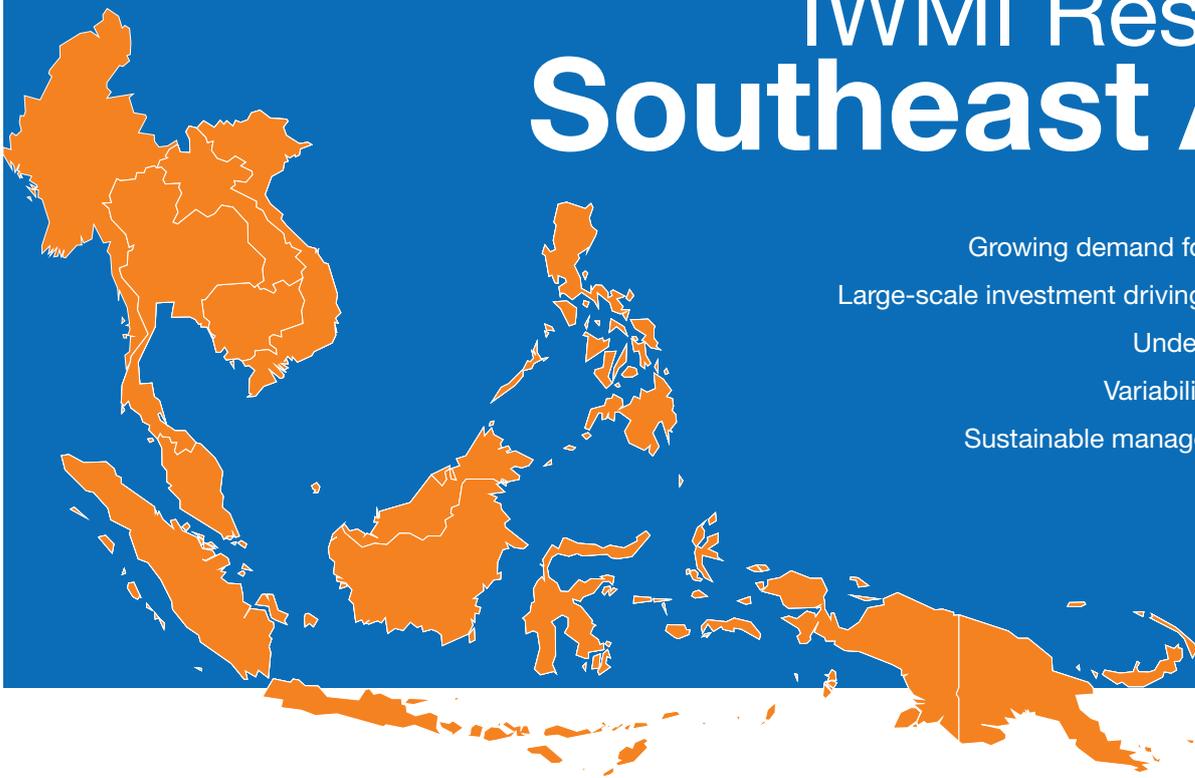




IWMI Research Southeast Asia



Growing demand for food and electricity

Large-scale investment driving changes in land use

Underperforming irrigation

Variability in water availability

Sustainable management of ecosystems

Climate change



Photo: CPWF Mekong on Flickr

Introduction

The diverse countries of Southeast Asia enjoy an abundance of water, but its distribution is uneven. As a result, water security is low in much of the region. Geographic location and seasonal variations, as well as varying degrees of economic development and contrasting political systems, greatly affect people's access to water and land.

Although individual nations and regions are developing at different speeds, agriculture everywhere is modernizing fast. Population is rising fast. The number of people living in the Greater Mekong Subregion (GMS), comprising Cambodia, Lao PDR, Myanmar, Thailand, Vietnam and Yunnan Province in China, is likely to be 320 million by 2050. All the regional governments recognize the critical role that water and land resources management will play in future development.

The International Water Management Institute (IWMI) conducts research to enhance sustainable development and improve people's livelihoods. By providing a better scientific understanding of water-related issues, and making sure information and knowledge are actively shared, the Southeast Asia Office of IWMI works with partners to address key challenges that the region faces.

Growing demand for food and electricity

The demand for energy from hydroelectric schemes is rising. They can also lead to increased access to water for food, by modifying flow regimes and fueling pumps. However, dams can alter aquatic ecosystems, potentially threatening livelihoods and food security.

Solutions: Showing how hydropower companies can benefit from ecosystems, and how empowered local populations can benefit from reservoirs, produces incentives for both sides to work together. IWMI aims to facilitate these kinds of negotiations by working with hydropower companies to try and ensure that local communities are not overlooked in the development process and instead benefit from hydropower schemes.

IWMI research can help to identify how water use for energy is linked, at odds, and in balance with food security and environmental systems. It examines alternative water management, technology and governance options to reduce some potentially adverse consequences of hydropower development.

Ultimately, it is not enough to try to resolve issues related to hydropower on a local or even national scale. Water governance and management as it relates to dams in Southeast Asia, especially in the GMS, must transcend national borders in order to succeed. IWMI can provide information and advice in order to

improve the way internationally shared waters are cooperatively managed and how links between transboundary decision-making bodies and national bureaucracies can be improved.

Large-scale investment driving changes in land use

Many of the large river deltas of Southeast Asia support large-scale rice cultivation. Recently, however, rice farmers have been forced to compete for resources as shrimp farming and other aquaculture expands. Upland agriculture is also changing from traditional slash-and-burn farming to commercial cash cropping. These changes have led to an increase in the use of water, as well as a dramatic increase in the application of agricultural chemicals. Concerns are growing about water and land security, equitable distribution of resources and a growing population of landless poor.

Solutions: Addressing water and land degradation while maintaining effective ecosystem services will be vital for the region's future agricultural performance. IWMI has conducted research to better understand soil erosion and how land use affects water quantity and quality. For instance, research has found that an increase in sedimentation due to agricultural or industrial activities can have a negative impact on water storage structures and fish populations.

IWMI is also working to understand the socioeconomic impacts of land-use change. As farmers move away from

subsistence agriculture and focus on cash crops, the distribution of benefits and burdens changes. By considering the impacts of these dramatic changes on working communities, IWMI can advise decision makers on the needs of the poor and marginalized people, while working towards development and economic growth.

Underperforming irrigation

Although many Southeast Asian countries are investing in irrigation expansion, many existing surface-based irrigation systems are inefficient and consistently underperform. This is jeopardizing regional food security and global grain supplies. Groundwater supplies and quality are also not well understood, sometimes resulting in over-extraction or poor investments in irrigation technologies.

Solutions: IWMI and partners are exploring ways to revamp irrigation management, while also assessing the impacts of surface water and groundwater access on livelihoods. Establishing pilot projects to explore the potential for community-based groundwater irrigation and management is one such initiative. IWMI can also help communities rehabilitate surface-based irrigation schemes and improve their resource management decision making.



IWMI research:

Local solutions to regional challenges

● IWMI office



"In Cambodia, IWMI together with key partners worked on improving the Commune Agroecosystem Analysis (CAEA) process, which is a participatory approach that enables local communities to engage in decision making at the commune level. A revised CAEA guidance manual was produced through an adaptive cycle of pilot testing in four communes in the Tonle Sap Wetland System. The manual was endorsed by the Ministry of Agriculture, Forestry and Fisheries, and adopted by the Ministry's Department of Agricultural Extension in Cambodia. It has also shown potential for broader uptake, with a number of the tools being used by other projects within Cambodia. Additionally, the revised CAEA manual is being included as part of the curriculum in some agricultural universities in the country."

Sonali Senaratna Sellamuttu, Office Head and Senior Researcher - Livelihood Systems, IWMI, Vientiane, Lao PDR



"New irrigation technologies are needed to help Lao PDR increase agricultural production and enhance food exports. We have worked with national and regional partners to design, implement and test small-scale private and community-managed groundwater irrigation systems, which are vital in areas remote from surface water supplies. These add to the portfolio of options available for farmers to improve their food security and incomes."

Paul Pavelic, Principal Researcher - Hydrogeology, IWMI, Vientiane, Lao PDR



"Vietnam has abundant surface water and groundwater resources. The main challenge is how to use this water in an efficient and sustainable manner. IWMI has helped the Vietnamese to analyze trade-offs in using freshwater for food production, hydropower generation and ecosystem services."

Furthermore, since Vietnam has a coastline of over 3,200 km and two large deltas, many farmers consider saline water to be a resource rather than a constraint. IWMI has helped them to resolve current conflicts between freshwater agriculture and brackish water aquaculture through proper water management, and to also adapt to rising sea levels in the future."

Chu Thai Hoanh, Emeritus Scientist, based in Hanoi, Vietnam (formerly Principal Researcher - Water Resources, IWMI, Vientiane, Lao PDR)



"Private investors in the Mekong region make large investments in the resources sector, which could potentially disadvantage the poorest groups of the population and those livelihoods which depend heavily on natural resources. It is important for IWMI to create a better understanding of the interactions between private sector actors and the resources sector in order to yield knowledge on resource governance and livelihood improvement."

Oulavanh Keovilignavong, Postdoctoral Fellow - Policy and Institutions, IWMI, Vientiane, Lao PDR



"As Myanmar emerges from almost three decades of sanctions, agricultural development is widely perceived to be central to both broad-based national growth and poverty reduction. In the central Dry Zone, where water variability is the greatest constraint to vibrant agriculture, IWMI has worked with national partners to develop recommendations for stabilizing agricultural productivity and increasing the resilience of households by improving water management, availability and access."

Matthew McCartney, Theme Leader - Ecosystem Services, IWMI, Vientiane, Lao PDR



"Myanmar's iconic rivers, the Ayeyarwady and Thanlwin, are critical to the country's economy, providing irrigation, drinking water, fisheries and transport, as well as cultural and environmental values. However, these rivers are under increasing pressure from over-exploitation, pollution and habitat loss. Under the Myanmar Healthy Rivers Initiative, IWMI is working with the government and local communities to assess the current state of the rivers and the way that development (including irrigation and hydropower dams) affects river health, with a view to providing evidence for informed planning and management of the river systems."

Robyn Johnston, IWMI Representative - Myanmar, IWMI, Yangon, Myanmar



"Water resource variability is influenced by multiple drivers (e.g., climate, hydropower development, land-use changes) while agricultural water use is controlled by social behavior and economic constraints. IWMI is using a range of tools and approaches (e.g., hydrological models, statistics, field surveys and demonstration sites) to work with partners, ensuring that water is used efficiently and cost-effectively at the right time and location."

Guillaume Lacombe, Senior Researcher - Hydrologist, IWMI, Vientiane, Lao PDR



"The equitable management of water across sectors requires innovative information systems which quantify and report on the water resources situation consistently and on a regular basis. IWMI is working with partners across the region to operationalize its *Water Accounting Plus (WA+)* framework for this purpose."

Lisa-Maria Rebelo, Senior Researcher - Remote Sensing & GIS, IWMI, Vientiane, Lao PDR



"Natural resource governance is central in our understanding of complex development issues. IWMI takes a holistic, people-centered approach in linking policy and practice in natural resource governance, focusing at the intersection of water, food, energy and the environment. It looks at relevant stakeholders' views and perceptions of development, and how actors and institutions construct realities at various governance scales, from transboundary to local level in Southeast Asia."

Diana Suhardiman, Sub-theme Leader (Governance & Political Economy), IWMI, Vientiane, Lao PDR



Photo: Matthew McCartney/IWMI

Photo: Emily Koo/IWMI

One concrete way that water access can be improved is to ensure better operation and maintenance of canal systems. In part, this can be done by promoting the use and management of surface water and groundwater resources together in canal-irrigated areas. Food and water productivity, and equity of access to water, can be increased through improved incentives, management, and operation and maintenance in canal-irrigated areas. By developing institutional mechanisms to operate and maintain large schemes in a financially sustainable manner, IWMI can work with governments and organizations to improve access to water for agriculture in the region.

Variability in water availability

Some communities in Southeast Asia are plagued by a seasonal lack of water, while others have to deal with flooding. These climatic extremes can lead to crop damage, unstable food security and loss of life. Water variability also affects supply to non-agricultural sectors, negatively impacting development prospects.

Solutions: Variability in water access requires a holistic and community tailored approach to water management. By conducting biophysical, socioeconomic and institutional research, IWMI can provide a wealth of information to water managers and consider negative factors, such as environmental degradation and unequal distribution.

Increasing competition for water resources necessitates a better understanding of flows, fluxes, stocks, and the services and benefits related to water consumption, and there is a pressing need to describe water resources in a standard context using clear terminology and a consistent data collection system with defined quality standards. Innovative thinking is needed; IWMI is developing new decision support tools and approaches to integrate hydrological processes with land use, managed water flows and the services that result from water consumption in river basins, with the objective of achieving equitable and transparent water governance for all water users and a sustainable water balance.

IWMI will focus on managing water supply and demand while reducing the damage from droughts and floods. The best solutions will be those that are able to exploit the beneficial aspects of seasonal extremes while simultaneously addressing the negative impacts. For instance, fisheries and floodplain agriculture depend on flooding, and drought can help with pest control. One possible approach is to help develop an underground storage for excess water from floods, which can then be used for irrigation during dry spells. Exploring the costs, benefits and feasibility of diverse forms of water storage can also help communities develop systems that will increase access to water while taking into consideration the needs of the environment.

Sustainable management of ecosystems

Low levels of water security throughout Southeast Asia are linked to inadequate river management which has compromised ecosystems. Future water-related planning decisions need to be viable, not just from engineering, financial and social perspectives but for the environment as well. It is essential to protect ecosystem functions on which a large number of people depend. Careful consideration must be given to the trade-offs and synergies with these ecosystems.

Solutions: Ecosystems should be recognized as 'natural water infrastructure' that provide benefits which are equally as important as man-made dams, canals and embankments. Water resource planning needs to incorporate new ways of thinking that consider diverse situations and scales, and are built to benefit all socioeconomic groups. Much greater consideration needs to be given to the full range of possible infrastructure interventions as well as to the cumulative impacts and the likely consequences of each factor. This is not a matter of simply supplying 'water for nature', it makes good economic sense. IWMI's work is focused on mapping and quantifying ecosystem services, so that they can be better incorporated into decision-making processes. IWMI is also collaborating with Vietnamese partners to investigate the effectiveness of a scheme of Payments for Environmental Services (PES), which aims to safeguard upland forests.

Climate change

No one knows for sure how climate change will affect food security and environmental degradation in Southeast Asia. According to the Intergovernmental Panel on Climate Change (IPCC), changes in rainfall and runoff will affect water quality and supply and may alter the viability of irrigation schemes. Southeast Asia will experience more extreme weather events that can threaten the climate-sensitive livelihoods of poor people who have limited adaptive capacity. Proper planning and precautionary measures must be implemented in order to curb the potentially catastrophic consequences of climate change.

Solutions: IWMI researchers are mapping, modelling and analyzing information in order to explore how climate change might affect water and land resources in Southeast Asia. These data can increase awareness of possible impacts and help policymakers, as well as farmers, adapt their strategies in order to prepare for and mitigate the effects of climate change and environmental degradation.

In addition, IWMI can work with many different sectors, including the private, public and non-profit, to make new technologies and strategies available to farmers, industry and domestic water users. One such approach would be to facilitate reuse-based business planning and opportunities in the region. In doing so, IWMI can bring together many societal players to cooperatively help protect food security and water availability while improving livelihoods and promoting environmental conservation.



Photo: Jim Holmes/IWMI

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Find out more:

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For project details, databases, publications and communication materials.

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