Sustainable land and water development in the Mekong Basin and role of SEI in Mekong countries

Dr. Thanapon Piman

Water Cluster Lead

Email: thanapon.piman@sei,org

Stockholm Environment Institute

The expert consultation and workshop on the development and implementation of soil doctors program in Lancang-Mekong Countries

16th March 2022

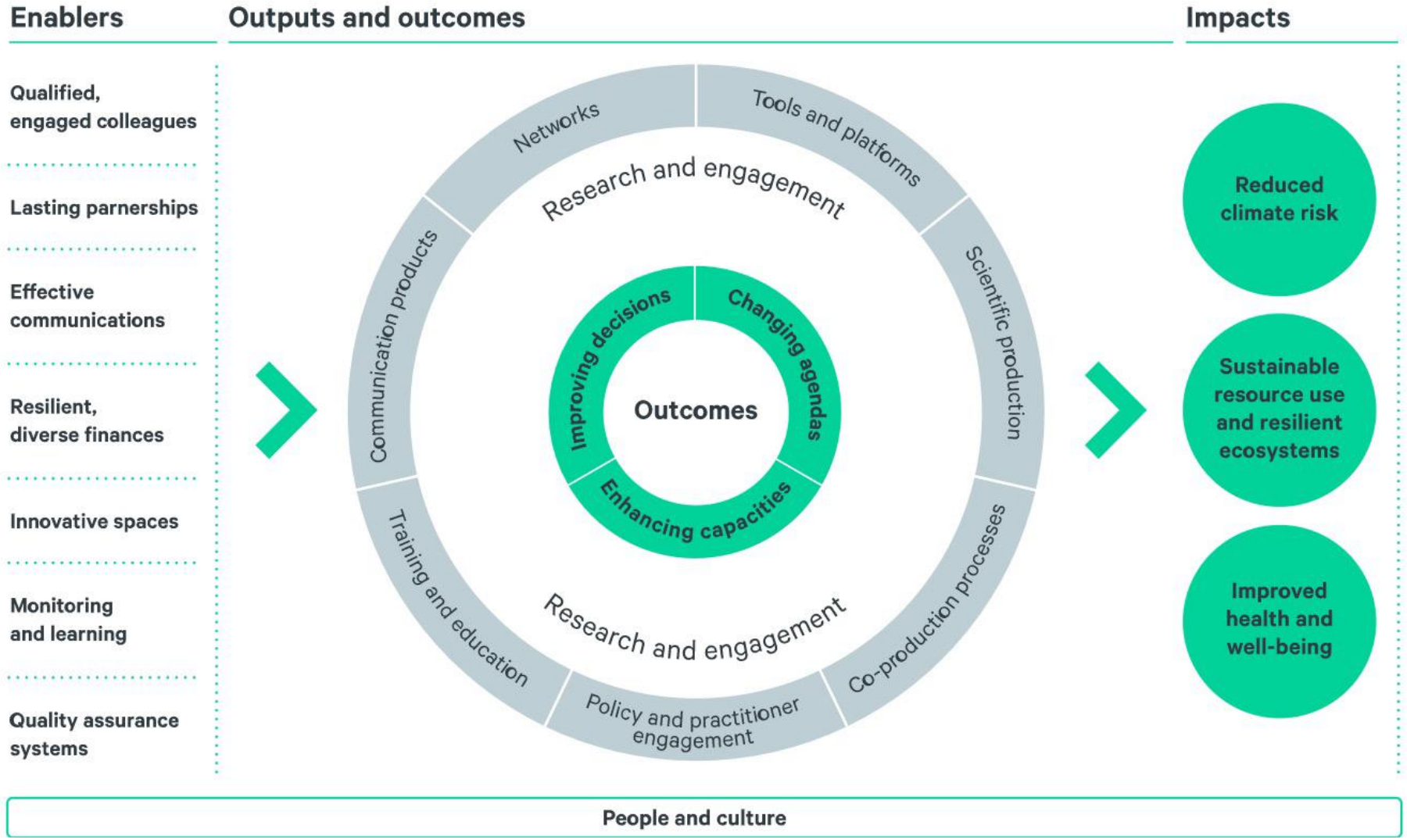
Introduction of SEI

Stockholm Environment Institute (SEI):

We are an international non-profit research and policy organization that tackles environment and development challenges.

We are a global organization that work locally to “**bridging science, policy and practice**”

SEI Strategy for 2020-24:Knowledge for action



Sustainable land and water resources development

Seven global initiatives

1) Water Beyond Boundaries
2) Bioeconomy Pathways
3) Integrated Climate and Development Planning
4) City Health and Well-being
5) Gridless Solutions
6) Tackling Carbon Lock-in
7) Gender Equality, Social Equity and Poverty

SEI Asia Centre, Bangkok, Thailand

Research focus areas

1) Water Resources Management
2) Climate Change, Disaster and Development
3) Urban Health and Well-being
4) Sustainable Agriculture
5) Gender, Environment and Development
6) Energy Futures

Existing research and programs on sustainable land and water development in the Mekong

Sustainable Mekong Research Network (SUMERNET)

Established in 2005, SUMERNET has completed 3 implementation phases, currently we are at implementation phase 4, **SUMERNET 4 All: 2018 – 2023**.

- **Diverse memberships**, with research, policy and practice backgrounds from wide-range of sectors relevant to environmental sustainability.
- Supports **policy-relevant research** and **engagement** with policy-makers, planners and stakeholders.
- **Develop capacity** of researchers in the Mekong region to produce credible and influential research
- Supported by **Swedish International Development Cooperation Agency (Sida)**
- **Stockholm Environmental Institute (SEI)** as the host of the **Secretariat**

SUMERNET is a regional research network for sustainable development in the Mekong Region through strengthening knowledge-based policy processes

SUMERNET

SEI Stockholm Environment Institute

Sweden Sverige

SUMERNET 4 ALL 2018-2023

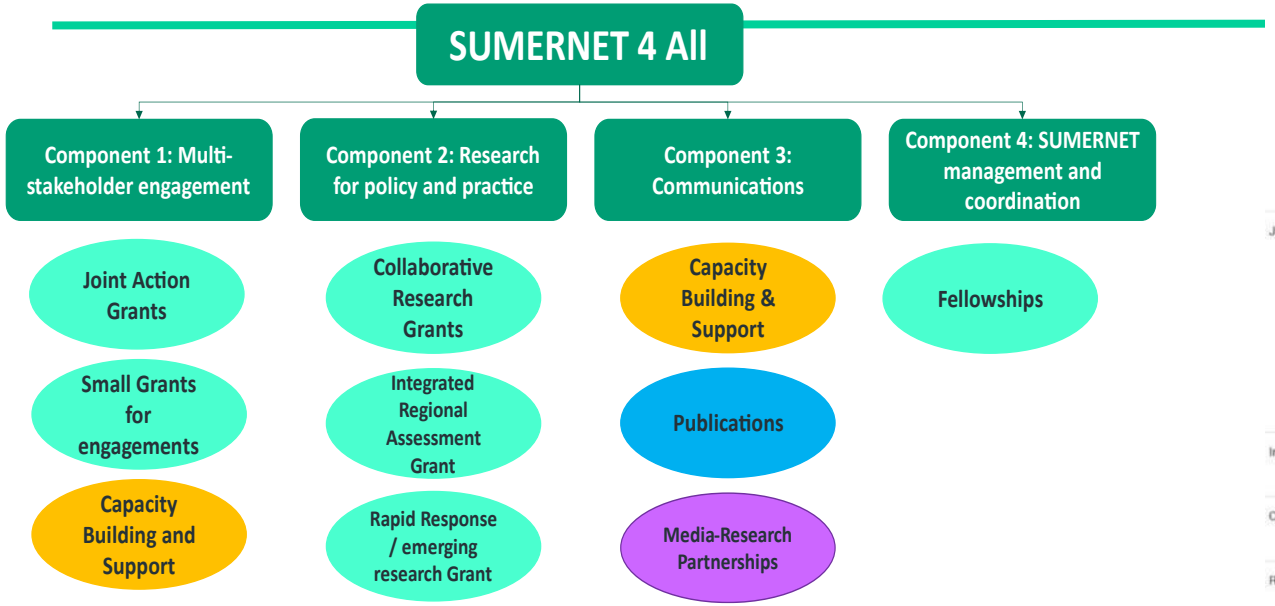
Mission

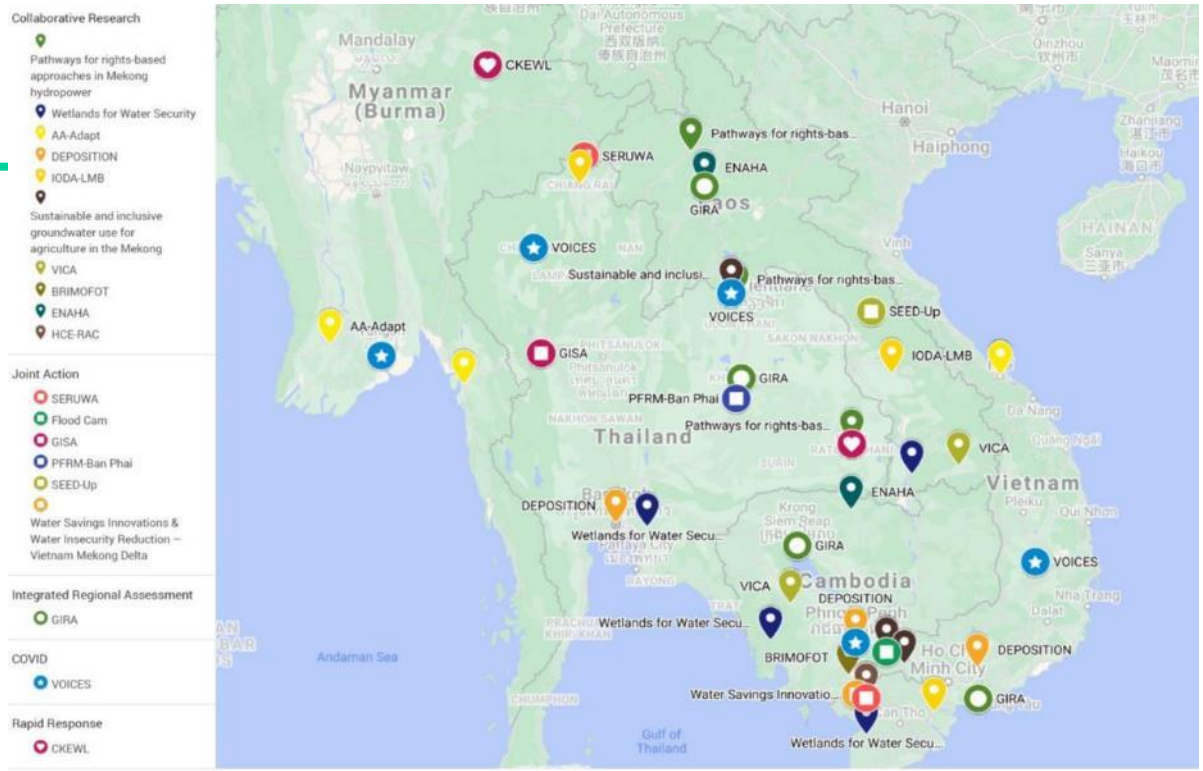
"To improve the policies and practices in reducing water insecurity by **conducting collaborative research, engaging in the policy process, and promoting scientifically sound research and innovation** while considering gender and social equality, human rights, conflict sensitivity, environmental integrity and poverty reduction in the Mekong Region."

Impact

"Reduced water insecurities for all, in particular poor, marginalized and socially vulnerable men and women in the Mekong Region"

Research and Joint Action Projects





- **Number of grants: 27**
  - Collaborative research: 10
  - Integrated regional assessment: 1
  - COVID-19 emerging grant: 1
  - Rapid response research: 1
  - Joint Action: 6
  - Small grants: 4
  - Fellowship: 4

- **Number of active researchers: 177 (5 countries)**
- Proportion:
  - Male: 101 (57%);
  - Female: 76 (43%)
- ***Media-Research Partnerships*: 8 grants**

19 projects, ± 40 study sites

SUMERNET Projects

SERVIR-Mekong

Connecting Space to Village in the Lower Mekong Region

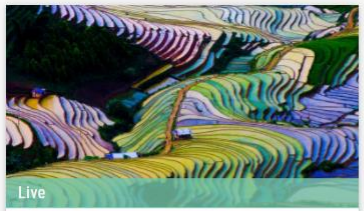
SERVIR-Mekong is a geospatial data-for-development program that responds to the needs of Lower Mekong countries. Learn more

Spatial Informatics Group

SEI Stockholm Environment Institute

Deltares Enabling Delta Life

SERVIR-Mekong: Decision Support Tools



Live

Regional Land Cover Monitoring System

This system guides users in applying peer-reviewed methods and cloud computing power to produce a wide variety of high-quality land cover information products that can be updated regularly and consistently.

more

Live

Mekong Drought and Crop Watch

Droughts in the Lower Mekong region negatively impact ecosystem services, food and water security, and biodiversity. These impacts are exacerbated by climate change, further highlighting the need for improved governance…

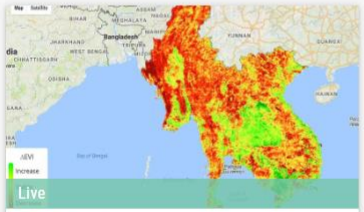
more

Live

Satellite Radar-derived Virtual Rain and Stream Gauge Data Service

This service provides near real-time rainfall and stream height data from publicly available satellite measurements by creation of a virtual network of rain gauges and stream gauges at points widely distributed over the…

more



Live

Eco-Dash

Changes to vegetation can have a significant impact on health, resilience, growth, and sustainable development. Ensuring ecological stability and biological productivity over a large area is a common goal for landscape…

more

Live

ClimateSERV

This tool allows development practitioners, scientists/researchers, and government decision-makers to visualize and download historical rainfall data, vegetation condition data, and 180-day forecasts of rainfall and…

more

Live

Historical Flood Analysis Tool

Currently, there is lack of systematic flood risk analysis through collection of local knowledge in order to inform emergency planning, which although critical, takes significant resources and can introduce bias and human…

more

Live

Biophysical M&E Dashboard

Biophysical M&E Dashboard supports USAID, Cambodia in monitoring and managing large scale sustainable landscape management projects by using satellite data to determine landscape conditions before and after project…

more

Live

Gender Equality Monitoring (GEM) Platform

This platform is developed to address two key issues: gender data gap at sub-national level, and accessibility to gender statistics which is critical to examine and track changes in gender inequality.

more

Live

Dancing Rivers

This system monitors the seasonal river course changes of Ayeyarwady River in Myanmar using remote sensing images. The monitoring system enables large geographical coverage of more than 2000 km river length for monitoring…

more

Live

Mekong Air Quality Explorer

Air quality is fast becoming a critical challenge across SERVIR regions. Each year, the World Health Organization estimates 7 million deaths occur globally as a result of air pollution exposure, with 2 million of these…

more

Live

Rainstorm Tracker

Rainstorm Tracker tool is an operational storm analyzer developed to monitor and alert authorities about the severity of rainstorm events over the Lower Mekong Basin in near-real-time. This system employs a 4D object-…

more

Live

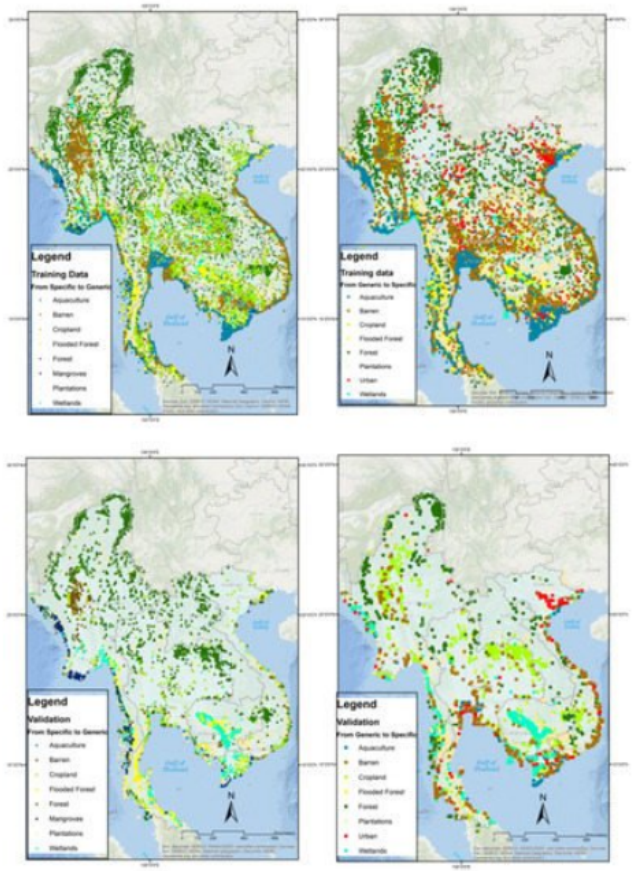
Cambodia Protected Area Alerts System

Cambodia Protected Area Alerts System monitors near real-time forest changes and external threats including deforestation, forest fires and floods within the PreyLang Wildlife Sanctuary, a protected area in Cambodia. is a…

more

Regional Land Cover Monitoring System

Publications



Predictive Analytics for Identifying Land Cover Change Hotspots in the Mekong Region

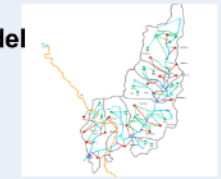
Authers:*by Ate Poortinga, Aekkapol Aekakkararungroj 2,Kritsana Kityuttachai, Quyen Nguyen, Biplov Bhandari, Nyein Soe Thwal, Hannah Priestley, Jiwon Kim, Karis Tenneson, Farrukh Chishtie, Peeranan Towashiraporn, David Saah*

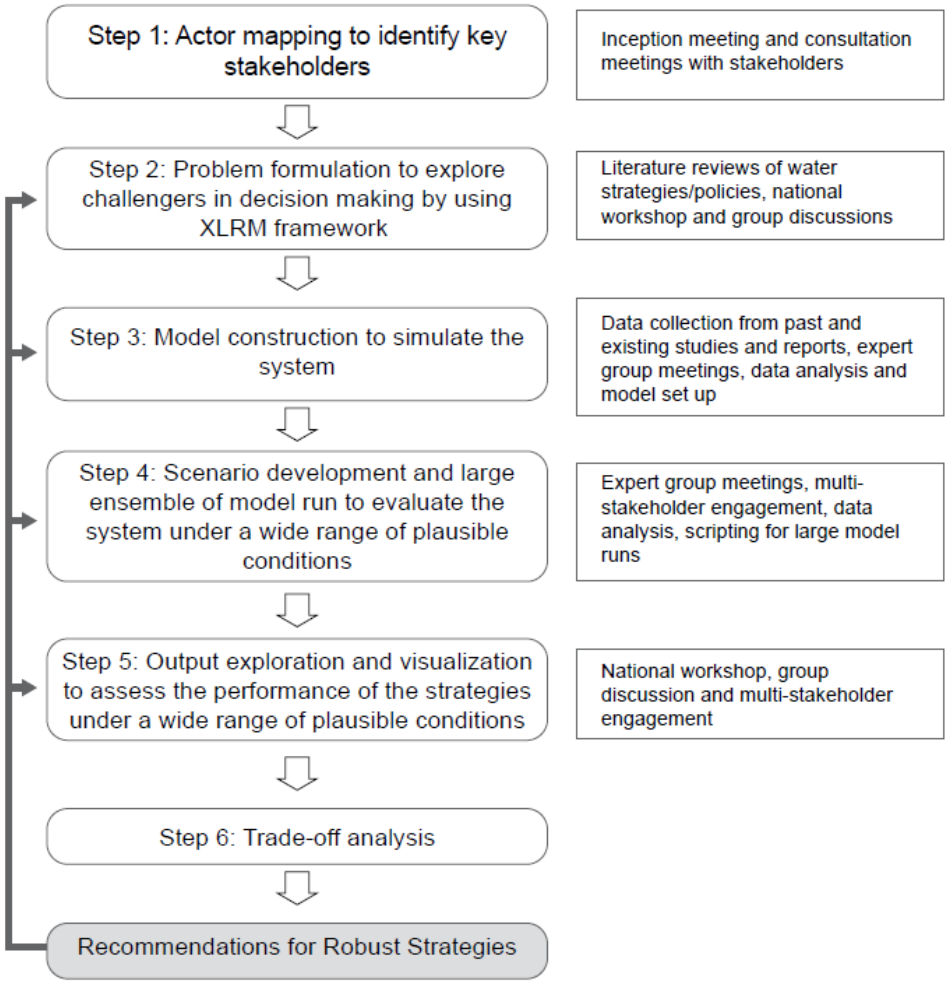
Understanding land cover change dynamics and potential pathways of change is of critical importance for sustainable resource management, to promote food security and resilience on a range of spatial scales. Data scarcity is a key concern, however, with the availability of free Earth Observation (EO) data, such challenges can be suitably addressed. In this research we have developed a robust machine learning (random forest) approach utilizing EO and Geographic Information System (GIS) data, which enables an innovative means for our simulations to be driven only by historical drivers of change and hotspot prediction based on probability to change. We used the Mekong region as a case study to generate a training and validation sample from historical land cover patterns of change and used this information to train a random forest machine learning model. Data samples were created from the SERVIR-Mekong land cover data series. Data sets were created for 2 categories both containing 8 classes. The 2 categories included—any generic class to change into a specific one and vice versa. Classes included the following: Aquaculture; Barren; Cropland; Flooded Forest; Mangroves; Forest; Plantations; Wetlands; and Urban. The training points were used to sample a series of satellite-derived surface reflectance products and other data layers such as information on slope, distance to road and census data, which represent the drivers of change. The classifier was trained in binary mode and showed a clear separation between change and no change. An independent validation dataset of historical change pixels show that all median change probabilities are greater than 80% and all lower quantiles, except one, are greater than 70%. The 2018 probability change maps show high probabilities for the Plantations and Forest classes in the ‘Generic to Specific’ and ’Specific to generic’ category, respectively. A time-series analysis of change probability shows that forests have become more likely to convert into other classes during the last two decades, across all countries. We successfully demonstrated that historical change patters combined with big data and machine learning technologies are powerful tools for predictive change analytics on a planetary scale.

Robust Decision Support (RDS) Framework for water and land management

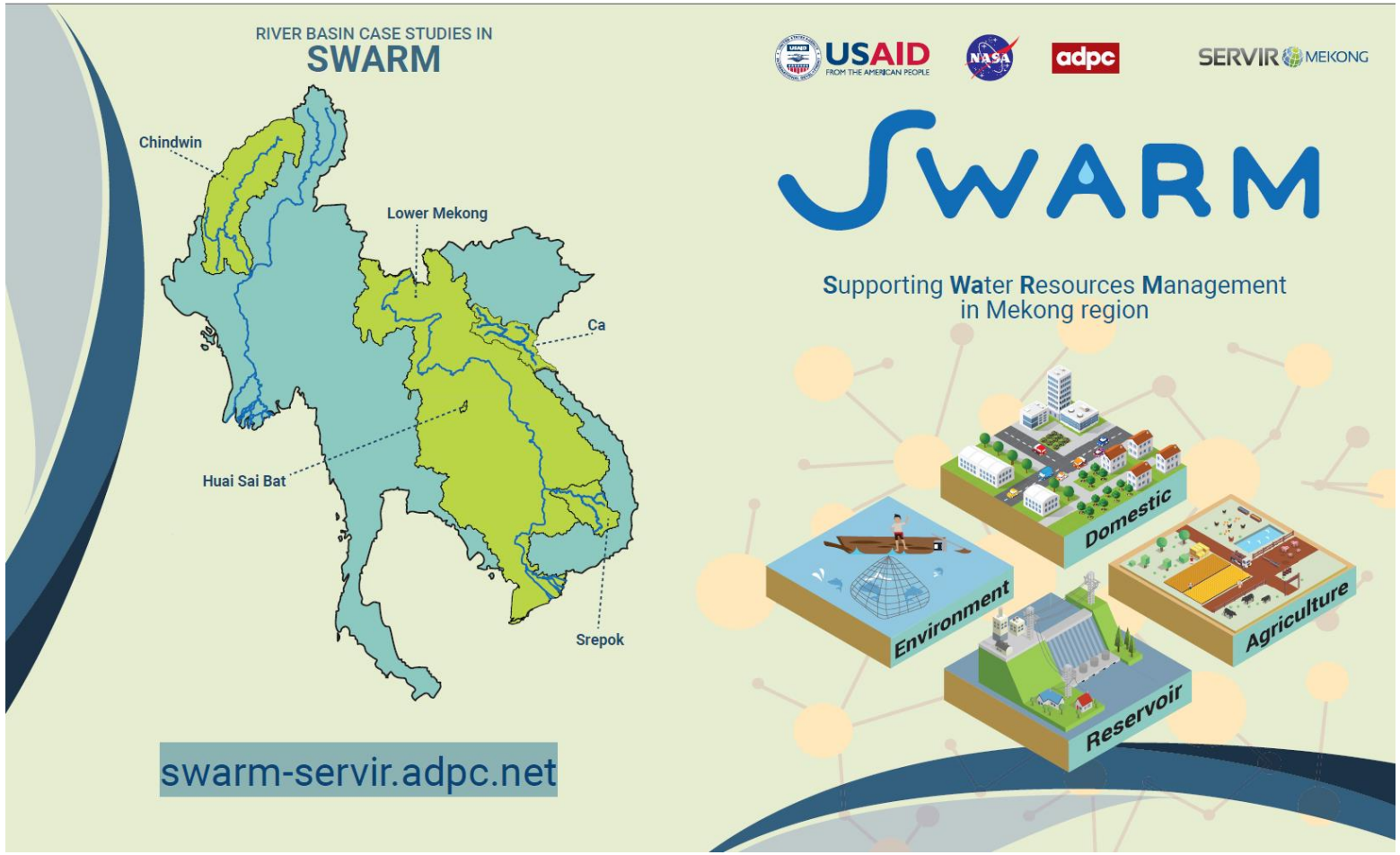
The RDS framework is a **quantitative, iterative, and participatory** methodology designed to support decision-making under conditions of **deep uncertainty**

Problem formulation
Huay Sai Bat River Basin example

Uncertainties (X)	Management Strategies (L)
A. Climate Change 1. Average/Normal Climate 2. Dry Climate 3. Wet Climate **B. Land use Change** 1. Sugarcane to rubber in upper region and rice to sugarcane in middle region 2. Expansion of irrigated areas in Lower region 3. Combination of both 1 and 2	S0: Business as usual S1: Dredging existing swamp for retention purpose S2: Use groundwater as alternative water supply S3: Shift cropping calendar S4 :Cascade weir construction in the upper region
Relationships or Models (R)	**Metrics of Performance (M)**
Huai Sai Bat WEAP Model WEAP 	A. Agricultural water coverage B. Domestic water coverage C. Industrial water coverage D. Environmental/Ecological flow

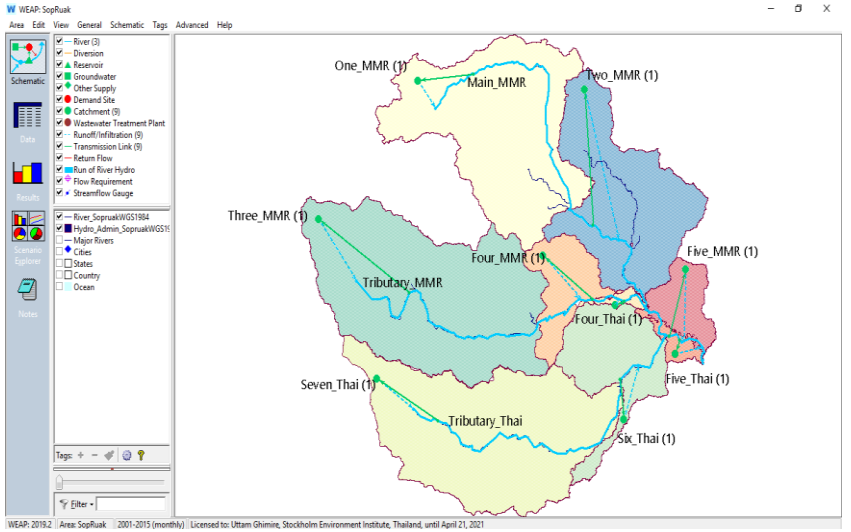


Robust Decision Support (RDS) Framework for water and land management



Assess impacts of land and water development on water resources, ecosystems and food production

WEAP modelling



Robust Decision Support (RDS) Framework in Huai Sai Bat (HSB) River Basin, Thailand

Uncertainty and Basin development choice

Uncertainty

Climate change
- (●) Normal
- ( ) Dry
- ( ) Wet

Land-use change
- (●) No changes
- ( ) Upper and middle region
- ( ) Lower region
- ( ) Entire basin

Population
- (●) No changes
- ( ) Growth 8%
- ( ) Decrease 5%

Water resources strategy

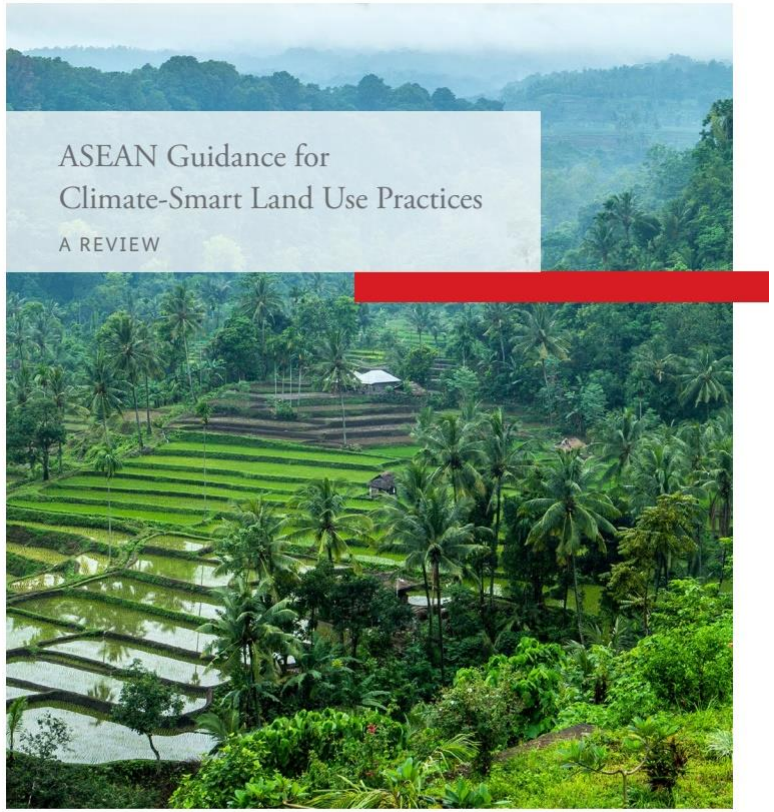
Shifting crop calendar
- (●) No changes
- ( ) Shifting rice crop farming from May to June

Dredging natural storage
- (●) No changes
- ( ) Dredging existing retention to increase its storage capacity (from 0.8 million cubic meter (Mm^3) to 2.5 Mm^3.

Alternative water supply
- (●) No changes
- ( ) Use groundwater as alternative source for small-scale irrigation in C04 and C06.

Cascade weir construction
- (●) No changes
- ( ) Development of cascade weir in the upper region (C00) to be active in 2020.

ASEAN Guidance for Climate-Smart Land Use Practices



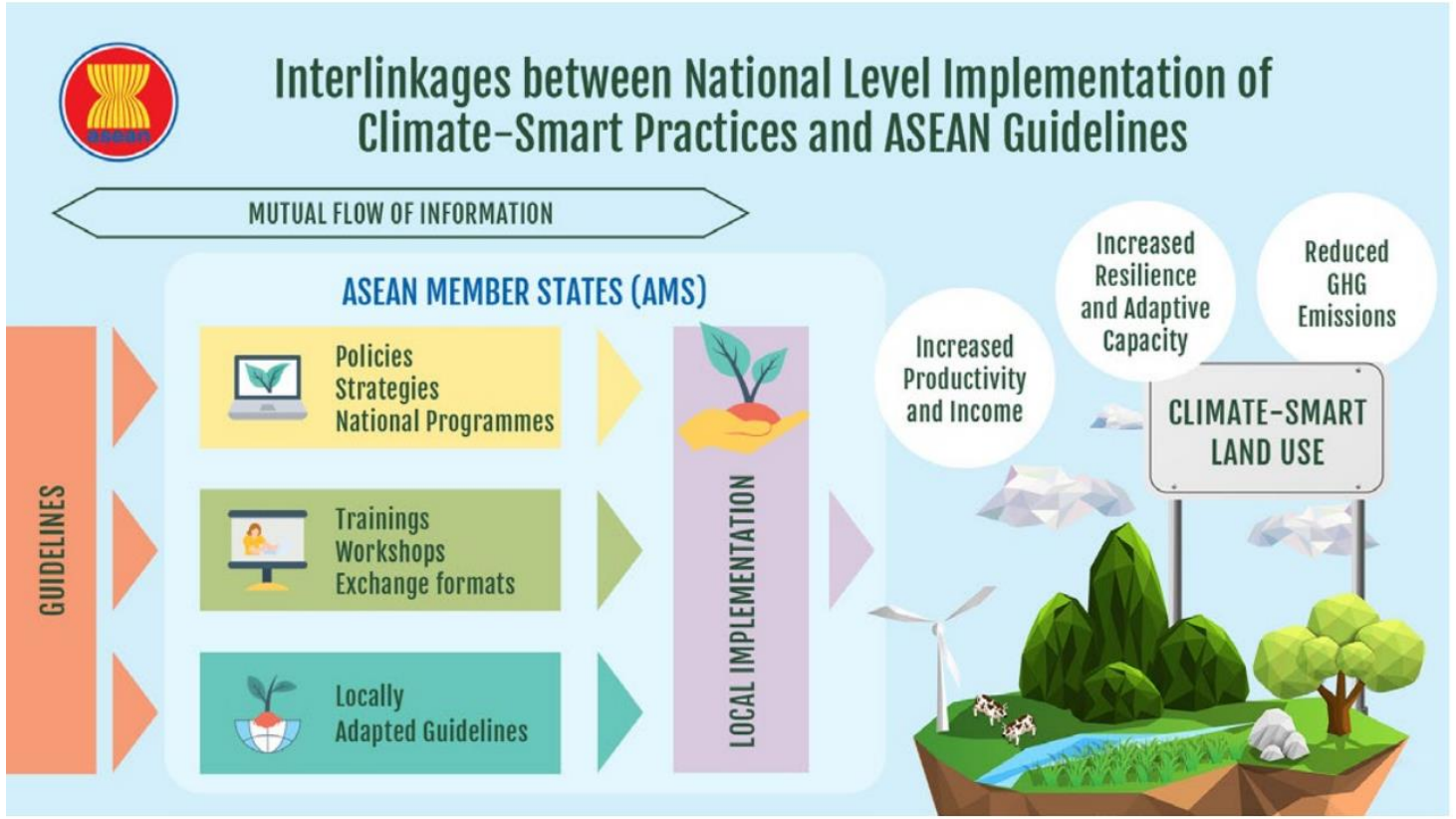
german cooperation
DEUTSCHE ZUSAMMENARBEIT

published by:
giz

SEI Stockholm Environment Institute

In cooperation with:

To explore the usefulness of land use guidelines and similar policy-tools in implementing ASEAN priorities related to climate-smart land use at the national level.



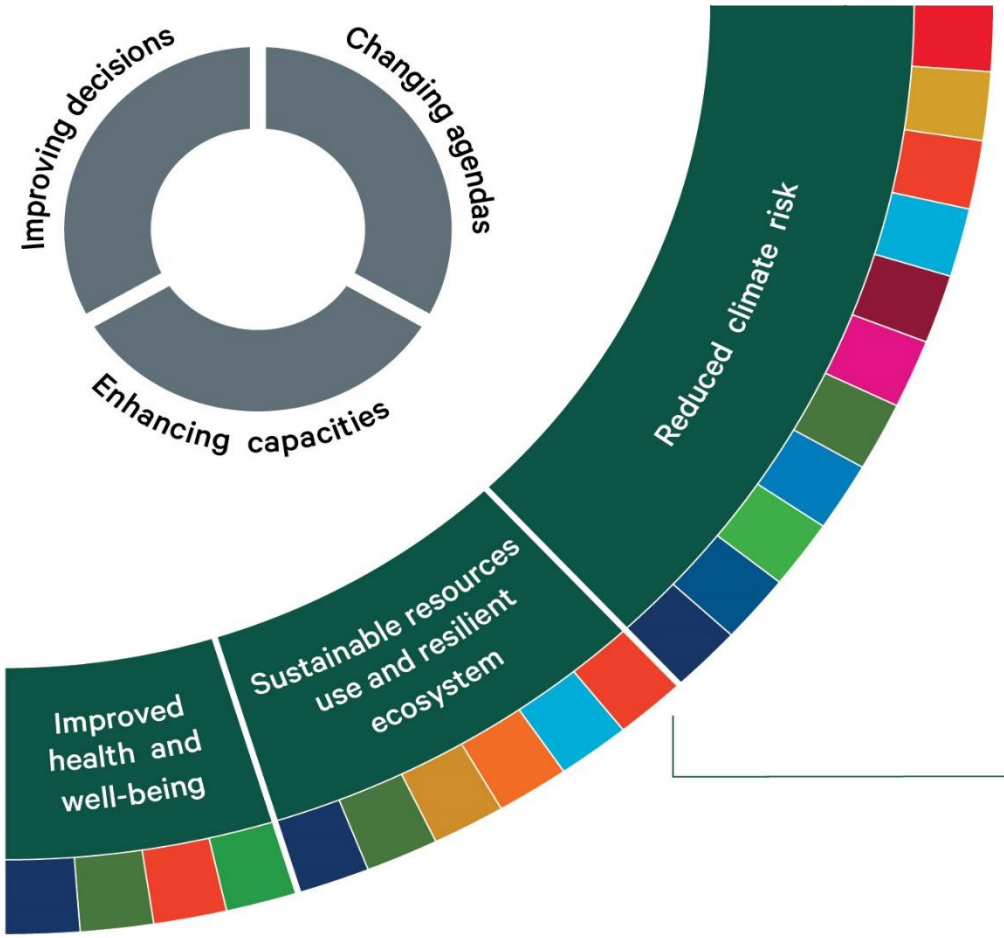
Strategic Collaborative Fund Phase 2 (SCF2)

Strategic Collaborative Fund Phase 2 (SCF) funded by Sida [2018-2022] to enhance the current 2030 Agenda efforts in Asia and the Pacific

SCF2 aims to **create long-term partnerships** to enhance policy development and institutional capacity building in Asia

The integration of **human rights and gender equality** is promoted regional and inter-regional collaboration for transboundary environmental policy development

SCF2's Impact Pathway



Outcomes

Changing ideas among stakeholders via knowledge exchange and networking

Enhancing capacities through SCF2-funded events, direct discussions, and online learning

Improving decisions among stakeholders via the tools and engagement

Call for 2022

Themes for 2022

1. **Inclusive Disaster Risk Reduction in the context of COVID-19 and the climate crisis** – Deadline: 25 February 2022
2. **Climate-resilient practices to promote inclusive and sustainable agricultural systems and value chains** – Deadline: 20 March 2022
3. **Closing the loop: circular waste management in Asia's cities** – Deadline: 20 March 2022
4. **Improving water resources management and climate resilience by integrating socio-ecological systems thinking** – Deadline: 20 March 2022
5. **Rethinking climate adaptation and mitigation through gender transformative approaches and amplifying local agency** – Deadline: 20 March 2022

Grant value

For 2022, SEI will support five themes (disaster risk reduction, agri-food systems, circular economy, gender, and water resources management), covering one grant per theme.

A maximum of SEK 450,000 (approximately USD 45,000) will be awarded per grant. The grants can fund one or more events in their entirety or provide supplemental funding to already confirmed co-funded event(s). The delivery period of event organization and impact monitoring must be within April and December 2022, in which the latest events should be held by no later than late September 2022 to allow for final report preparation.

Who can apply

Interested applicants must send proposal for events on any of the five themes. Proposals should also include a human rights and gender angle, to be considered.


Thank you!