

PRAGMA 39 Workshop

Disaster Management System

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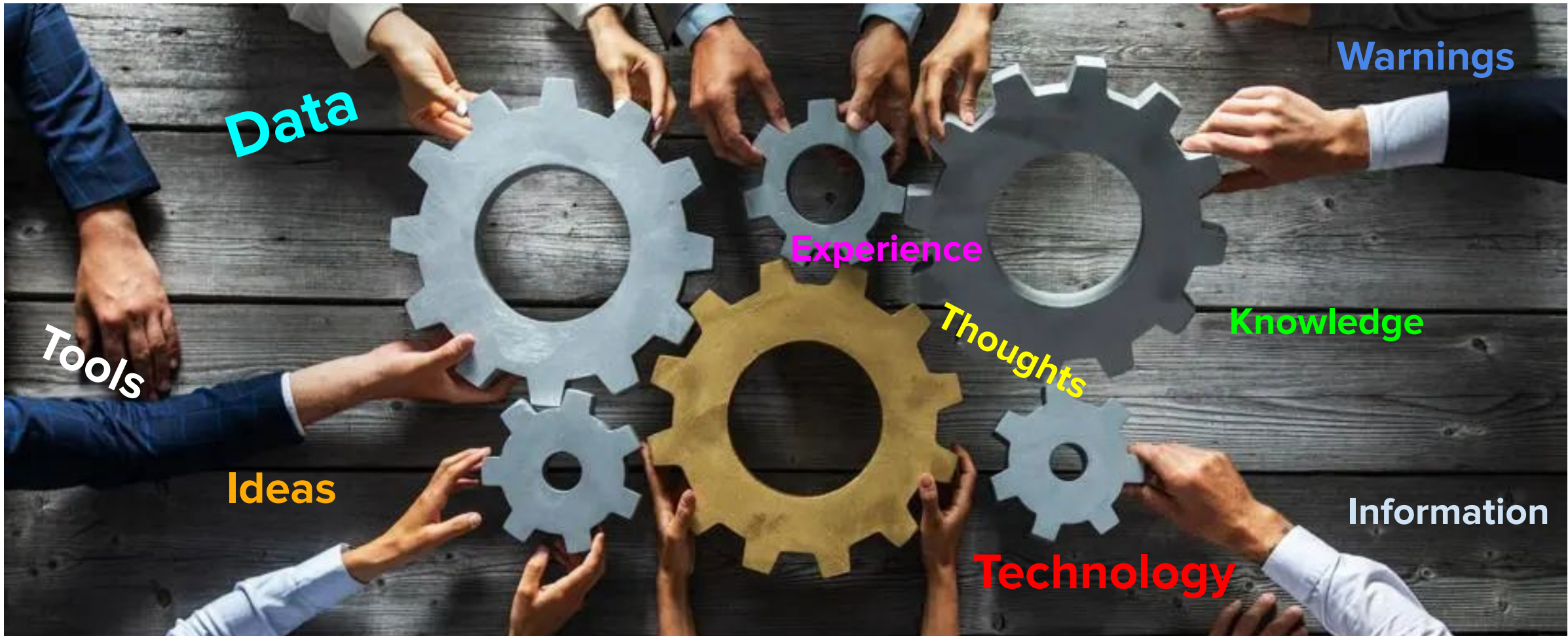
Universitas Yarsi, Jakarta, Indonesia, Jun 21 - 24 2023

“The commemoration demonstrates ASEAN’s **commitment and efforts towards disaster reduction and management**. This leads to an important end goal – to alleviate the hardship and suffering of peoples of ASEAN, who live in one of the most disaster-prone regions in the world.”

- Chair of the ASEAN Ministerial Meeting
on Disaster Management (AMMDM)

The ASEAN Day for Disaster Management (ADDM) 2021
/International Day for Disaster Risk Reduction 2021

Disaster management is a crucial international issue



Session Agenda

- Introduction to **CyberCANOE**, **SAGE3**, and the **LandSAGE** projects
- Brief Summary and Demonstration of **LandSAGE Decision Support software**
- Discussion for **collaboration in disaster management**
 - Originated from the LandSAGE project: landslide and flood
 - PM2.5, wildfire, climate change (El Niño and La Niña)
 - Pandemic, disease



Smart Amplified Group Environment

NSF Award ACI- 2004014 (UHM), 2003800 (UIC), 2003387 (VT)



**Smart Collaborative Decision Support via the Cyber-enabled Collaboration, Analysis, Navigation,
and Observation Environment (CyberCANOE)
and Smart Amplified Group Environment (SAGE)**



Laboratory for Advanced Visualization & Applications

lava.hawaii.edu

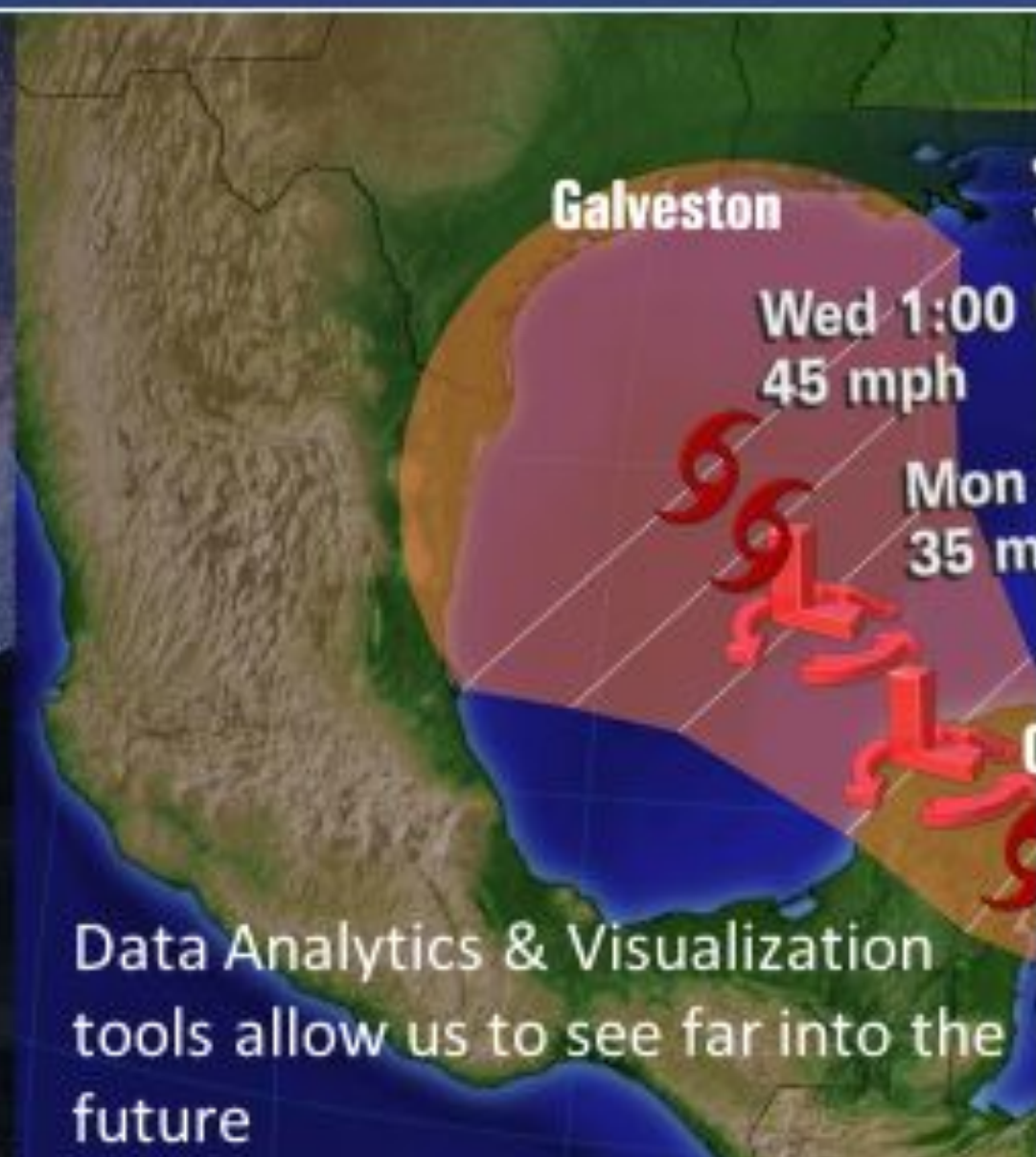
Lenses for Bringing Data Into Focus



Telescopes allow us to see deep into the past



Data Analytics & Visualization tools allow us to see far into the future

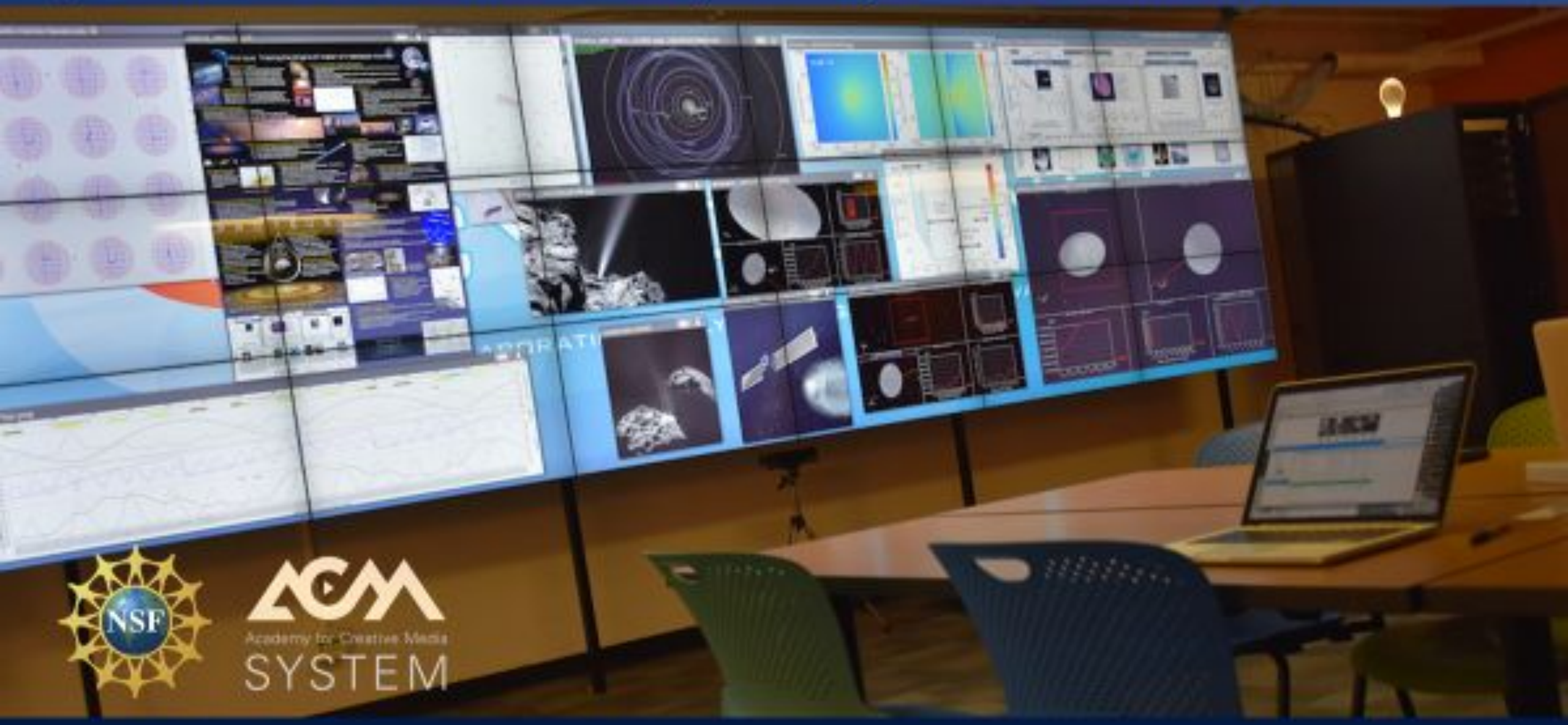




CyberCANOE:



Cyber-enabled Collaboration Analysis Navigation & Observation Environment



ACM
Academy for Creative Media
SYSTEM

The Canoe is the Island, The Island is the Canoe



CyberCANOEes allow users to come to decisions with greater speed, accuracy, comprehensiveness & confidence

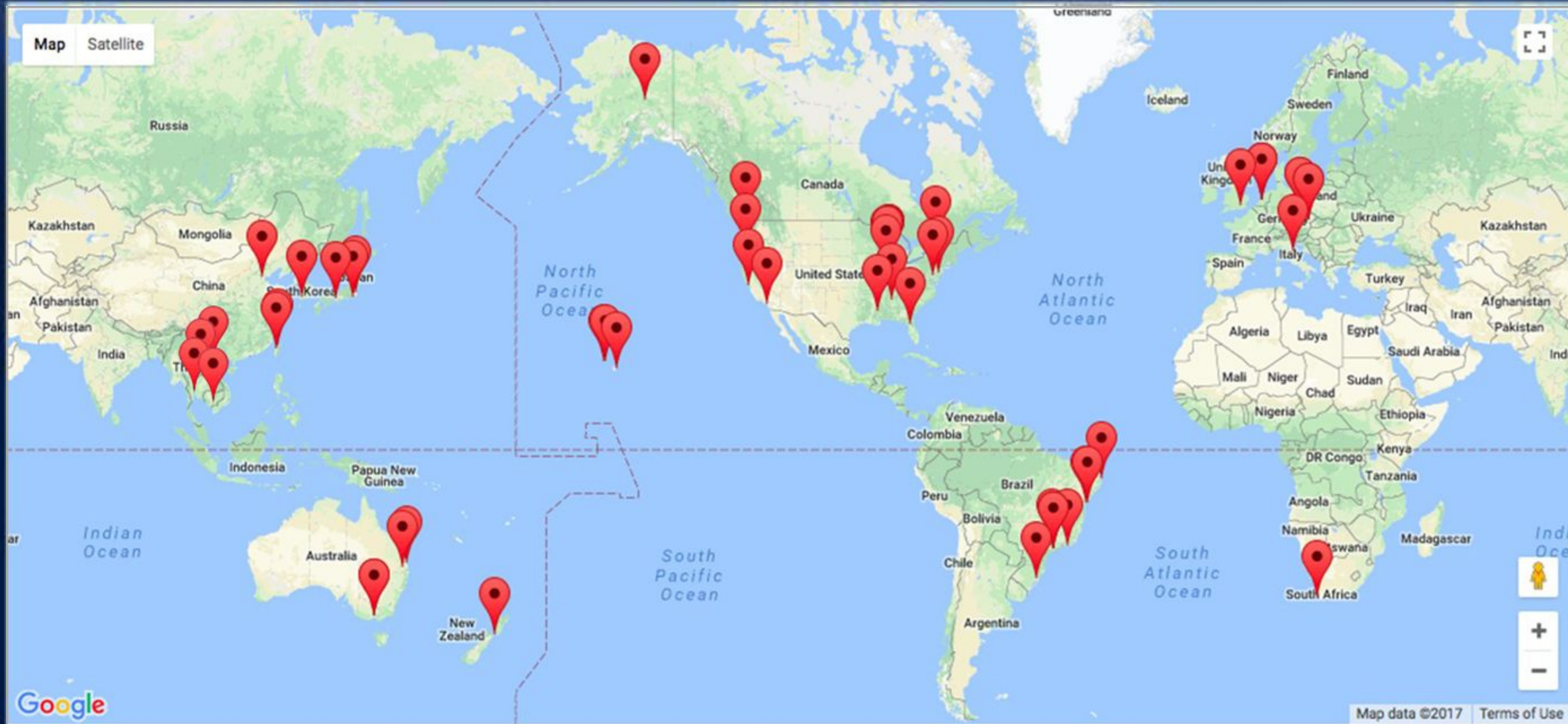
Main Types of Activities to Demonstrate

- Brainstorming
- Classroom / Presentations
- Discovery
- Collaboration



CyberCANOE User Community

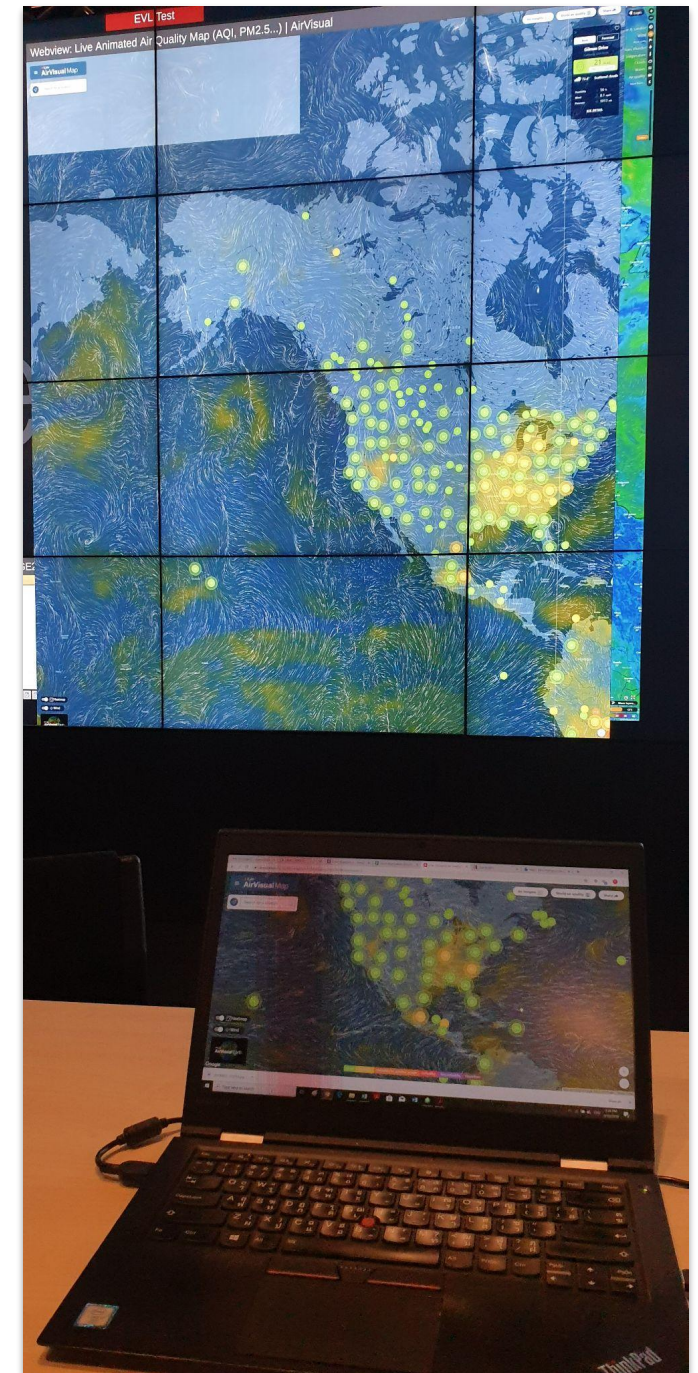
Over 17 Countries, ~800 Sites



Big Wall vs Laptop Screen



4x8 Tiles @ SDSC



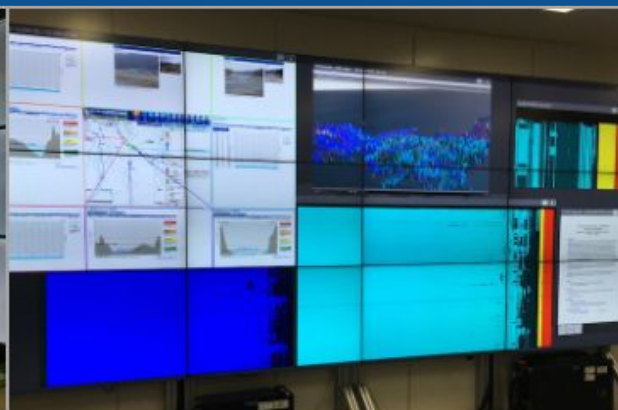
CyberCANOE User Sites Examples



AUSTRALIA, Monash Univ.,
Monash Immersive Visualisation
Platform



CHINA, Tianjin University of
Technology



JAPAN, National Institute of Advanced
Industrial Science and Technology
(AIST)



TAIWAN, National Chung Hsing University



USA, UNIV. ALASKA FAIRBANKS,
DECISION THEATER NORTH



USA, University of Illinois at
Chicago, Innovation Center



USA, Univ. Oregon, Allan
Price Science Commons &
Research Library

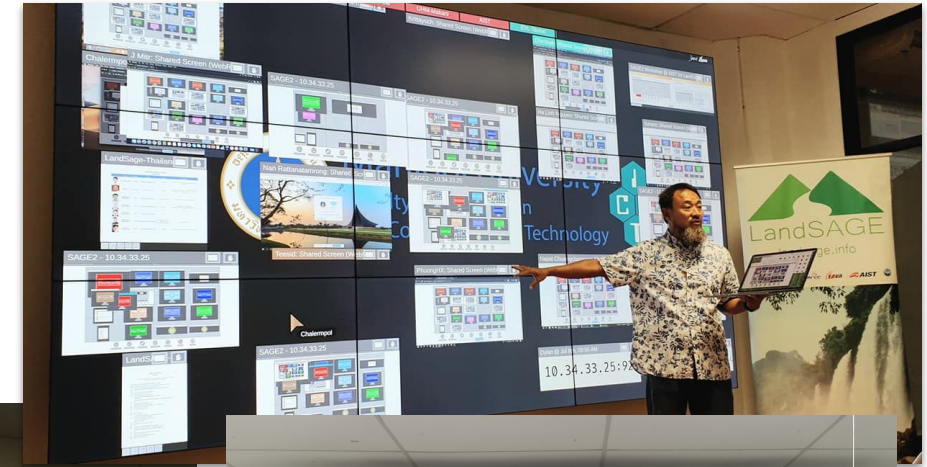
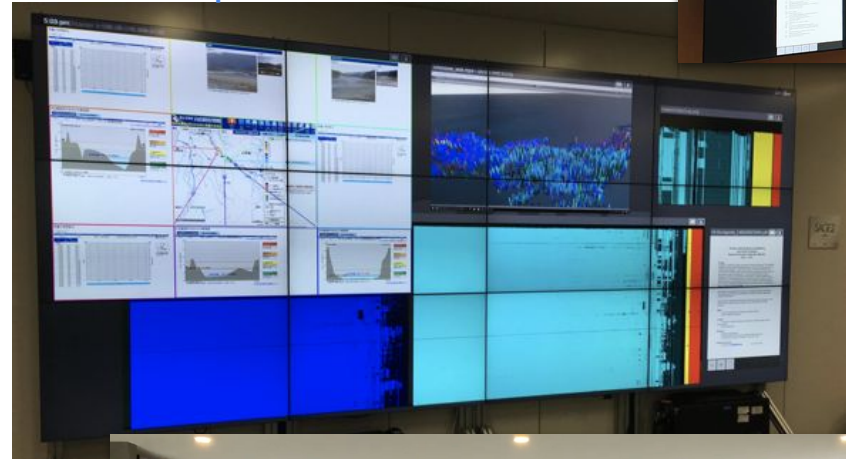


USA, Univ. Pennsylvania,
Biomedical Informatics, Idea
Factory

Asian User Communities

- **Japan**
 - AIST
 - University of Tokyo
- **Thailand**
 - Mahidol University
 - Walailak University
 - Thammasat University
- **Lao**
- **Cambodia**
- **Vietnam**
- **Indonesia**
 - Universitas Yarsi
- **Philippines**

AIST, Japan



Walailak U., Thailand

U. Tokyo, Japan

Thammasat University's Walls

Cloud Computing Class CSTU (Jan 2023)



Brainstorming session (Jan 2023)



Research lab meetings (Jan-Jun 2023)

SAGE in the World

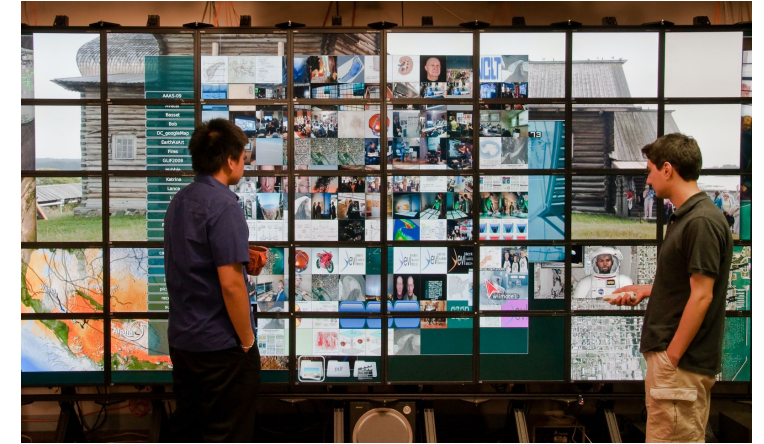
Started in 2004 as part of OptIPuter project.

Currently in 17 countries. ~4000 users, ~800 sites.

In 2017 61% of sites had 1 tiled display. 39% managed more than one. 77% of walls used several times a week.

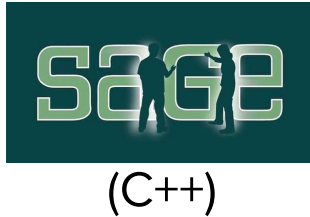
Meeting sizes ranged from 2-200, 20 on average.

Disciplines: Archaeology, Architecture, Art, Atmospheric Science, Biology, Chemistry, Civil Engineering, Communications, Computer Science, Education, Geoscience, Health, Library Science, Mathematics, Medical, Meteorology, Network Engineering, Neuroscience, Physics, Psychology, and Statistics.



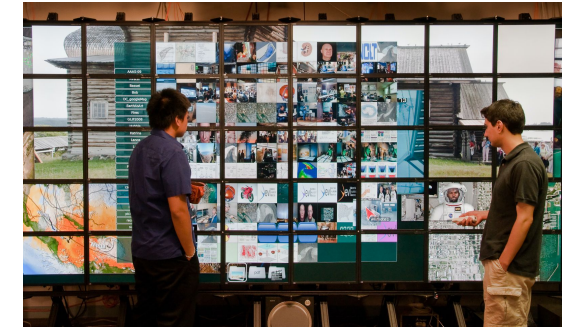
Evolution of the World from SAGE to SAGE3

2004



Compute Cluster
\$500K-\$1M
systems

Grid Computing



2014

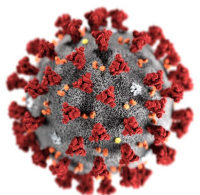


Single PC
\$100K-\$300K
systems

Science Portals &
Gateways
Cloud Computing

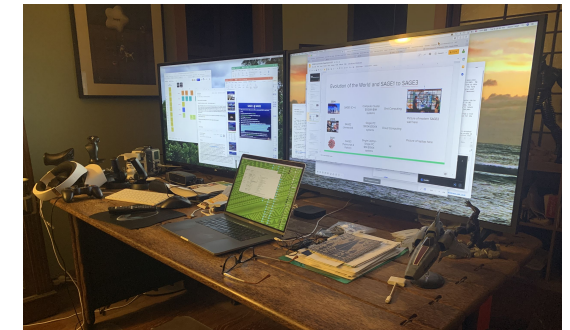


2020



Single Laptop -
Single PC
\$3K-\$100K
systems

Data Science
Notebooks,
Cloud AI &
Containers
NSF Cyber
Ecosystem



The SAGE3 Senior Team

University of Hawai'i at Mānoa - Laboratory for Advanced Visualization & Applications

- Jason Leigh [overall PI]
- Mahdi Belcaid [PI - data science lead]
- Ryan Theriot [Hawai'i software developer]

University of Illinois at Chicago - Electronic Visualization Laboratory

- Andrew Johnson [overall Chicago PI]
- Maxine Brown [PI - outreach and reporting]
- Luc Renambot [PI - software development lead]

Virginia Tech

- Chris North [PI - user-interaction / user-experience]

The SAGE3 Student Team

University of Hawai'i at Mānoa - Laboratory for Advanced Visualization & Applications

- Nurit Kirshenbaum [User-Interface and User Experience Design]
- Dylan Kobayashi [SAGEly advisor]
- Roderick Tabalba [Developer]

University of Illinois at Chicago - Electronic Visualization Laboratory

- Andrew Burks
- Krishna Bharadwaj
- Undergrads: Ese Omene, Rohan Verma

Virginia Tech

- Jesse Harden [Ethnographic HCI Studies]



LandSAGE 4

***Smart Collaborative Decision Support for Monitoring and Mitigation of Natural Disasters
(Landslides, Mudflows, and Floods) in Southeastern Asia via the Cyber-enabled Collaboration, Analysis,
Navigation and Observation Environment***

PI-Yr1: Dr. Jason Leigh, University of Hawaii at Manoa, US

PI-Yr2: Dr. Jason H. Haga, AIST, JP

PI-Yr3&4: Dr. Mores Prachyabrued, Mahidol University, TH

Future PI-Yr5: Dr. Prapaporn Rattanathamrong, Thammasat University, TH

Senior Advisor: Dr. William Y. Chang, University of Hawaii System, US

Project Introduction

- > 3300 disasters affecting ~4.7 billion people were recorded in Asia between 1980 to 2008
- Responses require a team of experts and a way to combine their data and expertise
- LandSAGE provides decision support for monitoring and mitigation of disasters in SE Asia
- CyberCANOE & SAGE lets users combine large volumes of data so better decisions can be made

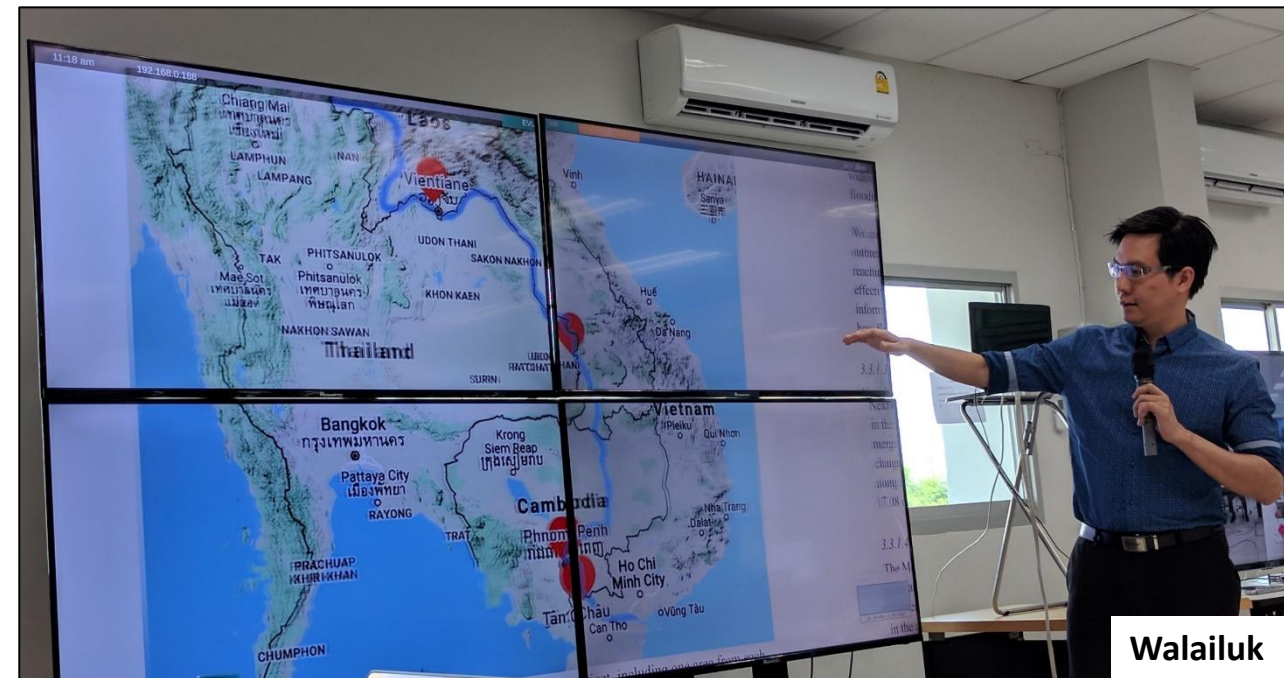
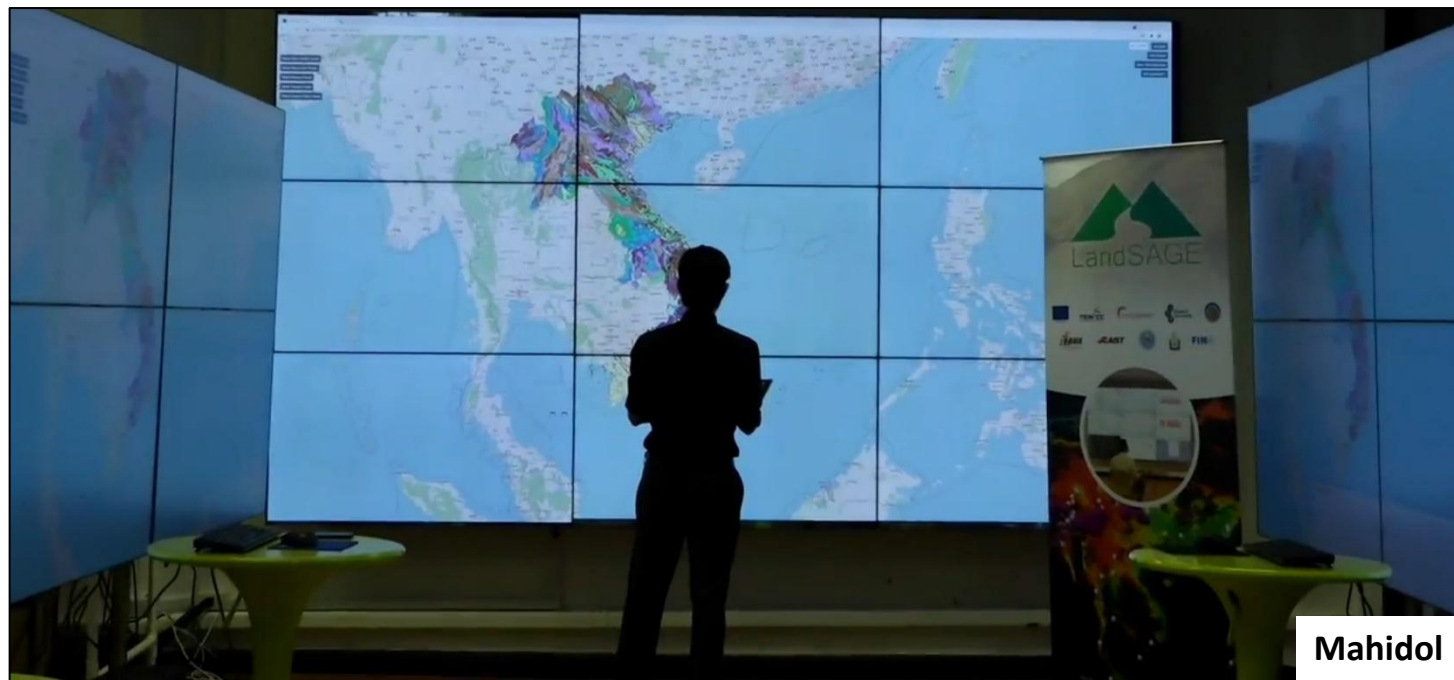


LandSAGE1 (Sep 28, 2018 – Jul 30, 2019)

170 Participants

Introduced SE Asian researchers to utilize CyberCANOE and SAGE2 to design decision support tools for landslide management and mitigation. A prototype software was developed.





LandSAGE2 (Jan 6, 2020 – Aug 31, 2021) 42 Participants

CyberCANOEes were deployed to KH, LA, VN & TH.
Additional training & tech support were provided.



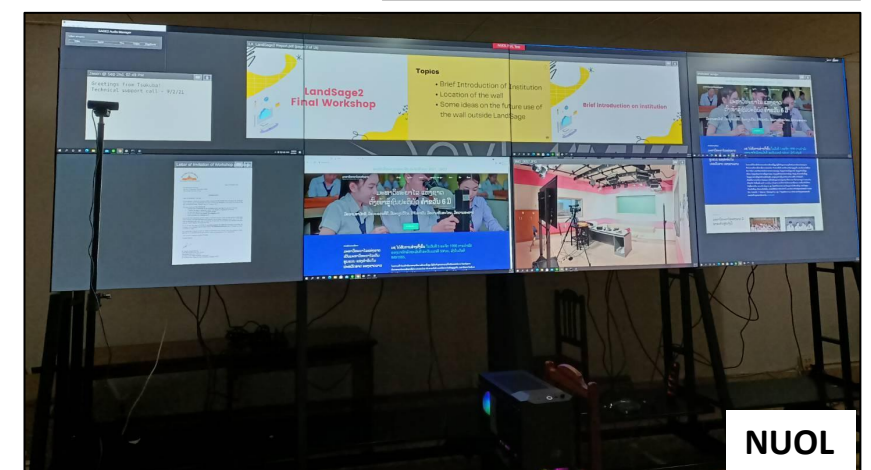
Virtual leadership meeting



Kickoff



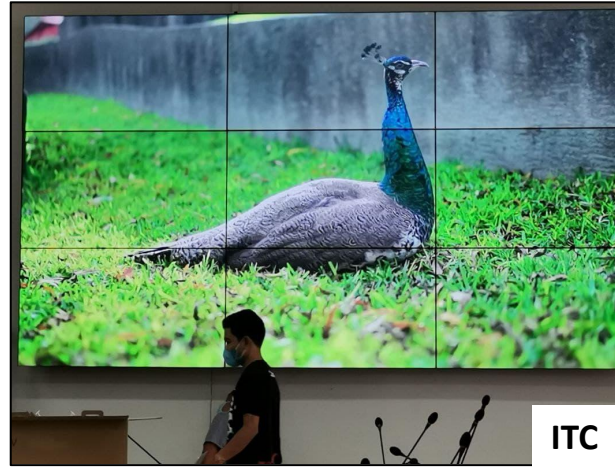
Thammasart



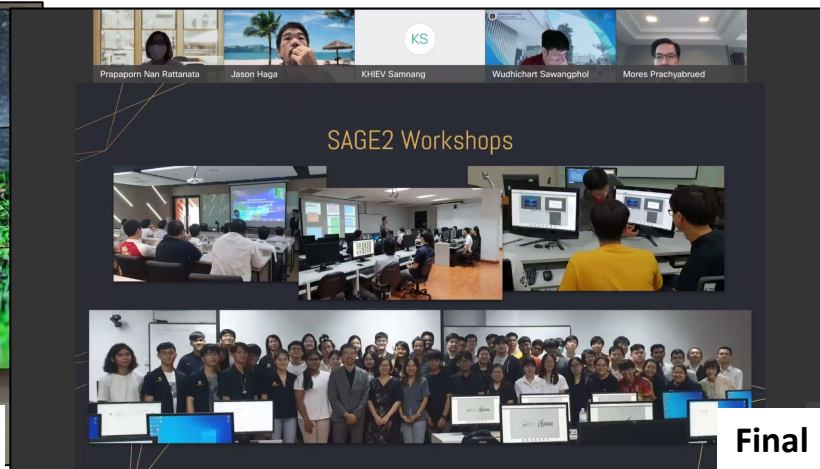
NUOL



FIMO



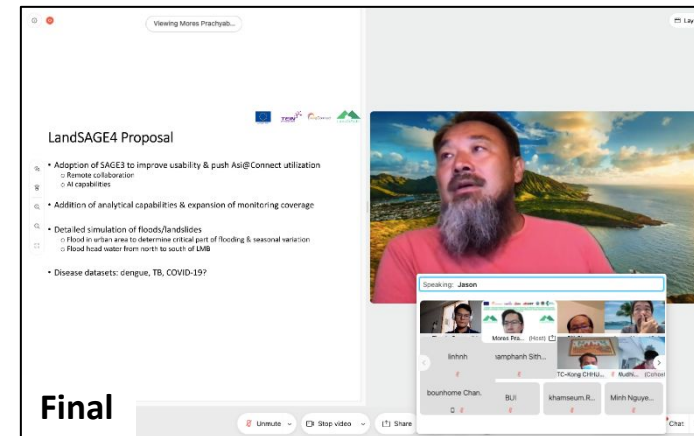
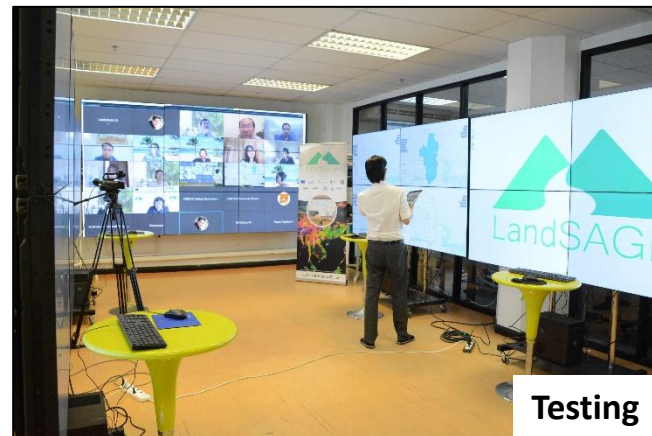
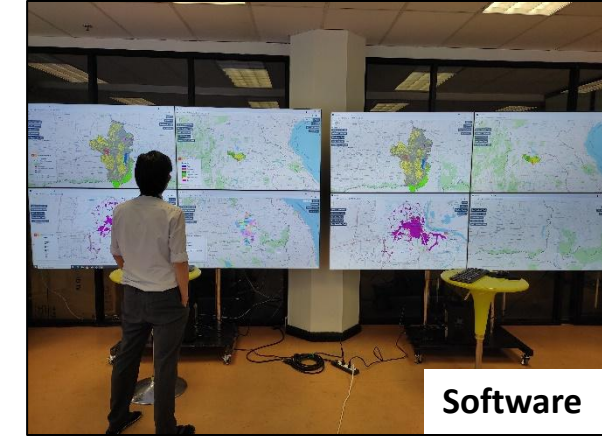
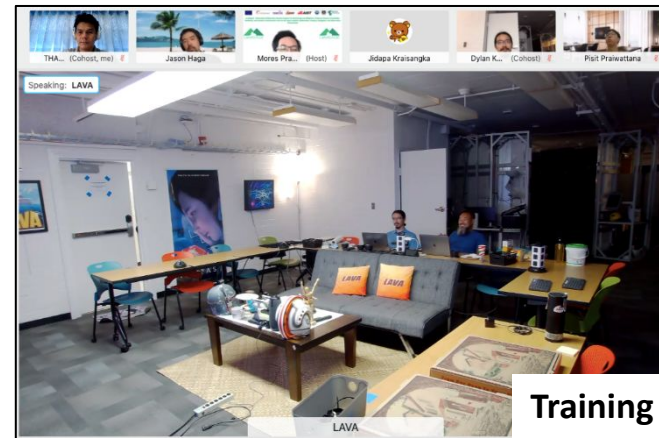
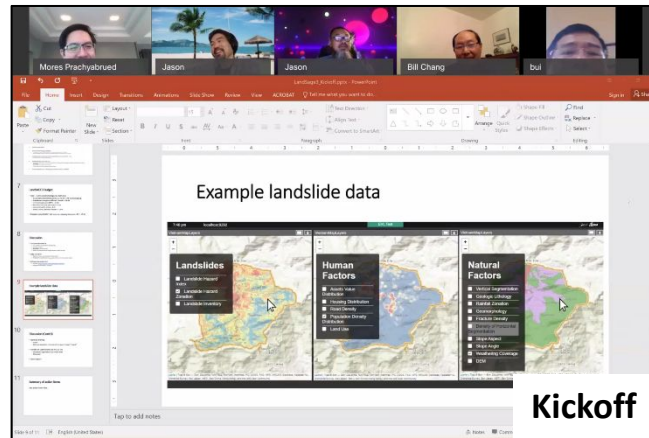
ITC



Final

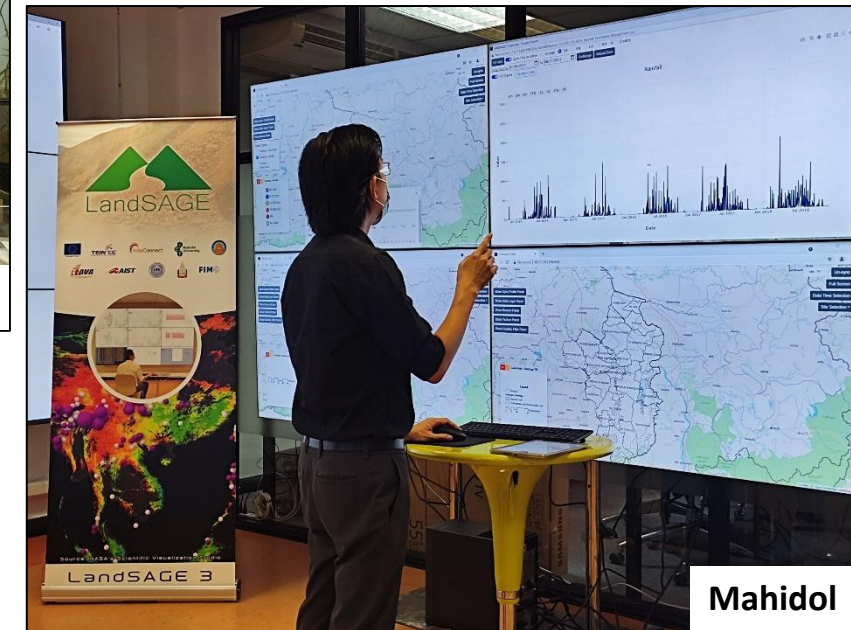
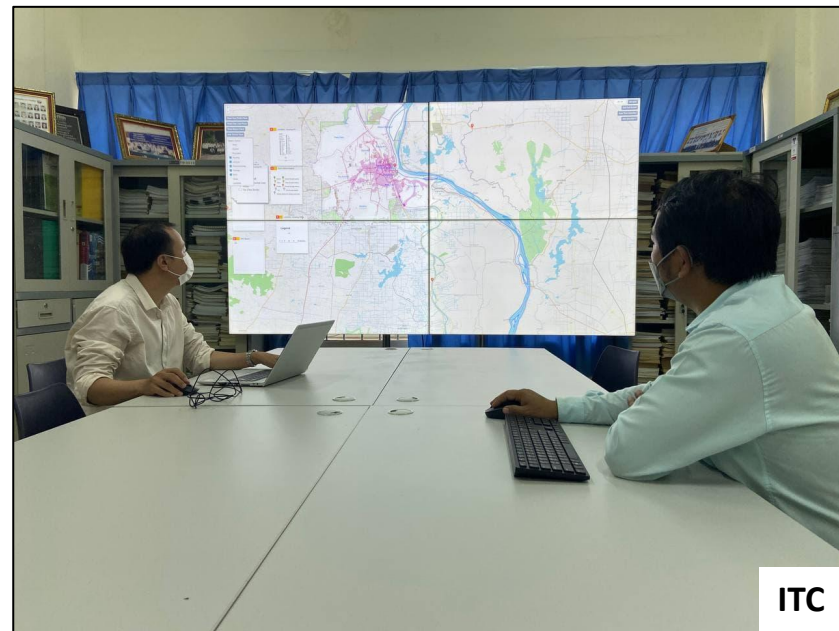
LandSAGE3 (Mar 1, 2021 – Aug 31, 2021) 95 Participants

- Developed a software enabling SE Asian researchers to collaborate over Asi@Connect's networks on monitoring and mitigation of landslides and floods in Lower Mekong, which is one of the most disaster-prone areas in the world
- MRC's strategic plans: (1) Strengthening regional cooperation (2) Better information monitoring and communication



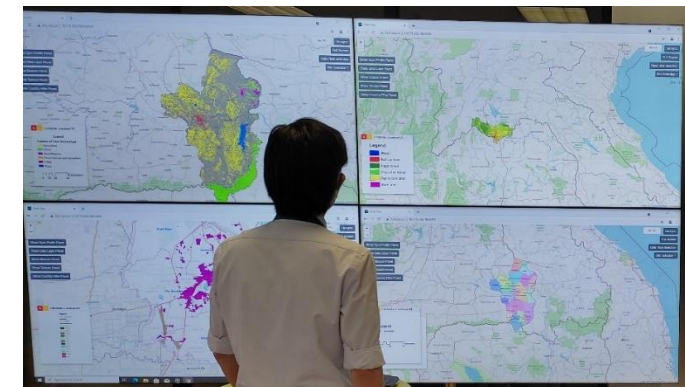
LandSAGE3 (Cont'd)

Deployed four additional (portable) CyberCANOEes in SE Asia

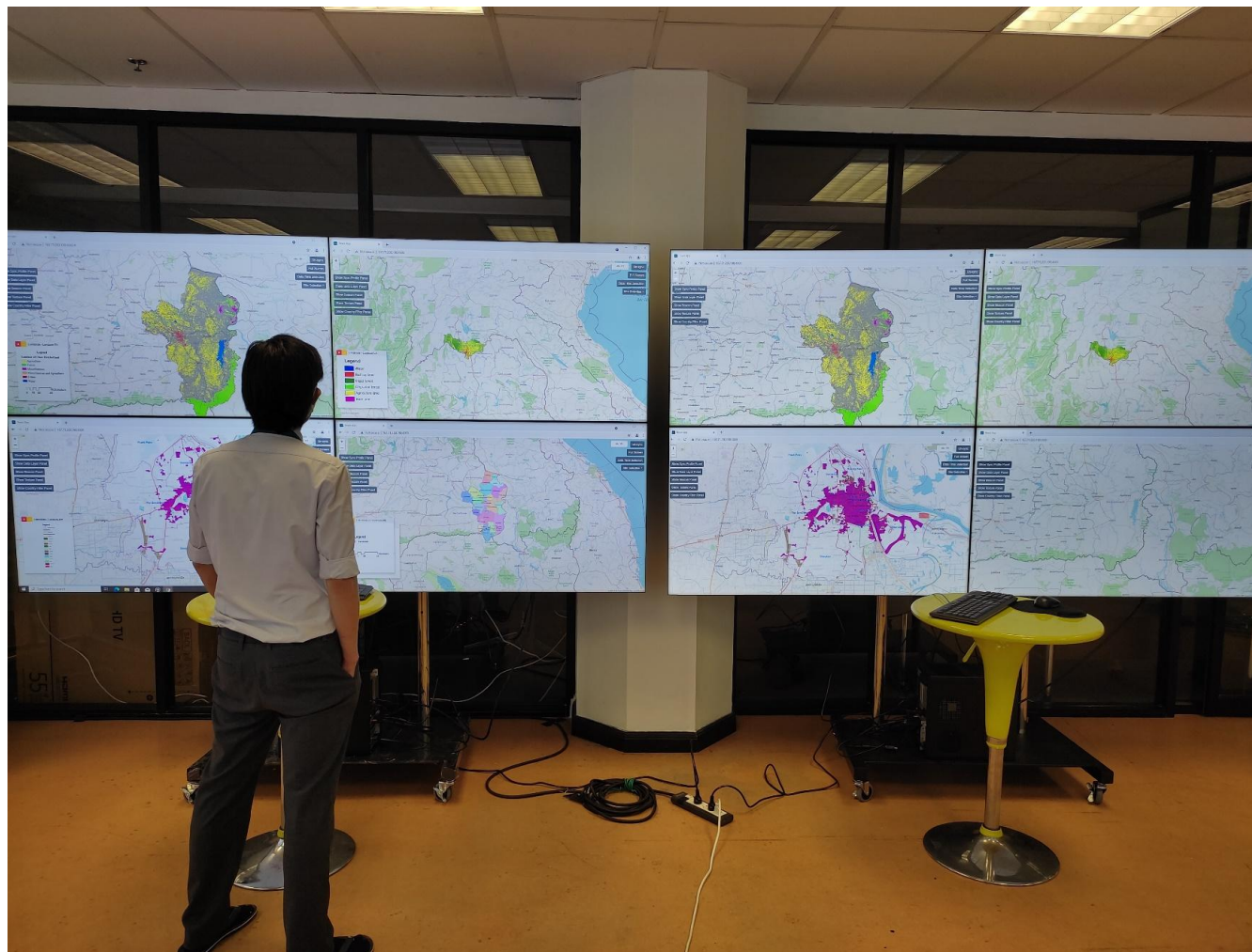


CyberCANOE Benefits

- View and collaborate over significantly more data at one time
- See both context and details simultaneously
- Multiple views can be juxtaposed, with each presenting adequate level of detail
- Facilitates observing patterns, seeing big picture in data, relationship exploration, and forming hypotheses
- Can immerse users in data because of size, resolution, interactivity -> increase user engagement
- Reduce virtual navigation (pan, zoom, switching) -> cognitive load associated with information exploration -> enable researchers to dedicate more effort to analysis
- Visualization performance scales with display size -> help user performance scale with increasing data size
- Draw conclusions faster, more accurately, with more comprehensiveness and with more confidence



LandSAGE Decision Support Software

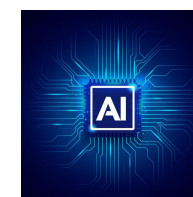
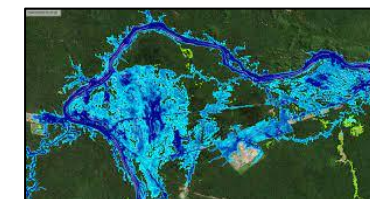


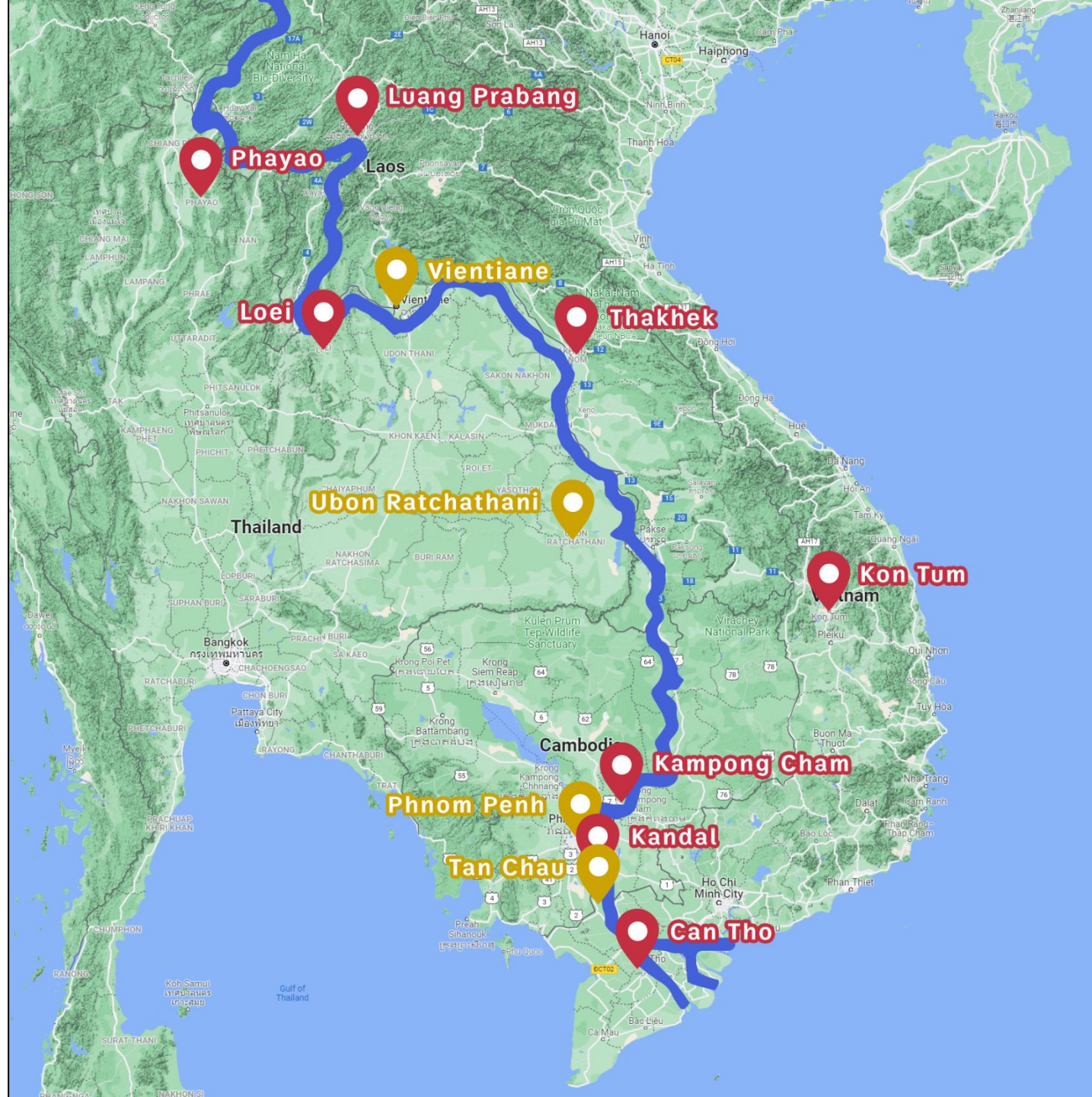
Two of the four CyberCANOEes purchased in LandSAGE3 running the LandSAGE software

LandSAGE4 (Mar 1, 2022 – Feb 28, 2023)

Goals: To develop further on the capability necessary to help mitigate disasters. To raise the recognition/adoption of LandSAGE. To expand LandSAGE's research network.

- Improving the intelligence and usefulness of LandSAGE software
 - SAGE3 “Smart”, analysis & simulation, monitoring coverage expansion
- Providing LandSAGE training, promotion, and awareness
 - Onsite workshop in each country and online lecture series
- Construction of CyberCANOE at new partnering institutes
- Seeking new research ideas, creating a plan to drive LandSAGE future





LandSAGE4 (Cont'd)

- Three CyberCANOEes were procured and deployed to Mekong River Commission Secretariat, Universitas YARSI and Thammasat University.
- In addition, a CyberCANOE at Mahidol University was upgraded to add more screens and video conferencing capability.



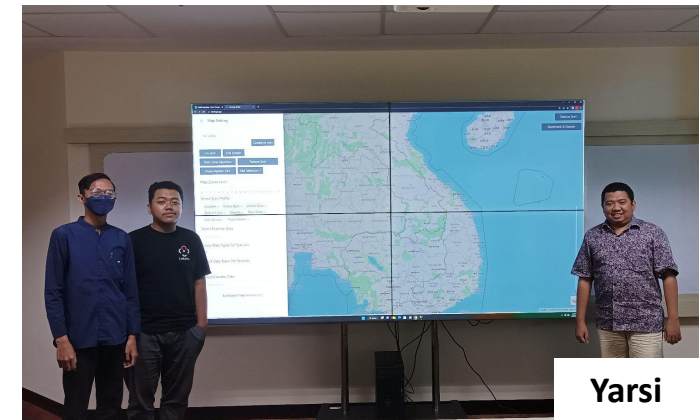
Mahidol U.



Thammasat U.



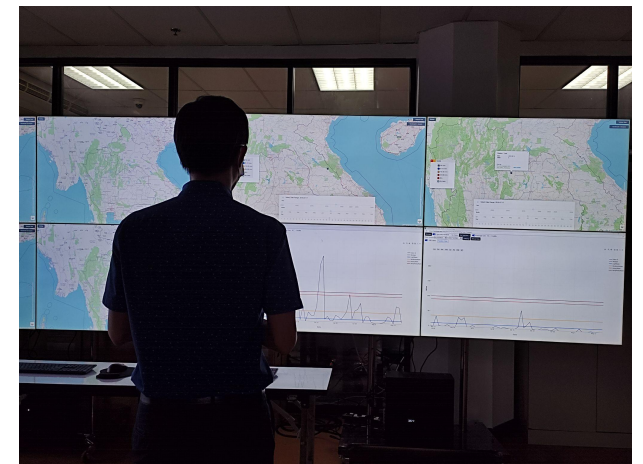
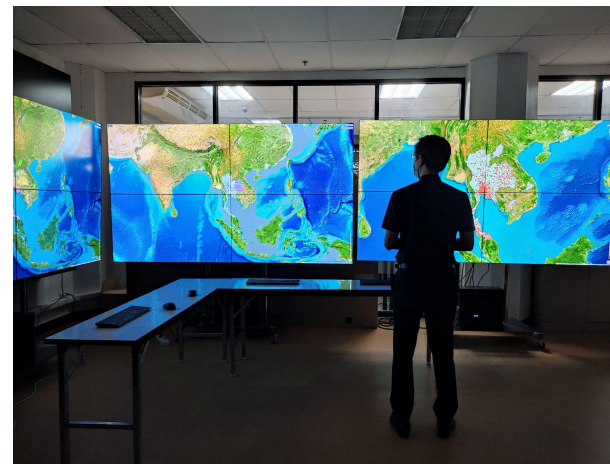
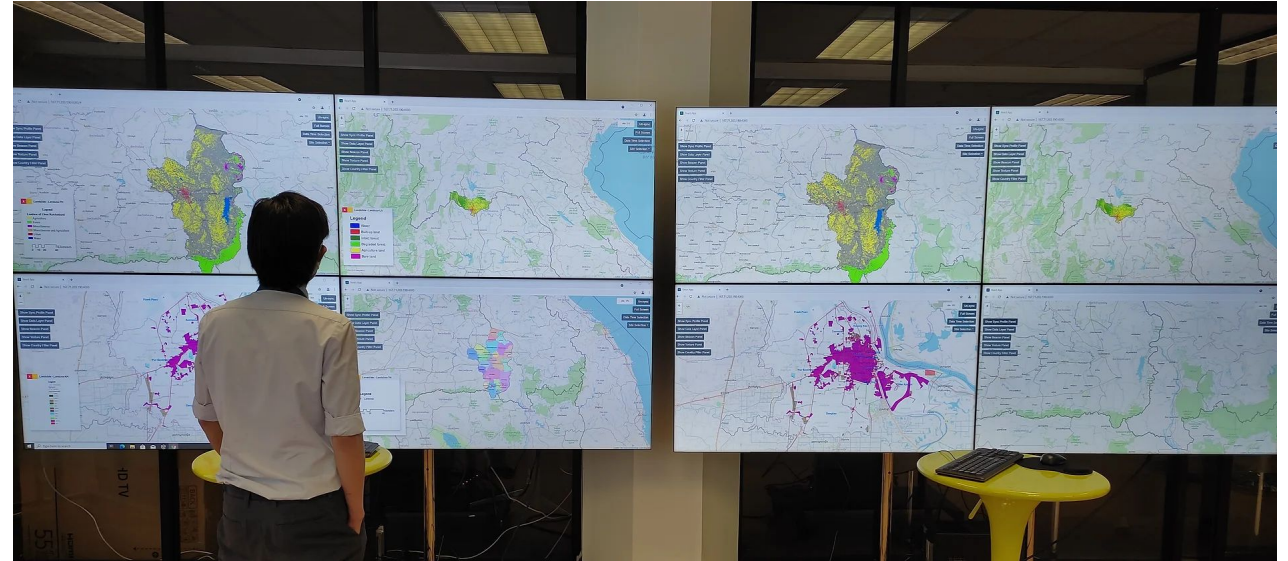
MRCS



Yarsi

LandSAGE4 (Cont'd)

- The ability to simultaneously visualize multiple flood and landslide factors on a large display wall.
- The ability to synchronize multiple views of data.
- The flexibility of the software in terms of setting up scenarios.
- Flood simulations and predictions.
- The integration with the real-time hydro-meteorological data from Mekong River Commission, Thai Meteorological Department and National Hydroinformatics Data Center of Thailand.



Impacts of LandSAGE

- Support UN Sustainable Development Goals (11 – Disaster Risk Reduction) & broaden SDGs relevant user applications
- Promote international R&E collaboration
- Deploy advanced products & services
- Increase the Asi@Connect's network utilization
- Enhance human capacity of the Asi@Connect partners
- Promote gender equality



Total CyberCANOE's deployed = 12 (+4)

Total participants = 306 (18% female)

Total countries = 8 (KH,LA,VN,TH,PH,ID,JP,US)

Total organizations = 10

SOFTWARE DEMO

<https://www.landsage.info/y4-software>







VN

VN

US

VN

JP

KH

US

LA

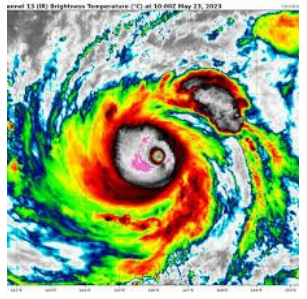
KH

LA

TH

TH

US



Discussion for Collaboration

Points for Discussion

- Interest to collaborate?
- Common disasters?
- Who has what?
- Identify short-term collaborative activities (6 months)

Thank you