

Workshop Report

Cyberinfrastructure and Water Resources in the Lower Mekong Region

August 18-22, 2014
Hanoi, Vietnam



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Executive Summary

Science research has evolved to require collaboration between multiple investigators dispersed geographically, often accessing data, instruments, and other resources remotely. This evolution means that there is an increasing reliance on a comprehensive cyberinfrastructure. The motivation for the workshop resulted from the observation that the Lower Mekong Region has increasing cyberinfrastructure capabilities and that there were opportunities to leverage those capabilities to increase collaboration between scientists in the United States and the Lower Mekong region. In addition, we sought to provide an opportunity for the staff supporting cyberinfrastructure and the scientists to communicate with each other about capabilities of the cyberinfrastructure and needs of the science community.

The workshop brought together scientists from institutions within the Lower Mekong Region and from the US who collaborate in three main areas of science: disaster management, climate change and other topics with the overall theme of water resources. In addition, network engineers from the Lower Mekong region that support these science activities at the campus and national levels also attended the workshop to interact with scientists and better understand research issues.

The five-day workshop had over 70 participants and combined the scientists and network engineers in two days of combined activities and three days of separate science discussions and network activities.

Key outcomes of the workshop included:

- Increased awareness of the science activities in the region and opportunities for collaboration;
- Improvement in the skills of the network engineers who support campus networks;
- A science-based planning team, along with the leadership at the Vietnamese National Agency for Science and Technological Information (NASATI), are investigating a follow up workshop in 2015;
- In-region science collaborations are moving forward, with some seeking additional support both US and in-region; and
- A series of technological advances and connections are ongoing.

Report Editors: Dale Smith, Jennifer Schopf
December 20, 2014

Introduction

The Lower Mekong Initiative Workshop, part of the Network-enabled Collaboration series on “Cyberinfrastructure and Water Resources in the Lower Mekong Region”, was held August 18-22, 2014 in Hanoi, Vietnam. It brought together scientists in water-related research disciplines and their network support staff from the Lower Mekong region (including Cambodia, Laos, Myanmar, Thailand, and Vietnam) and scientists and network experts from United States to provide an opportunity:

- To raise awareness among scientists and researchers in the Lower Mekong Region of the opportunities available for enhancing the region's ability to respond to the impacts of climate change by exploiting network-enabled collaboration opportunities;
- For US and Lower Mekong researchers to establish and strengthen research relationships resulting in increased scientific collaboration;
- To provide training in network skills and techniques to the network staff of the institutions of the scientists from the Lower Mekong region to improve the skills of these staff to better support network-enabled collaboration.

This five-day workshop had a science stream and a network stream. The science stream included presentations and interactive sessions on water-related research; tutorials that highlight tools for data-intensive research collaborations; case studies; and brainstorming on opportunities for network-enabled collaboration among scientists in the Lower Mekong Region and with US scientists. The network stream focused on training and awareness-raising of the network staff from the institutions of the scientists in the science stream. The training examined improving campus network facilities to better serve the needs of the science community.

Acknowledgements

This workshop was by invitation only and funded by the US National Science Foundation (NSF award #1313585) and the US Department of State (DoS Award #S-LMAQM-13-GR-1042); organized by Indiana University and the University of Oregon; and supported by the US National Center for Atmospheric Research, the University of California at San Diego PRAGMA project, and the Vietnam Research and Education Network (VinaREN), with additional support from the Vietnam - National Agency for Science and Technological Information (NASATI) and the TEIN*CC organization.

Complete information about the workshop is available at <http://internationalnetworking.iu.edu/archives/LMI/>

Workshop Objectives and Motivation

Science research has evolved to require collaboration between multiple investigators dispersed geographically, often accessing data, instruments, and other resources remotely. This evolution means that there is an increasing reliance on a comprehensive cyberinfrastructure. The motivation for the workshop resulted from the observation that the Lower Mekong Region has increasing cyberinfrastructure capabilities and that there were opportunities to leverage those capabilities to increase collaboration between scientists in the United States and the Lower Mekong region. In addition, we sought to provide an opportunity for the staff supporting cyberinfrastructure and the scientists to communicate with each other about capabilities of the cyberinfrastructure and needs of the science community.

The workshop had three major goals:

1. Forming and enhancing science and education collaborations among US scientists and scientists of the countries of the LMR;
2. Developing human capacity to operate and maintain cyberinfrastructure and networking resources in support of science and engineering collaborations;
3. Informing policy, funding, and regulatory attendees of the best practices in cyberinfrastructure development and science collaboration.

The workshop brought together researchers from institutions within the Lower Mekong region and from the US who collaborate in three main areas of science: disaster management, climate change, and other topics with the overall theme of water resources and operators, as well as managers of networks that support these science activities at the campus and national levels. Participants came from major water resource groups and networking centers in the US as well as those in the Lower Mekong region (LMR), including Cambodia, Laos, Thailand, Vietnam, and Myanmar.

Workshop Organization and Participation

The workshop was primarily organized by Indiana University and the Network Startup Resource Center (NSRC). The Vietnam Research and Education Network (VinaREN) and the Vietnam – National Agency for Science and Technology Information (NASATI) provided logistical support. Additional project partners included PRAGMA and the National Center for Atmospheric Research (NCAR). We established a Science Advisory Committee to help with the planning of the science tracks. The main organizers met weekly or bi-weekly as needed throughout the planning stages.

The workshop website was established early in the process, and was used as the main vehicle for all aspects of the workshop. Its content was expanded as plans developed and this web site was used for organization and communications, both during the development of the workshop as well as during the workshop. The permanent version of this web site (<http://internationalnetworking.iu.edu/archives/LMI/index.html>) contains all presentations and

workshop materials including the agenda (also in Appendix 1) and participant list (also in Appendix 2).

During the workshop, two complementary websites were also used. The Networking sessions hosted their information at <https://nsrc.org/workshops/2014/science-ci-mekong>, which is also a permanent archive. And as part of the outcomes of the meeting, a Google document was set up to assist in planning and evaluating next steps for collaboration, and is included as Appendix 3.

The workshop attracted 75 registrants from universities, national laboratories, and government organizations. These broke down according to country as shown in Table 1. These numbers do not include various NASATI staff and dignitaries that attended portions of the workshop. The Lower Mekong region participants were funded by the US State Department award, and most of the US participants were funded by the US NSF award, with some supplementary funding from the NSRC.

Table 1: Participants by Country

Country	Number of Participants
Cambodia	4
Korea	2
Laos	10
Myanmar	5
Philippines	1
Thailand	7
USA	18
Vietnam	28

Workshop Structure and Content

In general, the workshop was structured to create an environment that encouraged collaboration and encouraged discussions between attendees. The first morning had a number of local government and policy attendees, so it concentrated on defining the policy implications of climate and water research and ICT needs. The workshop opened with remarks that set the stage for the international partners and policy makers. Schopf and Smith followed with an overview of the workshop, and the morning session closed with a panel giving an overview of the role of Research and Education Networks to support science. The speakers referred to the importance of Information and Communications Technology (ICT) and, in particular, networking

support for data sharing and international collaborations. Many of them underlined the significance of the workshop in promoting Lower Mekong regional collaboration with the US.

The afternoon session began with a talk on the intersection between science, technology, and policy. This was followed by 19 “lightning talks” by the attendee researchers discussing their challenges, barriers, and goals for the workshop. These laid the foundation for the two breakout sessions later in the workshop and set the stage for common themes. **The lightning talks were very well received by the participants as a way of enabling many researchers to communicate their ideas with each other, and were one of the ways collaborations were identified.**

Days 2-4 each began with a joint panel or talk, and then split into the two streams: science and networking. Presentations in the networking track were done by NSRC personnel using the standard materials for campus networking and included a significant amount of hands on work in configuring switches and routers to develop a prototype campus network. Presentations in the science track were done by a mix of US and in-region researchers. The science track include additional talks and breakouts covering:

- Sensors and broad-scale monitoring challenges,
- Result interpretation,
- Metadata needs,
- Collaborative tools,
- Visualization approaches, and
- Communication with policy makers.

One of the highlights in the science track, which took place on Day 4, were presentations of two specific case studies that highlighted two past weather events, the science that predicted what would happen as the weather event unfolded, and how those predictions were communicated and acted upon by decision makers. These case studies were very warmly received and included a presentation by Veerachai Tanpipat of the Hydro Agro Informatics Institute (HAI) of Thailand that looked at the floods of 2011 in Thailand, and another presentation by Jo Brianne Louise Briones of the Nationwide Operational Assessment of Hazards (NOAH) of the Philippines who discussed the recent Typhoon Haiyan in the Philippines. **If a workshop like this were organized again, it would be our recommendation to have additional case studies of how technology interacted with actual predictions and needs.**

The science track included two different breakout sessions with open discussion. The first breakout session was in the afternoon of the third day. This session was driven by the themes that were identified in the Lightning Talks on the first day. The three themes that were identified included water quality, climate and land-use, and disaster response. The participants were divided into three groups and each group was assigned one of the themes to discuss five items, including data source, data sharing, data quality, models and tool access, and funding. The second breakout session was on the afternoon of the fourth day and focused on science communications issues and included three groups that were to discuss one of the following issues: 1) communications among various science communities; 2) communications between

the science communities and policy/decision makers; and 3) communications across regions, cultures, and disciplines. Summaries of these discussions are included in the online talk materials.

The final day featured a synthesis and discussion of the results of the breakout sessions on the two previous days and ended with a session discussing next steps. The results of a short survey given on Day 4 were also discussed. **In general, participants were happy with how the meeting had gone, and had several suggestions for next steps including a science-focused follow-on workshop**, discussed below.

Workshop Feedback

Two sets of additional feedback from the workshop are available. First, a survey was taken (shown in Appendix 4), and there is some follow up listed in the survey results (shown in Appendix 5). Second, as already mentioned, a Google document of items to follow up was shared with participants, included as Appendix 3.

Survey

At the end of the meeting a paper survey was shared with participants, full results given in Appendix 4. With 57 responses, the results overall were very positive. 81% of the participants said their knowledge increased during the workshop (and 9% said they were already experts to begin with so their knowledge could not increase). 100% said they had the opportunity to pursue additional collaboration with an in-region participant, and 94% said the same for a US participant.

Overall, participants were very happy with the meeting, with the plenary and breakouts receiving the most positive comments. Even so, several participants noted the breakouts could be longer and some of the presentations could be shorter. The use case sessions were especially well received, with several comments suggesting that more would have been helpful. **It was noted that additional in-region speakers would have been appreciated.** Many of the networking-attendees stated that they learned a lot about what researchers needed and why, and many of the science-attendees commented they learned about the network and why that was more complicated than they had originally thought. Several comments noted that **having additional funders or policy people at the meeting for a longer period of time might have been helpful as well.** Two people noted that a workshop on the Mekong region should be held on the Mekong.

Sample representative comments include:

- Cyberinfrastructure is not just networks: HPC, cloud, grid technologies etc should also be included
- The workshop format gave me a very easy way to approach the new information, and I now have a much fuller view about the water resources in LMR

- The workshop format provided the opportunity for participants to build new relationships for collaboration

Most participants strongly supported follow-up via email, in-person meetings, or online forums.

Follow-on Document

As part of the workshop summary session, Papadopoulos suggested that everyone think about one thing that they would do as a result of this workshop. A Google document was created so that participants could contribute ideas. Participants contributed 29 items of follow-on activities that they would participate in. These items ranged from very specific and concrete short term actions to commitments for individuals to work on activities together. We have anecdotal evidence that a number of these follow-on items have indeed catalyzed a number of activities. Any kind of follow-on workshop should carefully consider these contributions during the planning phase of the workshop. These 29 actions are included in the “Specific Activities and Collaborations Catalyzed by the Workshop” section included as Appendix 3.

Outcomes and Next Steps

There were 5 major outcomes and suggestions for next steps identified as part of the workshop:

- Increased awareness of the science activities in the region and opportunities for collaboration;
- Improvement in the skills of the network engineers who support campus networks;
- A science-based planning team, along with the leadership at the Vietnamese National Agency for Science and Technological Information (NASATI), are investigating a follow up workshop in 2015;
- In-region science collaborations are moving forward, with some seeking additional support both US and in-region; and
- A series of technological advances and connections are ongoing.

Awareness

Overall, the majority of the participants identified an increased awareness of the science and available resources related to water research in the Lower Mekong Region. Not only did US and in-region scientists learn about each other, but in-region scientists made connections not previously made.

Skills Improvements

A key outcome of the workshop was the improvement in the skills of the network engineers who support campus networks. Several of them commented that the workshop had enabled them to better understand their role in working with scientists, and the science needs on their infrastructure. In addition, scientists learned about possible new tools and approaches, extending their technical know-how.

Follow-on Workshop

This workshop clearly identified interest and opportunities to continue to develop collaborations. **There is an opportunity in 2015 to leverage focus on the 20th anniversary of US**

Vietnamese diplomatic relations. We believe that a workshop in 2015 is one option and it would be extremely valuable to continue momentum and engage a broader set of in-region experts. In addition, there was significant discussion around a follow-on workshop focused on science collaborations. Dr Le Xuan Dinh, Director General of NASATI expressed a strong willingness to support a follow on workshop in 2015. Each side was planning to discuss these options with colleagues and funding agencies to determine the feasibility, topics, and timing. We envision a planning group to identify key players, topics, and approaches to identify funding.

Agencies to approach include the NSF for US participation, the US State Department for in-region support. In addition, members of the planning group should approach NASATI, who have expressed interest in supporting Vietnamese participation. One aspect of a follow-on workshop should be creation of longer-term online resources, including a discussion forum and reference links. **If a planning group is formed, they should refer to some of the lessons learned from this workshop, including our recommendation to have additional case studies of how technology interacted with actual predictions and needs and that greater attempts should be made to include more in-region speakers.**

Support Regional Work

In region scientists are in need of additional and long-term support to continue collaborations both within and external to the region. There is a need for funded projects to enable collaborations between groups, to the benefit of all. As was apparent at the workshop, local representatives are invaluable for data collection and sharing, and providing valuable data to global-level data sets. **There is a strong need for on-going support of climate work in-region.**

Wee advocated the model of a regional community computing facility to enable the execution of high spatial and temporal resolution, coupled models for environmental forecasting. Singapore has a Centre for Climate Research Singapore (CCRS) that operates under the Meteorological Service Singapore (MSS) with the stated role of “understanding of Southeast Asia’s complex tropical climate and weather systems and the prediction of future climate changes, by conducting climate modeling and research”. Discussions should be initiated with the CCRS to assess the possibilities for access to computing resources.

Related to this, another collaboration that emerged from the workshop has resulted in a request for funding for a larger scale effort. Peucker-Ehrenbrink (Woods Hole Oceanographic Institution), Zaslavsky (UCSD), and Erland Jenson (Cambodia) submitted a pre-proposal to the NSF Partnership for International Research and Education (PIRE) program entitled “PIRE: Natural and Anthropogenic Stressors in the Mekong River Delta” (NSF proposal #1503940). It proposes a joint research and education program with focus on the Mekong River delta.

Address Technical Challenges

In addition, several technical challenges were identified, and are being pursued for follow up. For example, it was noticed that HAIL downloads a variety of data sets every day to run some of their weather and flood models, but one of the USA National Oceanic and Atmospheric Administration (NOAA) sites that housed the largest data set was not reachable via the global research and education network infrastructure. Instead, it was being accessed from Thailand via the commercial Internet because NOAA was not advertising the prefix that contained the IP address of ftpprd.ncep.noaa.gov (140.90.101.61) to any research and education network. This meant that all scientists, researchers, and meteorologists who were accessing this data were using the commercial Internet. This was brought to NOAA’s attention and the problem has been

resolved, which has resulted in much faster downloads of data from this site for Universities and research units around the world.

Several other technical issues relating to research and education networking were discovered, including:

- A NASA and USAID joint funded project called SERVIR that is focused on making NASA data more accessible to people in emerging regions is funding a regional hub hosted by RCMRD in Kenya, however, the RCMRD servers are not connected to the KENET, the Kenyan research and education network.
- The consortium for the Advancement of Hydrologic Science Inc (CUAHSI), an NSF sponsored consortium of 125 universities providing support for the study of the terrestrial components and processes of the global water cycle is using the Microsoft Azure cloud services to host their systems and services. This means that CUAHSI services are not available using the global research and education network infrastructure.

As technical issues such as the ones that were identified during this workshop are discovered, these should be noted on the workshop on-line forum, for groups to address. **One specific group to engage would be the Network Startup Resource Center (NSRC) based out of the University of Oregon should be engaged to perform the initial triage and diagnosis.** The NSRC current support (NSF award #1451045) may be able to be leveraged to help address technical issues such as these

Appendix 1: Workshop Agenda

Cyberinfrastructure and Water Resources in the Lower Mekong Region

Monday, August 18, 2014 - Hoa Binh Hotel Ballroom

Joint Plenary Session with all Participants

- 8:00-8:30 Registration desk open in lobby outside of Hoa Binh Ballroom on ground floor
- 8:30-8:40 Introduction of dignitaries
- 8:40-9:00 Workshop opening ceremony (Vietnam partners)
- 9:00-9:30 Workshop Goals: Jennifer Schopf, Indiana University and Dale Smith, University of Oregon, USA (slides [en](#) / [vn](#))
- 9:30-10:30 Plenary Talk: Infrastructure and policy for research and education: Assoc. Prof. Dr. Pham Van Cu and Dr. Bui Quang Hung, Vietnam National University, Vietnam (slides - [en](#) / [vn](#))
- 10:30-11:00 Tea Break
- 11:00-12:00 Panel: Importance and role of the NRENs in supporting science
Moderator: Jennifer Schopf, Indiana University, USA
Dale Smith, University of Oregon/NSRC, USA (slides: [en](#) / [vn](#))
Dr. Nguyen Hong Van, NASATI/VinaREN (slides: [en](#) / [vn](#))
BK Kim, TEIN*CC, Korea (slides: [en](#) / [vn](#))
Chalermpol Charnsripinyo, NECTEC/ThaiREN, Thailand (slides: [en](#) / [vn](#))
- 12:00-13:30 Lunch
- 13:30-14:30 Science Plenary – “Science, Technology, and Policy Rising to the Challenge of Food Security” – Brian Wee of the US National Ecological Observatory Network (NEON) ([slides-updated](#))
- 14:30-15:00 Tea Break
- 15:00-17:00 Lightning talks (6 minutes each talk) Participants will prepare a short talk about what their water-related research interests are, what are the challenges/barriers to that research, and what do you hope to get out of this event.
- [Bernhard Peucker](#)
[Daronwan Kamthonkiat](#)
[Erland D Jensen](#)
[Ilya Zaslavsky](#)
[Jo Brianne Louise Briones](#)
[Khamkeng Chanthavongsa](#)
[Khamhong Sichanthavong](#)
[Khin Su Su Htwe](#)
[Nguyen Kim Loi](#)
[Lindsay Correa](#)
[Ngo Duc Thanh](#)
[Nguyen Dang Tinh](#)
[Nguyen Hieu Trung](#)
[Nguyen Hong Quan](#)
[Phingsaliao Sithiengtham](#)

[Tran Ngoc Anh](#)
[Sengphasouk Xayavong](#)
[Veerachai Tanpipat](#)
[Van Pham Dang Tri](#)

18:00 European Union co-funded Dinner with TEIN as the sponsor for all participants. Buses will depart Hoa Binh Hotel at 18:00. Dinner will be at Su Buffet, 64 Nguyen Du, Hanoi

Tuesday, August 19, 2014 - Meeting rooms at NASATI

- 8:30-10:00 Panel (Room 407): Big Science Challenges related to Monitoring and Understanding the Surface and Groundwater Systems (including cyberinfrastructure challenges
Moderator: Daroonwan Kamthonkiat, Thammasart University, Thailand
Tracy Collier, Puget Sound Partnership, USA ([slides](#))
Bernhard Peucker-Ehrenbrink, Woods Hole Institute/Global Rivers, USA
Chris Elvidge, US National Oceanic and Atmospheric Administration (NOAA), USA ([slides](#))
- 10:00-10:30 Tea Break
- 10:30-17:00 Two separate tracks:
- Network Engineer Track (Room 612)**
- 10:30-12:30 Campus Network Best Practices (for details see <https://nsrc.org/workshops/2014/science-ci-mekong/>)
- 12:30-13:30 Lunch
- 13:30-17:00 Layer 2 lecture (for details see <https://nsrc.org/workshops/2014/science-ci-mekong/>)
- Science Track: Monitoring and Understanding the Surface and Ground Water Systems (Room 407)**
- 10:30-11:30 A global look at satellite data and monitoring: Chris Elvidge of NOAA, USA ([slides](#))
- 11:30-12:30 NASA/SERVIR: Satellite-based Earth observation and science applications for emerging regions: Ashutosh Limaye, US National Aeronautics and Space Administration (NASA), USA ([slides](#))
- 12:30-13:30 Lunch
- 13:30-14:30 Metadata and data standards (WMO/WIS, etc). Include discussion about how can data be shared openly in collaborative fashion. Looking at modern best practices for water data: Ilya Zaslavski, University of California San Diego (UCSD), USA ([slides](#))
- 14:30-15:15 Survey of the importance of sensor networks and trying to find out what is happening in individual countries. What exists for sensor networks, data repositories, and data sharing: Dr Surajate Aroonnet, Hydro Agro Informatics Institute (HAI), Thailand ([slides](#))
- 15:00-15:30 Tea Break
- 15:30-16:15 Hydro Agro Informatics Institute (Thailand) collaboration with Laos on monitoring: Mrs Khamnhong Sichanthavong, Deputy Director General, Department of Technology and Innovation, Ministry of

- 16:15-17:00 Science and Technology, Laos ([slides](#))
 Collaboration between the Vietnam National University – Ho Chi Minh City, CUAHSI and UCSD on hydrologic data management in Southern Vietnam: Dr. Nguyen Hong Quan, Vietnam National University and Ilya Zaslavsky, UCSD ([slides](#))
- 18:00-20:00 Poster Session sponsored by Internet2 at Hoa Binh Hotel in ground floor ballroom.

Wednesday, August 20, 2014 - Meeting rooms at NASATI

- 8:30-10:00 Panel (Room 407): Big Science Challenges: How to use water data to produce knowledge for water security (including cyberinfrastructure challenges).
 Moderator: Phil Papadopoulos, University of California San Diego (UCSD)
 Jon Pollak, Consortium of Universities for the Advancement of Hydrologic Science Inc. (CUASHI), USA ([Slides](#))
 Ashutosh Limaye, National Aeronautics and Space Administration (NASA)/SERVIR, USA ([Slides](#))
- 10:00-10:30 Tea Break
- 10:30-17:00 Two separate tracks:
- Network Engineer Track (Room 612)**
- 10:30-12:30 Layer 2 hands on labs (for details see <https://nsrc.org/workshops/2014/science-ci-mekong/>)
- 12:30-13:30 Lunch
- 13:30-17:00 Layer 3 lecture (for details see <https://nsrc.org/workshops/2014/science-ci-mekong/>)
- Science Track: How to use water data to produce knowledge for water security (Room 407)**
- 10:30-11:30 PRAGMA virtual data and compute resource sharing: Phil Papadopoulos, University of California, San Diego (UCSD), USA ([Slides](#))
- 11:30-12:30 Open and Free Community Resources for Environmental Research: Don Middleton, US National Center for Atmospheric Research (NCAR), USA ([Slides](#))
- 12:30-13:30 Lunch
- 13:30-15:00 Demonstration of Projects
 Jon Pollak, CUASHI: demonstration of tools for sharing water data ([slides](#))
 Ilya Zaslavsky, UCSD: EarthCube CINERGI: Community Inventory of EarthCube Resources for Geoscience Interoperability ([slides](#))
 Chris Elvidge, NOAA: Nightly global mosaic (VIIRS) ([Website](#))
 Jo Brianne Brions, Nationwide Operational Assessment of Hazards (NOAH), Philippines ([slides](#))
 Ashutosh Limaye, NASA/SERVIR, USA ([slides](#))
 Van Pham Dang Tri, Can Tho University, Vietnam ([slides](#))
- 15:00-15:30 Tea Break
- 15:30-17:00 Break out groups: [OVERVIEW SLIDES](#)
 Water quality, lead by Bernhard Peucker-Ehrenbrink (Woods Hole Institute/Global Rivers), in Room 407 ([notes](#))

Climate change, lead by Brian Wee (NEON), in Room 201
([notes](#))
Natural hazards, lead by Jon Pollak (CUASHI), in Room 202
([notes](#))

Thursday, August 21, 2014 - Meeting rooms at NASATI

- 8:30-10:00 Panel (Room 407): Big Challenge: Visualization and communication of derived knowledge to policy makers at different levels (including cyberinfrastructure challenges)
Moderator: Chris Elvidge, NOAA, USA
Brian Wee, NEON, USA ([slides](#))
Ilya Zaslavsky, UCSD, USA ([slides](#))
Nguyen Hieu Trung, Can Tho University, Vietnam ([slides](#))
- 10:00-10:30 Tea Break
- 10:30-17:00 Two separate tracks:
Network Engineer Track (Room 612)
10:30-12:30 Layer 3 hands on labs (for details see <https://nsrc.org/workshops/2014/science-ci-mekong/>)
12:30-13:30 Lunch
13:30-17:00 Introduction to Network Monitoring and Management (for details see <https://nsrc.org/workshops/2014/science-ci-mekong/>)
- 18:00 NASATI sponsored dinner. Buses will depart Hoa Binh Hotel at 18:00. Dinner is buffet at Sen Tay Ho at 614 Lac Long Quan, Hanoi

Friday, August 22, 2014 – Meeting room at Hoa Binh Hotel

- 8:30 - 8:35 Morning agenda - Jennifer Schopf (slides)
- 8:35-10:00 Reports from Breakout sessions from Wednesday and Thursday
- | | |
|--|----------------------------|
| Report from NSCR training workshop | Dean Pemberton |
| Water Quality | Bernhard Peuker-Ehrenbrink |
| Climate and Land use Change | Brian Wee |
| Hazards | Jon Pollak |
| Communications among science communities | Tracy Collier |
| Communications between science communities and policy makers | Jon Pollak |
| Communications across regions, cultures | Brian Wee |
- 10:00-10:30 Tea Break - Note: per diem available for participants from Lower Mekong Countries ([list by country](#))
- 10:30-12:30 Discussion of next steps, how to address issues raised in report outs

Appendix 2: Participant List

Note: Participants in [Blue](#) were in the Networking Track. All others were in the Science Track

Last	First	Country	Organization	Email
Anh	Assoc. Prof. Dr. Tran Ngoc	Vietnam	Vietnam National University	anhntn@vnu.edu.vn
Aroonnet	Dr Surajate	Thailand	Hydro and Agro Informatics Institute (HAI)	surajate@haii.or.th
Arzberger	Peter	USA	UCSD	parzberg@sdsc.edu
Aye	Dr. Zin May	Myanmar	University of Computer Studies, Yangon	zinmay110@gmail.com
Briones	Ms. Jo Brianne	Philippines	Nationwide Operational Assessment of Hazards (NOAH)	jblt.briones@gmail.com
ByungKyu	Kim	Korea	TEIN*CC	bkkim@teincc.org
Chaiwat	Ekkawatpanit	Thailand	Civil Engineering, King Mongkut's University of Technology Thonburi	chaiwat.ekk@kmutt.ac.th
Chan-In	Mr. Chatchai	Thailand	National Electronics and Computer Technology Center/ThaiREN NOC	chatchai@nectec.or.th
Chanthavongsa	Mr. Khamkeng	Laos	Lecturer/IWRM Specialist, Water Resources Engineering Department, National University of Laos	ckhamkeng@yahoo.com
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Choi	Mr. Hyunho (Louis)	Korea	TEIN*CC	hhchoi@teincc.org
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Cuong	Vu Manh	Vietnam	VinaREN	cuongvm@vista.gov.vn
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Appendix 3: Specific Activities and Collaborations Catalyzed by the Workshop

As part of the workshop wrap up on Friday, we created a google docs document that was available for all workshop participants to edit. We encouraged the participants to think of one activity that they would do to follow up from the workshop. What follows is the list of entries provided by the participants, organized by types of collaborations or activities proposed.

US-Lower Mekong Collaborations/Activities

1. Philip Papadopoulos to email Prof. Nguyen Dinh Minh, VNU Hanoi (+ Dr. Nguyen Hong Quan VNU-HCM, hongquanmt@yahoo.com) about Pragma expeditions, connections within Vietnam, and connections to GLEON.
2. Thanh Ngo-Duc to follow up with the HCM's group & Brian Wee (via Researchgate), to follow the activities of EarthCube.
3. T. Ngo-Duc is interested in a joint project in the Lower Mekong Region to understand the impact of monsoon activities and/or climate change to water resources and agriculture in the region.
4. T.Ngo-Duc to stay in touch with Ashutosh on NWP, moisture update & remotely sensed products.
5. Don Middleton is curious if a data analysis and visualization training workshop would be useful for groups in this region. These have been very useful to other groups, especially where graduate students are relied upon to develop analyses. If so, please contact me at the email address included with the conference materials, and we can discuss.
6. Bernhard P-E will stay in touch (via email: behrenbrink@whoi.edu) with Erland Jensen to find out about MRC data on water quality, and to find in-region partners to explore how best to set up a river observatory on the lower Mekong River.
7. Nguyen Hong Quan will email to Bernhard P-E (behrenbrink@whoi.edu) to discuss about some opportunity on collaboration on water quality management (e.g. source tracing, exchanging students).
8. Erland Jensen and Van Pham Dang Tri (CTU) will keep communicating to figure out possibilities to work together on water and sediment changes along the Mekong and livelihood of local residents
9. Ilya Zaslavsky and Van Pham Dang Tri (CTU) have worked with US Embassy to figure out if there is any possibilities to execute a project on developing a water-database for different provinces in the Mekong Vietnamese Delta. They are also looking forward to work with Cambodian partners to apply CUAHSI HIS in Cambodia as well. Ilya to coordinate with Jon Pollak from CUAHSI WDC.
10. Bernhard P-E (behrenbrink@whoi.edu) and Van Pham Dang Tri (CTU) will work with on possibilities for funding to execute a project on student-exchanged program and projects on water quality and sediment transport along the Mekong.
11. Nguyen Hieu Trung (CTU) and Ashutosh Mohanty will work together to figure out the possibilities to integrate the remote sensing data, surface water modelling and crop-

- water modelling on food security issues in the Mekong Delta (under the context of climate change and the socio-economic development of the Mekong Basin)
12. Nguyen Hong Quan and Ilya Zaslavsky will work on (1) Proposal on decision support system including CUAHSI, dataturbine, modelling etc.; (2) Development Experts catalog in LM regions (+US). Ilya will coordinate with Jon Pollak from CUAHSI WDC
 13. Tracy Collier will look into how water quality issues are being recognized within the MRC structure, if at all, and also within APEC Oceans and Fisheries Working Group and ASEAN. He welcomes any inquiries from workshop participants about water quality issues they want to know more about. He is requesting that workshop participants provide him with some contacts in the region that he can ask questions of, regarding water quality. His email address is collier.psp@gmail.com
 14. Steve Wolff will follow up with Mr. Kyi Thar Ko regarding networking research.
 15. Nguyen Kim Loi and Brian Wee to discuss webinars in the next few months with a focus on aquatic measurements
 16. Tran Ngoc Anh is really interested in SERVIR science application for decision making, and is looking for a chance to develop the application in Mekong similar to applications in East Africa. This system might also be potential for other catchments in Vietnam.
 17. *Van P.D. Tri is ready to have **beer-conservation** with guys who want to visit the Mekong. whenever the chance is up.*
 18. Jo Briones will follow up with Sir Ashutosh for possible tie-ups/application of SERVIR with mapping for hydromet hazards. Also willing to connect with institutions who want to help create/improve/validate systematic frameworks for flood/storm surge/landslide forecasting and mapping (e.g., project NOAH website noah.dost.gov.ph), especially Sir Veerachai and Sir Surajate and Lower Mekong institutions. Will also contact participants for possible collaborations (my email address is jo@noah.dost.gov.ph).
 19. Contact the US GoV Office OES: Van Laningham, Neevy P, Oceans and International Environmental and Scientific Affairs (**OES**). [<mailto:VanLaninghamNP@state.gov>], Currently working with MRCS on providing products and services to MRCS. Perhaps it can be extended to the whole LMB and perhaps be funded for a longer period?
 20. Jon Pollak to investigate if/what type of support CUAHSI could provide for a follow up meeting
 21. Bernhard Peucker-Ehrenbrink (behrenbrink@whoi.edu), Ilya Zaslavsky and Erland Jenson will work on submitting a PIRE (Partnership for International Research and Education) pre-proposal to NSF proposing a joint research and education program with focus on the Mekong River delta.

US-US Collaborations/Activities

22. Jon Pollak to contact Bernhard Peucker-Ehrenbrink about making Global Rivers Observatory data available in CUAHSI HIS.
23. Tracy will also connect with Ilya on several science and social surveys that have recently been conducted in the Puget Sound region. He is interested to see if PSP can derive additional information from the survey data already collected, including analyses of regional science networks and an expert elicitation leading to a ranking of pressures system-wide.

24. Don Middleton will connect Lindsay Correa with visualization researchers at UC Davis.
25. Lindsay Correa and Ilya Zaslavsky will connect on survey analysis for the Delta Stewardship Council

Technical/Networking Issues/Activities

1. Dale Smith to follow up with Ashutosh and NASA/SERVIR to make sure that the Kenya R&E Network (KENET) works to get the NASA regional SERVIR hub at RCMRD in Kenya connected to the global Research and Education Network
2. Dale Smith to follow up with National University of Laos network engineers to discuss router configuration for the Lao PDR connection to TEIN.
3. Dale Smith to follow up with Mr Kyi Thar Ko of Yangon Technological University (YTU) to finalize details of the YTU campus network improvements
4. Dale Smith will try to track down why traffic between HAIL in thailand and ftpprd.ncep.noaa.gov goes on the commercial Internet rather than the research and education network

Appendix 4: Survey

Workshop Evaluation

Please take a few minutes to complete this workshop evaluation to help us measure the effectiveness of this workshop in meeting its intended goals. The responses received from this evaluation will be aggregated. Please indicate (below) if you would like your individual comments kept anonymous. Please return this evaluation form to a workshop organizer before you leave. Thank you!

Name:

Affiliation:

Country:

Please put an X in the box if you would like your individual comments kept anonymous:

Yes, please keep my individual comments anonymous

For questions 1-5 circle only one answer:

1. How would you describe your understanding of Cyberinfrastructure and Water Resources in the Lower Mekong **before** this workshop?

- a. Knowledgeable
- b. Somewhat knowledgeable
- c. Unknowledgeable

2. How would you describe your understanding of Cyberinfrastructure and Water Resources in the Lower Mekong after this workshop?

- a. Knowledgeable
- b. Somewhat knowledgeable
- c. Unknowledgeable

3. Did this workshop inform you of new opportunities to collaborate with scientists and/or network specialists in the Lower Mekong Region?

- a. Yes
- b. No

4. Did this workshop inform you of new opportunities to collaborate with scientists and/or network specialists in the United States of America?

- a. Yes
- b. No

5. Did you meet anyone that you would like to continue to talk with about opportunities to collaborate with after the meeting?
- a. Yes
 - b. No

For the following questions 6-10 please provide a short written response:

6. How well did the workshop format (plenary sessions, network and science tracks, poster session, tea breaks, break out discussion groups) facilitate opportunities for you to learn new information, build new relationships and identify opportunities for collaboration?

7. Please list at least two things you learned about Cyberinfrastructure and Water Resources in the Lower Mekong Region that you did not know before this workshop?

8. What collaborations would you like to build or further as a result of this workshop?

9. How would you like to follow-up with potential collaborators after this workshop (for example, email, and on-line forum, teleconference, in-person meetings)?

10. As a recommendation for potential follow-up workshops, what, if anything, would you change about this workshop?

Other comments I would like to share with the organizers:

Appendix 5: Survey Results

Total respondents: 57

Networking track respondents: 20

Science track respondents: 36

1) Knowledge before workshop:

Knowledgeable: 8.7% (5)

Somewhat: 59.6% (34)

Unknowledgeable: 31.6%(18)

2) Knowledge after workshop

Knowledgeable: 59.6% (34)

Somewhat: 40.4% (23)

Unknowledgeable: 0

Respondents more knowledgeable after than before: 80.7% (46)

3) Inform you about collaborations in Lower Mekong Region?

Yes: 100% (57)

No: 0% (0)

4) Information you about collaborations in USA?

Yes: 93.0% (53)

No/No response: 7% (4)

5) Did you meet anyone you'll continue to talk with after meeting?

yes: 94.7% (54)

No/No response: 5.3% (3)

9) How would you like to follow up?

Email: 68.4% (39)

Online forum: 35% (20)

Video or teleconference: 8.7% (5)

In person meetings: 17.5 (10)

6) How well did the workshop format facilitate opportunities?

- Need to cooperate between scientists and network engineers
- Good
- Excellent
- All good. Thank you
- A good chance for me to meet, talk, and share information with scientists and network specialists from the US and the lower Mekong region
- Everything good

- I met many researchers who helped me resolve difficulties in my research
- All most good
- I joined network track but I also want to joined some science session
- Very well
- Very well format for this workshop
- Very well
- Quiet well
- This is very good workshop, I can learn many things with useful information. Thanks to organizers and partnership
- The place is not quite good
- The workshop is interested
- Very well
- As well as might be expected, given the disparate communities attending. The morning plenaries are a good idea – though execution faltered at times – but a plenary specifically on the regional and/or US cyber infrastructure would have left us networking types feeling less like 2nd class citizens
- In my opinion the workshop format give me a very easy way to approach the new information. I have got some knowledge to have a full view about the water resources in LMR
- The workshop format is well organized. It provides the opportunity for participants to build new relationships for collaborations
- Worked pretty well, too many long talks, not enough time for group discussion and networking
- Very good with the panel session the split into 3 tracks
- It is pleasure to me, being open, learning atmosphere. Nice!
- Good. The poster session was great.
- More discussion forums would be nice
- Plenary session and science track
- I really enjoyed the breakout discussion groups because while it provided some structure for conversation there was still room to allow the conversation to progress organically
- The workshop helps me a lot in knowing new things and where to go if I have problems in the work on water resources and networking, especially the satellite data and sensor network
- It gave me great insight into how service focused people think about problems
- Great. Some new information I have learnt and knew more people in the same and related field of studies. The new relationships were built but the opportunities for further collaboration still not clear.
- The arrangement of the workshop is well done
- These types of workshops are always difficult, not knowing who would be active. In hindsight, more time at breakouts would be good. But overall, there is good conversation
- Very good
- Ok. Well done
- I liked the format. In retrospect, I would have liked to have more in-region speakers

- I have learnt new information, build new relationships in plenary sessions and science tracks and the breaks also
- The science track give me opportunities to learn new information, also build new relationship for collaboration with the scientists in LMR and US
- The plenary sessions were very informative. The poster session and lightening talks were the best, though
- The format worked well
- Very nice
- The content format of this workshop is nice. The presentations mainly focus on the projects in the region and related ones in other regions, I would love that the future events can have one or two sessions to discuss about the new research findings in the region.
- This workshop format is very good. I learnt new information. I hope of building new relationships for studying Mekong river.
- It was very good organized
- It is professional, very good job
- The workshop provides a good opportunities to know the others
- The sessions were able to expose the challenges the lower Mekong region, the Philippines, and the USA face, as well as the progress in science and technology, o we can connect and relate on the same level
- For the plenary sessions, I got a lot of new information about tools, models, etc. For break and discussion, poster session, we can build a new relation
- Discussion groups is good way to communicate with other people because it is small group be very people can talk
- It worked well for me. I think exposing the network engineers to more of the science barriers is also valuable, but understand the constraints of priorities, goals, and time
- It has gone well so far. The important thing for me is to know what others are doing and to know who should I talk to after the workshop
- Quiet well. I wish we had had more opportunities to discuss in small groups potentials for future collaborations. I think the US side was too dominant
- The breakout sessions and meal times provided positive experiences to meet others
- Good
- Everything is fine. The breakout sessions should be a bit longer

7) List 2 things you learned and did not know before the workshop

- about virtual lab and other networking strategies
- Network layer; Network design
- How to built vlan
- Design a new network; building a relationship
- Basic network engineering knowledge; Cyberinfrastructure and its role in supporting science and challenges
- Good I know about network, router; have many knowledgeable
- Open and free data, sharing data; food security

- Network design; network monitoring and management; importance and role of the NREN in supporting science
- Data collection and manager system; REN role to activities
- The importance and role of the NREN in supporting science; cyberinfrastructure challenges
- Scientists research from usa; mostly bas on ISOTOPIC
- Mostly base on ISO TOPIC; Scientist research from USA
- Water research; food security
- Research methodology; the way to more collaborators
- The most important of the networking in research
- Use cloud computing in NRENS; use cloud storage in NRENS
- Experience and guideline about campus design; guideline about larger network design
- Collaboration among regional practitioners is NOT the norm (except for networking folk); Data are hard to find and when found have idiosyncratic semantics and sparse metadata. Just like other countries...
- Food security in LMR; the river observatory systems
- The issue related to Water Resources; The institutes and people who are involved in water resources
- That the effort exists; that there is so little exchange between agencies and institutions in different countries of the LMR
- EarthCube; PRAGMA
- Global rivers; hydro desktop; cuahsi
- That HCMC is not in the Mekong watershed; That Jim Williams is retired
- Night images; Science networks
- Global look at satellite data and monitoring; metadata and data standard
- Related to natural hazards, the flow of data -> knowledge -> informing and warning the public is difficult. Trust is an issue; The countries in the region do not have common, standardized GIS data
- Challenges in networking and managing of water resources in LMR; Importances of sharing information to be able to predict and respond to natural disasters
- There are a lot more insurmountable (to us) problems at the government/resources level; there are a lot of smart people everywhere
- Understanding about the components of cyberinfrastructure and the linkage among it. Using EarthCube in related to water resources
- The situation of cyberinfrastructure for research communities; how to use the cyberinfra for benefit of the researcher in water resource in particular
- Vast number of satellite data resources available (but hard to get at w/o human in the loop); The possibility of some regionwide GIS
- Network for data sharing, eg TEIN; role of REN; compute resource sharing
- That there are many active climate change initiatives going on; multiple stresses on the socio-environmental landscape
- Sharing data base; exchange scientist results and lessons learnts

- I did not know that VNU and CTU had programs that were as advanced as they are; I learned a lot about data standards and meta data and the challenges of managing data
- REN (research and Education network); New tools for water resources management; new integration about sharing data from US scientists
- Flood warning system in Thailand; satellite-base earth observations and science applications for emerging regions
- I've known how to search and collect the satellite data from many websites and the improvement of cyberinfrastructure in other regions
- NRENS are everywhere; 5 min lightening talks from 19 speakers in 90 mins can be effectively managed. I'm using it in my meeting next month (thanks for the concept)
- The extent and details of water quality monitoring
- SERVIR project; PRAGMA project; NEON project
- Possibility to collaborate with other countries to study about eh MLI region without going through MRC (Mekong city river commissions); the existing project in the region
- REN/NREN; TEIN
- HYDROSERVER; CUBE; PRAGMA
- Need to network between scientists on water resources and ICT; Many opportunities to work with USA
- Similar problems between Philippines and Mekong countries; BetweEN cyberinfrastructure needed for networking, collaboration, and info dissemination
- NCL (NCAR Command Language), Hydro Desktop, VIIRS data
- How to collaborate with other scientists; This workshop make me know a lot of network organizations and communities
- The vulnerability combined with the complexity of problem solving across the multiple countries; the challenges of having access to adequate computational resources. Some of the efforts, even with little support, were very impressive still
- Different platforms as software; Different experts
- I did not know how much (or little) water quality work had been done or is ongoing; I had no appreciation for the organizational/logistical challenges that hinder collaborations
- There are metadata tools available to develop visualizations; I now know what a research and education network is
- About the water management; How to use cyberinfrastructure good to service
- High level US scientists attend the work; demonstration of many interesting projects in US

8) What collaborations would you like to build?

- I would like my university (YTU) to be in NREN
- Network installation in my department
- I want to build web to share data
- Connect more often with NSRC team
- Support members inside an outside Vietnam about network , technical
- Collaborations are welcome for the process of Mekong

- Network trace is very useful for network; infrastructure and science track is also good for doing research
- Establish the network to exchange the data
- Network engineering
- Exploit effectively VINAREN
- Exchange experience about cyberinfrastructure for research; special in environment, agriculture, fishery
- EarthCube; PRAGMA; CUAHSI
- I would like to collaborate with institutions and people who are working in water resources and invite them to utilize the existing cyberinfrastructure
- Collaborations on regional approach to understanding and protecting water quality
- Data and Technology
- Education exchange; Water related issue – experience transfer; water quality programme; pilot projects
- Expand the number of users for NOAA satellite data and meteorological products; Introduce fishery agency to VIIRS boat detections
- LMR monitoring; LMR visualization
- Data platform among lower Mekong region and USA
- Data sharing within the region that can transcend political borders
- HAIL, NASA, CuaSHI, UCSD
- Would like to know how IU can help networks like VINAREN, maybe through closer work with TEIN
- After this workshop, I'd like to keep learning about cyberinfrastructure and need many advice from the scientists and/or network specialists in the LMR and USE. Not only hop in taking more knowledge and using infra/data from APAN. I'd happy to share and exchange data/experiences to others
- In field of cyberinfra for researchers
- Talk with folks about a common software core
- Share data each other
- Share water observation technical protocols
- Changing of natural resources related with water resources monitoring by apply GIS and remote sensing tools
- I want to work with NASA/SERVIR to get their in-region offices around the world connected to the global R&E network
- I hope that we will have a chance to collaborate with NEON to conduct project in Vietnam relate with sensor network
- I would like to build collaboration in assessment of hazards among our regional and I can contact other participants as a result of this workshop
- HAIL, Min of water Laos, Cambodia, Various universities
- Collaborations with Ho Chi Minh university and Cantho Univ
- Conducting joint training and research projects
- I hope to collaborate in the following study: to build a shared computing center for the MLR; To study the impact of monsoon activities in the region

- I would like to study forecasting flood, drought, salinity intrusion, and climate change in the Lower Mekong Region
- Collaboration researches; exchange experiences with the other universities and network institutions
- NOAA-NGDC
- Looking for more collaborations with USA scientist to solve problem {cant read} Mekong river
- Comparisons and improvement on forecasting/hazard mapping methodologies, funding opportunities, publicity opportunities
- I can contact a lot of researchers from Lower Mekong and US, further collaboration.
- Develop scientist working group in national level and cooperate with regional level
- Given comments from the regional folks, I think one of our (NCAR's) data analysis and viz workshops could be quite valuable – if we could figure out how to fund it; I wonder if UN/WMO could help any – IPCC as well
- Research projects (including staff and student exchanges) with research units in the region and from the US
- I would like to explore the possibility of forming a network of partners who want to better understand and observe water quality or – in more general terms – the biogeochemical functioning of the Mekong river system
- Opportunities to use online tools I learned about at this workshop and opportunities to be trained on using them; Opportunities for Delta comparisons – Mekong and CA Delta
- Set up the meeting only for LMIs country for exchange more experience and take more case study of each country
- Dr. Ilya on further application of CUAHSI; Dr. Bernard on water quality pollution tracking

10) Recommendations for follow up workshops?

- network track is difficult to follow: with beginner had to understand too many new things. With network guy: too many basic information known already
- well organize
- good workshop
- more advance knowledge of networking
- how to use cloud computing and storage in NRENS
- Cyberinfrastructure should be an organic part of the program. And not just networks: HPC, cloud, grid, data stores, etc.
- Have some demonstrations in the workshop
- See above (Worked pretty well, too many long talks, not enough tie for group discussion and networking)
- Already in good format
- Taking more talk on local examples
- Recommend holding the workshop on a boat plying the Mekong
- More LMR involvement in discussions
- The agenda would be change some, it would be have side visit in the program

- I really like the idea of having an open google doc that participant can edit... it might be interesting to set it up at the beginning of the workshop o see what ideas come up throughout the whole week
- It isn't always clear what the relation between science and cyberinfrastructure might be. Maybe some presentations that are joint with a science perspective and CI perspective on the same issue
- Should invite people fro water resource management organization and some policy-maker to listen
- Next step: more workshop less lecture! This was a great first step, need a defined SECOND step
- Science, research, and management should be added more (because this workshop focused much on network and data
- Demos be parallelized poster-style
- More case studies and existing observation should be add more in agenda
- Everything good; thanks for everything
- For science track: please call for talk with some topics and will let all participants have a chance to talk to share and learn together
- I think this workshop is very effected to our region and I look forward other workshops in this region like this
- Make the workshop a 35 or 4 day event
- Once priorities, needs, and projects are identified, have more focused workshops with hands-on sessions
- Pls keep me informed of potential follow-up workshops
- More active roles of the regional experts; should have a concrete outcome/target to reach; to be able to clearly identify next steps
- The applied research for sustainable development and adaptation to climate change
- Try to contact with the potential collaborators
- Focus more on data sharing among researchers and government officials
- More social events? Overall conference was great; more ways to bridge language barriers
- We should know other track (network track) (overview is fine)
- Presentation is too much; No game for relaxing during meeting; there should be outdoor studying
- This workshop was just great, given its goals. The major challenges I see might suggest a workshop of higher-level participants who can influence funding and intergovernmental collaboration
- The Mekong workshop should be organized in the Mekong region
- Engage, at an early stage, more in-country partners in the workshop planning. Have more interactions/discussions - less frontal delivery (lectures)
- Provide more structured ice-breakers on the first day, shorter presentations and more ecology-focused presentations
- Please invite the cyberinfrastructure of each country to provide support the water and disaster management; Please arrange TEIN-3 and complete LaoREN project

- Shorten the program, eg 3 days
- More focused in the science track

11) Other comments

- I would like to make a workshop like this in my country. Maybe in my university
- It would be great if we have city tour session
- Breaking to small specific case would be well understood for non-expert participants; ppt sharing sources among participant
- Thank you for letting me participate. It has been great!
- Listing the email address was very helpful
- Hotel facilities is not so good such as internet, old
- I would like to compliment NASATI for their gracious hosting
- I learned a lot. Time well spent – thank you!
- It could be interesting to have a session/panel where have chance to talk with funding agency/decision makers from Lower Mekong regions. These people may able to clarify some issues in collaboration (eg co-funding)