Hydro and Agro Informatics Institute (HAII), simplifies the real-time information derived from the comprehensive www.thaiwater.net web-based platform and visualizes water and weather situation in Thailand into an easy to understand format. The application is an extension of the National Hydroinformatics and Climate Data Center (NHC) for public access on mobile platform aiming at self-awareness on water and weather situation monitoring. Information on ThaiWater application includes rainfall, water level, dam level, storm tracking, forecasting, and country-wide water situation. The users can also report the situation and share with others via this application. The favorite location can also be set for convenient use.

Application of tools and technologies:

» Mobile technology
» Internet
» Visualization

NCHMF

The National Centre for Hydro-Meteorological Forecastings
Viet Nam

Applying Remote Sensing Technology in flood forecasting and warning systems in Viet Nam

Lap Bui Dinh
(lapbuidinh@yahoo.com)

The National Centre for Hydro-Meteorological Forecastings (NCHMF) is a public-profitable organization which belongs to the National Hydro-Meteorological Service (HMS), Ministry of Natural Resources and Environment (MONRE). NCHMF is Vietnams weather and climate authority, responsible for protecting life, property, and national security.

Abstract:

This presentation aims to share knowledge and experiences on improving flood forecasting and warning systems through satellite-based technology and information and communication technology.

System Overview

»*Target Area :*
the Red River basin in Vietnam

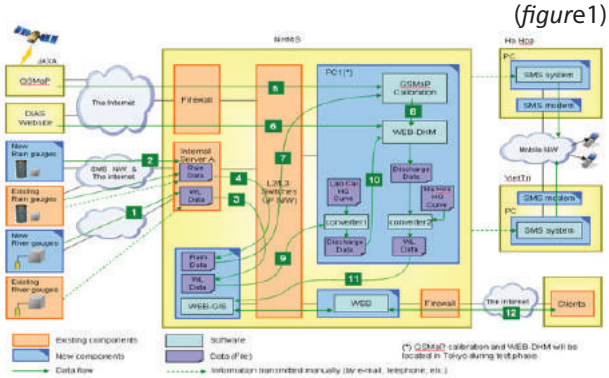
»Pilot area :
Ha Hoa District in Phu Tho Province

»*System Configuration* (*figure*1) *:*
overview of the flood forecasting and warning systems on the Red River basin

Application of tools and technologies:

» GSMaP Calibration
» The Water and Energy Budget based Distributed Hydrological Model (WEB-DHM)
» Web-GIS
» SMS for flood early warning dissemination

(*figure*1)



Information flow

» GSMaP data is obtained from JAXA server to the PC in NHMS via the internet.
» Rain data from rain gauges is transmitted to NHMS via SMS and the internet and stowed in the internal server.
» Water Level data from river gauges is transmitted to NHMS via some kind of media and stowed in the internal server.
» Rain data and Water Level data are transferred from the internal server A to WEB-GIS server.
» GSMaP Calibration obtains Rain data from WEB-GIS server.
» Calibrated GSMaP data is transferred to WEB-DHM.
» Discharge data output from WEB-DHM is converted to water level data by converter-2 software.
» SMS messages are generated by SMS systems in Ha Hoa or Viet Tri.
» WEB-GIS server presents rain data, water level data and prediction of water level to clients of government officers via web access.

FRDM

Fire and Rescue Department of Malaysia
Malaysia

FRDM: Managing flood and drought in Malaysia

Morni Mamat
(sugisuai41@yahoo.com)

Fire and Rescue Department of Malaysia is the main organization in rescue work in Malaysia. Operation Division is the back bone to Fire and Rescue of Malaysia to handle flood and drought. All 13,000 fire fighters are well trained to handle such disaster at any circumstances, supported by strong logistic equipments and rescue apparatus such as Mi-17-IV helicopter.

Abstract:

Pre-incident planning and response time procedure is most important thing to be considered during flood and drought occurred. Therefore, FRDM has co-operate with other government agencies to mitigate risk and lost when it happen. Information gathering is the critical element while disaster happens. Latest application may help rescue team to mobilize rescuer and logistic to the site as soon as possible in order to reduce life lost.

Remote area may become time obstacle to the rescue team reach the place in time. Community Fire Team and Volunteer Fire Fighters in that particular area are considered as response time to the FRDM. Head of the village in the community will relay the message to the FRDM request help to curb the disaster. In grey area that cannot be reached by cellular telephone or government inter radio network (GIRN), satellite phone is one of the option to solve the problem.

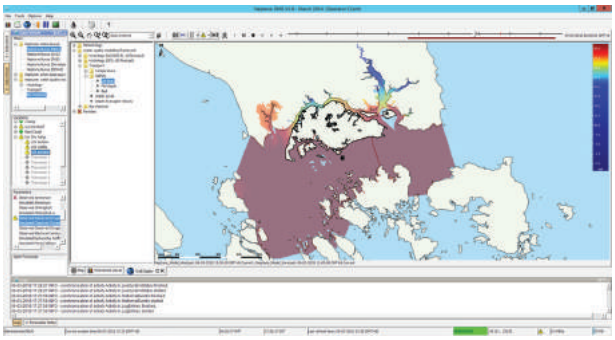
H2I

Hydroinformatics Institute
Singapore

NEPTUNE Singapore's coastal water quality monitoring and prediction system

Serene Tay
(serene@h2i.sg)

The Hydroinformatics Institute (H2I) was established in June 2014 with the purpose of developing, executing and managing specialist consultancy projects in the fields of monitoring, hydrodynamic modelling, water quality modelling and operational management systems. The team from H2I has extensive experience in research and specialist consultancy projects in Singapore, including numerical modelling using SOBEK and Delft3D and the setup and maintenance of integrated modelling systems and operational management systems at PUB and NEA



Abstract:

NEPTUNE is an operational management system for Singapore coastal water quality monitoring and prediction initiated and managed by National Environment Agency (NEA), Singapore. NEPTUNE integrates hydrodynamics and water quality modelling using eight specially outfitted buoys that act as miniature labs. The buoys continuously collect data on pollutants, including oil and nutrients, and send live updates to the authorities on how these could spread. They also monitor coastal waters for other abnormalities. The high resolution 3D models, which have more than 36,000 active grid cells, capture the complex tidal interactions in the Singapore and Johor Straits, allowing NEA to predict the impact of coastal incidents in the marine environment. This has bearing on marine ecosystems, including corals, mangroves and other living organisms, and industries like aquaculture and tourism. Since 2014, H2i has been responsible for the maintenance of NEPTUNE system for NEA.

Application of tools and technologies:

» Operation Management System
» Delft-FEWS
» Delft3D modelling software
» WFlow hydrological model

References

http://www.h2i.sg/project-neptune/

DID

Department of Irrigation and Drainage Malaysia
Malaysia

Implementation of Integrated Water Resource Management in Malaysia

Chiam Shiun Shu
(chiam@water.gov.my)

The Department of Irrigation and Drainage Malaysia (DID), Ministry of Natural Resource & Environment (NRE) aims to lead the Engineering Expertise Services and National Water Resources Management. Its mission to provide engineering expertise services and water resources management including river management, coastal and manage flood and drought in holistic way to improve citizens life in the context of water security and environment sustainability. Today, the DID's duties encompass:

- River Basin Management and Coastal Zone
- Water Resources Management and Hydrology
- Special Projects
- Flood Management
- Eco-friendly Drainage

Abstract:

Due to effect of the El Niño, La Niña effect and climate change, Malaysia has faced more frequent flood and drought. Malaysia government have adopted the Integrated Water Resource Management (IWRM) concept to manage our water resources. IWRM is a process, which deals with re-allocating water, allocation of financial resources, and in the implementation of environmental goals. The "National Water Balance Management System (NAWABS)" and "National Flood Forecasting and Warning Program (PRAB)" have been developed as a management instruments. Both of the modelling systems can give a very comprehensive output results. **NAWABS system** can provide 9 outputs including "Water Accounting", "Water Availability", "Water Demand Options", "Water Prioritization and demand management options", "Water Allocation", Water Quality", "Water Storing and releasing during high and low flows", "Water Resources Index (WRI) and Drought index (DI)" and "Water Auditing". It also provides 2-month water balance forecast, 2-week drought warning. While, **PRAB program** gives 7-day flood forecasting and 2-day flood warning.

With the strategy to "live with floods", accurate forecasting is an important tools in reducing vulnerabilities and flood risk. As a result, effective water management requires consideration of water status, involvement in land use matters and linkage to authorities dealing with land, forests, minerals and other such related resource or activity sectors. Malaysia is committed to conserve and manage its water resources to ensure adequate and safe water for all.

LIPI
Indonesian Institute of Sciences
Indonesia

STEP-A : Indonesian Contribution to the First Step in Assessing and Increasing School Disaster Preparedness

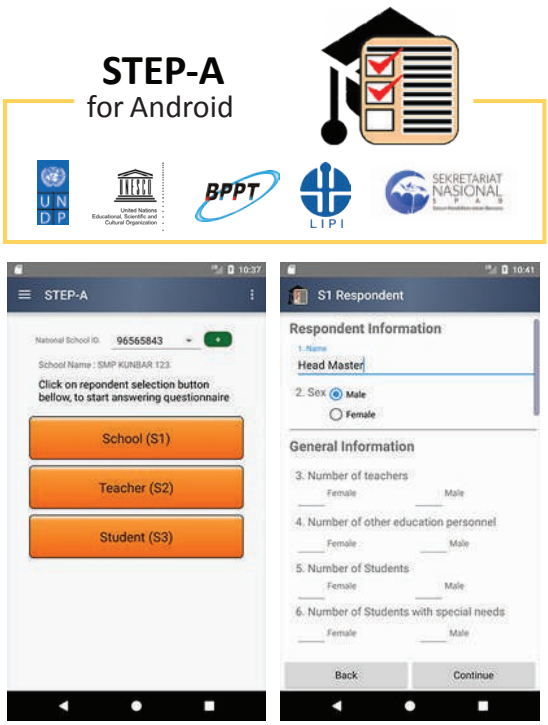
Irina Rafliana
(irina_rafliana@hotmail.com)

Organizations involved in this Web and Mobile Application are LIPI, UNESCO IOTIC, UNDP, BPPT, National Secretariat for Safe School (SMAB) and many others. This demonstration will be presented by LIPI (Indonesian Institute of Sciences). LIPI is the leading national research institution in Indonesia, with experiences in DRR research in area of geological and water-related hazards, public education and science communication.

Abstract:

The 26 December 2004 Indian Ocean tsunami showed significant impacts of fatalities and infrastructure damages. Communities including schools were utterly unprepared. It became important to understand the level of preparedness for appropriate interventions in future. In 2006, LIPI and UNESCO supported by UNISDR developed a tool to assess the tsunami preparedness level of schools based on five parameters; 1) Policy, 2) Knowledge, 3) Preparedness and Response Plan, 4) Early Warning System, and 5) Resource Mobilisation Capacity. More than 200 schools in 10 provinces in Indonesia have been assessed using this tool. With support from UNDP Regional programme and the Government of Japan, the initial web based application was improved to a convenient mobile-based application; both are now called "STEP-A". Focusing on earthquake and tsunami risk and potentially other types of hazards, it will be promoted in 18 countries across Asia-Pacific. This presentation will demonstrate the use of STEP-A in schools in Bali, Mentawai and Aceh, Indonesia.

Application of tools and technologies:



Institute of Information Technology, Vietnam Academy of Science and Technology
Viet Nam

A big data software system to support state authorities to response to disaster, flood and drought preparedness and prevention and water operation

Nguyen The Hoang Anh
(nt.hoanganh@ioit.ac.vn)

Institute of Information Technology (IoIT) is a preeminent and leading research institution in the area of Information and Communication Technology in Vietnam. IoIT, established in 1976, is one of 30 national member institutes of Vietnam Academy of Science and Technology. Notable achievements of IOIT includes assembling the first PC in Vietnam (1979) and the first organization to introduce Internet to Vietnam (early 1990s).

Abstract:

Information technology plays a crucial role to a variety of applications, including response to disaster, flood and drought preparedness and prevention and water operation. Big data has been rising as a hot topic in information technology and the fourth industrial revolution. In this talk, a big data based system, aimed at supporting state agencies in charge of those areas and improve their administrations/performances effectively, is presented. Key functions and state-of-the art techniques integrated to develop this software system are described along with different usage scenarios regarding how state authorities are benefited from this system.

Application of tools and technologies:

» **Big data technologies:**
Hadoop, MapReduce, MongoDB, ElasticSearch, Spark, etc.

» **Natural language processing (NLP):**
text clustering, POS tagging, text summarization, etc.

» **Machine learning:**
deep learning, R, GATE, Weka, KNIME, etc.

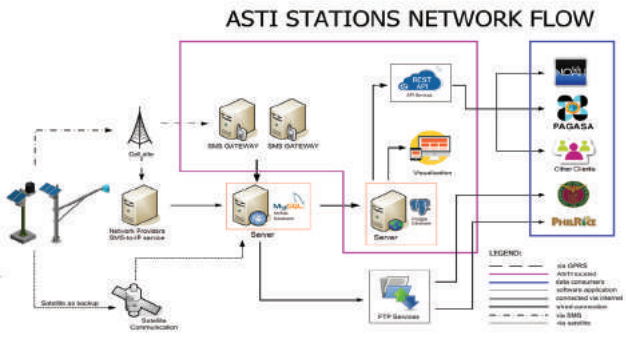
DOST-ASTI

Advanced Science and Technology
Institute, Department of Science and Technology, Republic of the Philippines

Nationwide Network of Hydrometeorological Sensors and Supporting Technologies to Gather, Process, and Deliver Data for Disaster Mitigation and Response in the Philippines

Alvin E. Retamar
(nt.hoanganh@ioit.ac.vn)

DOST-ASTI is a Philippine government agency that is mandated to conduct scientific research and development in the fields of information and communication technology and microelectronics. The institute complements the Philippines' endeavor in science with intensive activities in computer and information technologies. Among its project is the development and deployment of monitoring sensors nationwide, the establishment of high speed connectivity thru a national Research and Education Network, creation of a high performance computing and data archiving facility, and the development of the country's first satellite, DIWATA-1.



Abstract:

The presentation shows activities of the Philippines thru the use of locally developed technology to mitigate and respond to weather-related disasters. Thru DOST-ASTI, more than 2,000 hydrometeorological stations have been deployed to gather relevant data at predetermined intervals. These data are transmitted to a central repository using cellular network which covers most of the country. The data are distributed thru a high speed network to users who generate value by inputting the data into models and algorithms to generate forecasts and support decision-making. Computing and storage facilities are also available to ensure that data are properly kept for future use. The data are also presented in a website that is accessible to stakeholders. Satellite imagery are also available to complement sensor data. Community warning systems will also be installed to issue timely warnings to the public. In this presentation, the Philippines illustrates the use of multiple technologies to gather, process, distribute, and store data for use in disaster mitigation and other applications.

MSS

Mattayom Suwitserianusorn School, Bangkok
Thailand

Role of SCHOOLS in solving environmental problems in the community

Weeraphong Phimsarn
(koowee2015@gmail.com)

Abstract:

Although schools in Thailand are established within the community to educate local people, education cannot response to the changing environment within the community accordingly. Mattayom Suwitserianusorn School foresees the importance of integrated education which will improve life and social well-being within the community. The school has managed to learn with the community, companies and Utokapat Foundation by joint design and integrated all the subjects in the school. The integrated knowledge will help students develop skills and create over 50 new products and innovation to solve problems within the community.

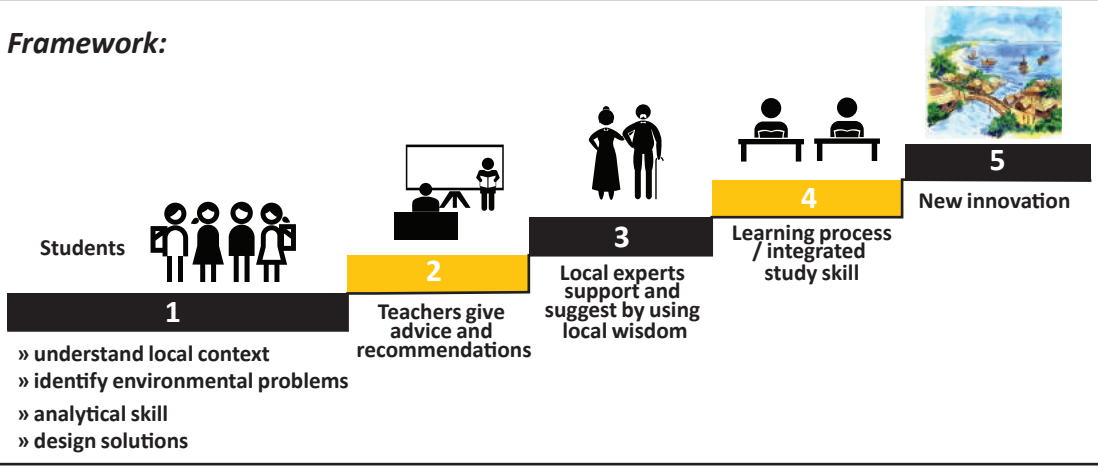
Application of tools and technologies:

Human-power water turbine to add more oxygen into the canal

Semi-automatic system water hyacinth collecting machine

Weather tracker

Framework:



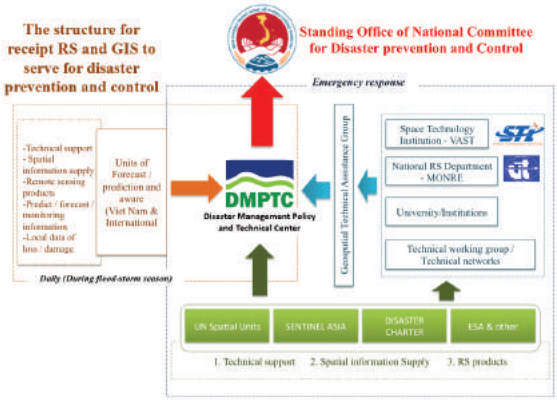
DMPTC

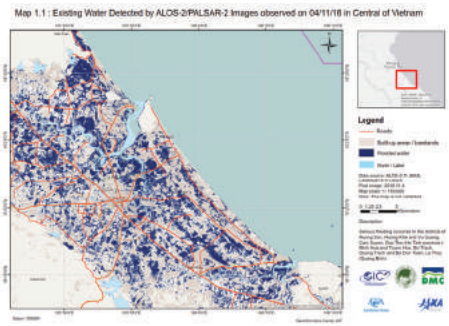
Disaster Management Policy and Technology Center
Viet Nam

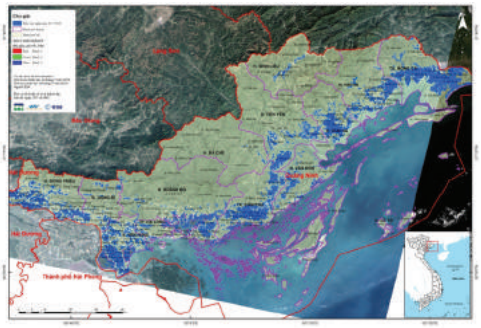
Space technology application for disaster management in Vietnam

An Quang Hung
(koowee2015@gmail.com)

Disaster Management Policy and Technology Center (DMPTC) is under the Viet Nam Disaster Management Authority (VNDMA) – belong to Ministry of Agricultural and Rural Development of Vietnam (MARD). DMPTC has functions which are supporting, implementation of State Management and specific Task in Natural Disaster Prevention, Mitigation and Climate Change Adaptation across the country.







Abstract:

Disaster Management Policy and Technology Center (DMPTC) started to apply space technology and Remote sensing for disaster management from 2013. We tried to connect the government agency with the technical organization in national and international to make technical support for disaster activities in Vietnam. We have pilot for quick assessment flood situation in Quang Ninh in 2015 using SAR images from Sentinel 1. The second pilot was made the drought map for drought situation in Highland and North center of Vietnam in 2016. The two pilot result also gives the potential for using remote sensing and GIS to support for disaster management activities in Vietnam.

Application of tools and technologies:

» Flooding maps base on satellite images
» Drought maps base on satellite images

Good Practice

Community Water Resource Management

Huai Pla Lod com

Suitable Crop Calendar for Natural-Rich Life

munity, Tak

Huai Pla Lod community

Tak province

General information

» Location: Dan Mae Lamao sub-district, Mae Sod district, Tak province

» Population: 1,013 people in 255 households of Black Muser hill tribe people

» Area: 36.69 km² in West Salween river, East of Ping river and Moei River basins

Land use

0.62 km² (1.7%)
of agriculture *(389.55 Rai)*

0.54 km² (1.49%)
of habitat *(340.38 Rai)*

0.59 km² (1.62%)
of graveyard *(370 Rai)*

5.85 km² (15.97%)
of farming *(3,655.44 Rai)*

26.46 km² (72.22%)
for agroforestry *(16,534.48 Rai)*

1.84 km² (5.01%)
of forest preservation *(1,148.12 Rai)*

0.56 km² (1.53%)
of Public area *(351.44 Rai)*

0.17 km² (0.46%)
of Local market *(105.77 Rai)*

Success factors

» Build local capacity to apply science and technology for integrated natural resource management: soil, water and forest.

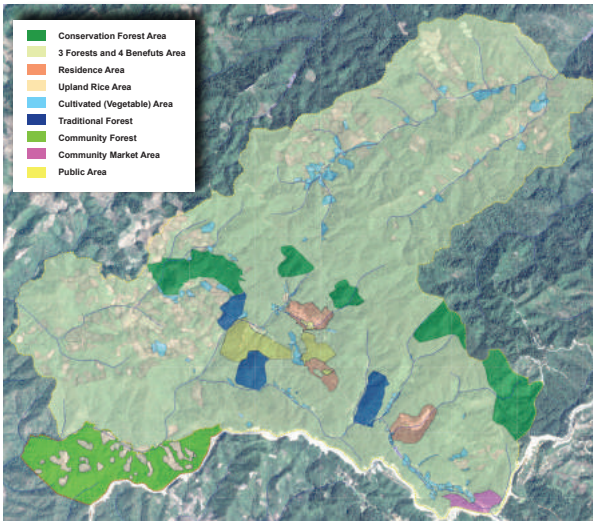
» Strengthen Public-Private and People (Community) Partnership (PPPP)

Challenges

» In the past, the Black Muser people in the community did not value the forest. They lived by growing opium, practiced mono crop and shifting cultivation. So, they suffered from deforestation, barren soil and regular drought. People disputed over water for consumption and agriculture production.

» January 1974, H.M. the King Bhumibol visited Huai Pla Lod and nearby communities. He gave advice to the villagers to conserve the forest by applying "3 Forest and 4 Benefits (Agroforestry)" concept, e.g. change in cultivation product from opium to other economic crops such as coffee.

» In 1981, the Huai Pla Lod community area was reclaimed by Taksin Maharat National Park. Musers realized that they need to restore the forest otherwise their land would be expropriated. However, despite community afforestation efforts, people still suffered from lack of water, soil degradation and insufficient income.



Achievements

» Yearlong income earning from local agricultural products such as Arabica coffee, bamboo shoot, Indian gooseberry, and Chayote.

» Optimum use of every drop of water: Water from protecting watershed area have been used for consumption in 225 households, generating hydropower electricity, 3 kilowatts, for street light, and then reuse the water for agriculture in downstream area, area of 0.62 km^2. Muser market for selling local agricultural products without middleman.

» Income earn from the market approximately 20,000 – 35,000 baht per month per household. The cash-flow within the community around 14.4 million baht per year.

Approaches

» Upstream forest rehabilitation and Community Water Resources Management (CWRM) by built over 400 check dams to increase absorption of water by the forest

» S&T application for water resource management and water balance analysis

» Zoning for community forest and conservation forest

» Change agricultural pattern and create crop calendar:

Community changed their agricultural pattern by using crop calendar and utilized the concept of Agroforestry and Sustainable Forest Rehabilitation to restored the forest and maintain the balance of the nature while planting trees for household use and cultivating agricultural products for food and income.

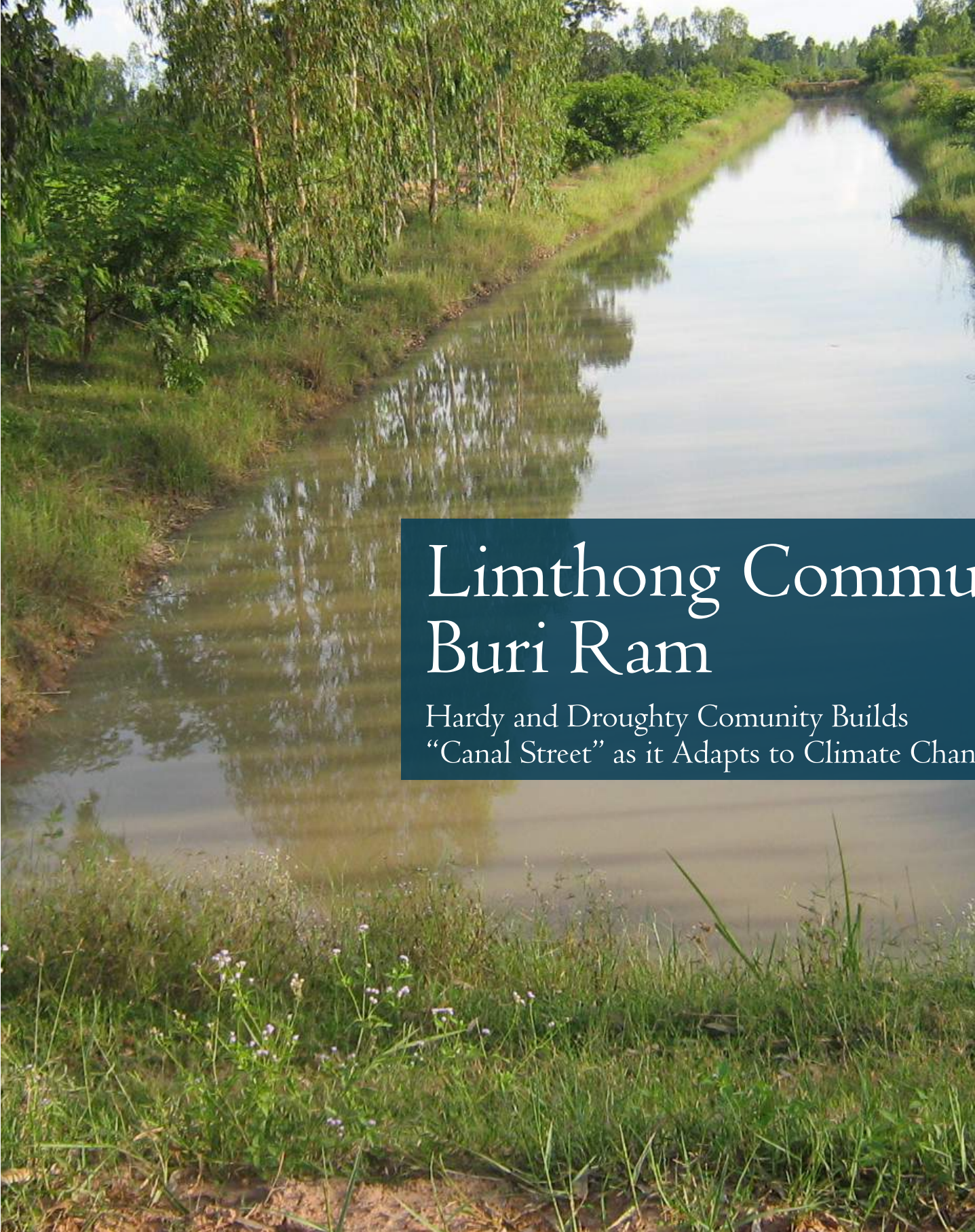
S&T for development

» Global Positioning System (GPS) to map water resources, water infrastructure, and community's zoning.

» Water balance analysis and crop calendar.

» Check dam system and impounding dam to increase water storage.

» Development of upstream forest conservation framework and regulations.



Limthong Commu
Buri Ram

Hardy and Droughty Comunity Builds "Canal Street" as it Adapts to Climate Chan

nity,

ge

Limthong Community,
Buri Ram Province

General information

» Location: Nang Rong District, Buri Ram Province, Lower Northeastern Thailand

» Population: 15,788 people

» Area: 475.57 km^2 in Mun river basin

Land use *of 93.03 km^2*
of agriculture production

93.03 km^2
of agriculture production

56.90 km^2 (61.2%)
of rice fields

32.80 km^2 (35.2%)
of farm crop

3.27 km^2 (3.5%)
of fruit crops-perennial plants

0.0528 km^2 (0.1%)
of vegetable crops

Challenges

» Villagers suffered from extreme flood and drought over 40 years, until 2007

» High debt from low productive agriculture, villagers migrated to seek income and better life

Success factors

» Empower community to apply science and technology in water resource management

» Integrate water resource management, disaster risk reduction and sustainable agriculture for resilient livelihoods

» Promote community leadership and innovations to expand the CWRM network and enhance cooperation for natural resource management

Achievements

» **Water security:** 56.35 km of water canals connected with more than 100 retention ponds that increase water storage by 1.679, million cubic metre

» **Food security:** Yearlong harvesting from changing agricultural pattern of mono crop to integrated agriculture.

» **Economic security:** Household income increase by 3 times and value of asset 21 times.

- Household expense decrease 2,000 baht per month
- Household income increase 10,400 baht per month

» Migrated people continuously returned to live at their hometown

Approaches

» Monkey cheek and pond network system were applied to increase water storage and prevent community for flood and drought resilience.

» Canal streets were used as a waterway and a distribution system to convey water to monkey cheek pond.

» Community-based agricultural concept were applied to better use farmland, strengthen crop planning and set up cooperation for mutual support of farmers in planting, distribution and selling.

S&T for development

» GPS receiver
» Telemetering station
» Satellite images
» Map
» Water balance
» Area-based analyses
» Water resource mapping

Rangsit Canal Co
Pathum Thani

Retention by Thriving Furrow and Canal Sy
Diminish Disaster Risk and Boost Economy

mmunity,

stem
y

Rangsit Canal Community

Pathum Thani Province

General information

» Location: Nong Suea District, Pathum Thani Province

» Population: 21,700 people in 6,400 households

» Area: 83.2 km^2 in Chao Phraya river basin

Land use

35.2 km^2 (42.31%)
of oil plam

48 km^2 (57.69%)
of agriculture and rice fields

Success factors

» Integrated water management, drought and flood risk reduction and agriculture for resilient livelihood and environmental management.

» Build partnership between community, local government and the private sector to scale up good practices.

» Building capacity for community self-management

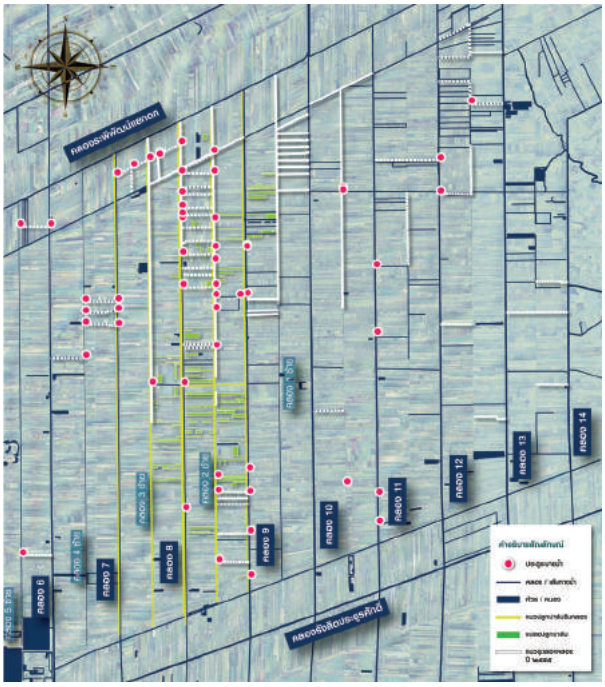
» Promoting the role of community leaders

Challenges

» For the decades, community living along Rangsit canal searched for ways to improve their livelihoods. In 1984, people changed farmland into orange orchards. Later in 1991, an outbreak of citrus diseases put many farmers into serious debt.

» In 2004, the orange orchards were replaced by oil palm cultivation. By cultivating oil palm, it helps to generate more income for each household. Therefore, farmers can reduced their long-term debts within three years.

» A lack of water due to the poorly maintained and shallow canal challenged oil palm cultivation. In addition, the severe flood of 2011 revealed other challenges including canal bank erosion.



Achievements

» Increased oil palm yields together with integrated community-based agricultural production following the New Theory provide a higher and more sustainable income for the community.

» Retention area for flood prevention in cyclone event (Gaemi in 2012) and enough water used in dry season.

» Retention area can retain 137 million cubic meter of water.

» The 131 kilometers of the canal bank was improved. 13,000 oil palm trees were planted to prevent erosion and illegal construction.

» By doing integrated agriculture along the canal banks, income increases 4.2 time higher than doing rice field (2016).

» The local farmers can yield oil palms 24 times per tree per year with production of more than 6-8 tons per 0.0016 km^2. The average income is 23,800 baht per 0.0016 km^2 per year (at the price of 4 baht per 1 kg of oil).

Approaches

» Community water resource management (CWRM) concept was introduced to the community by the supported of Her Royal Highness Princess Bajarakitiyabha's graciously in 2011 to solve drought problem. The donation from College of Justice help to develop Rangsit canal's to be an income-booster monkey cheeks area.

» Analysis of water balance and implementation of a new water resource management system to provide water for oil palm cultivation areas.

» The main canals and sub canals were dredged and linked with improved clarifiers and floodgates to maximize water reservoir and drainage system.

» The water reservoir area was improved by vegetable and oil palm furrows.

» Use of mire suction boat for deeper dredging the canal and furrows including opens new waterways to agricultural areas in dry season.

» Oil palm trees were planted along the canal banks to prevent erosion and illegal construction.

S&T for development

» Water balance analysis in designing new water management system.

» A mire suction boat is an important innovation in increasing drainage capacity during flood season, while open new waterways during dry season to provide water to remote areas.

» Strengthen canal banks by planting oil palm trees.

Saladin Communit
Nakhon Pathom

Reduce 4 Water-Related Problems by S&T :
Flood, Drought, Brackish, and Waste;

y,

Saladin Community

Nakhon Pathom Province

General information

» Location: Mahasawat sub-district, Phutthamonthon district, Nakhon Pathom province

» Population: 8,926 people

» Area: 12.97 km² in Tha Chin river basin

Land use

9.98 km²
of agriculture

6.85 km² (68.6%)
of rice fields

2.28 km² (22.8%)
of fruit crops-perennial plants

0.84 km² (8.5%)
of vegetable crops

Challenges

» Farmers in Saladin community used to follow monoculture of rice production. They were faced with four water problems: flood, drought, wastewater and brackish water.

» Mahasawat Canal and its sub-canals were clogged with household rubbish and an inundation of water hyacinth.

» A layer of grease formed on water surface as a result of the disposal of cooking waste directly into the canals.

Success factors

» Build community ownership and leadership

» Promote adaptation of technologies

» Strengthen collaboration between community, local government and other stakeholders

» Flood and drought were partly due to lacks of care and respect of the water resource. It caused a poverty to people in the area.

» In 1995, local road construction replaced the canals as a means of transportation. This resulted in a further deterioration of the maintenance of canals. In the same year, water gates were built to control the flood level, but making the water stagnant.

Achievements

» Community perception towards canals system and water resource management.

» Improvement of water quality in the canals.

» Enough water for yearlong agriculture activities (even in year of El Nino effect and drought event in Thailand).

» Yearlong income earning and economic spin off

- Return of water habitat
- Begin of lotus farm
- Higher return of paddy and vegetable crops
- Starting of agricultural tourism

» Establishment of self-managed fund.

Approaches

» Build community's ownership in managing local water resources.

» Community enterprises of water users were established for stronger collaboration among farmers for water resource management.

» Identified local leaders, apply appropriate technologies, integrated agriculture concept and combined with indigenous knowledge for problem solutions. For example, household grease trap, solar water turbine and water-hyacinth soil.

S&T for development

» Checking water quality tools

» Household grease trap

» Solar powered turbine for adding oxygen into the water

» Water hyacinth soil

www.haii.or.th, www.aseanwater.net
Hydro and Agro Informatics Institute (HAII)
E-mail : iaf@haii.or.th