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WATER MANAGEMENT IN THAILAND[†]

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ABSTRACT

The government of Thailand is now promoting the Thailand 4.0 model to escape its middle-income level trap. The model uses an innovative 'value-based economy' for climbing up to the high-income level. The three main elements of this are: (i) a knowledge-based economy; (ii) an inclusive society with equitable access; (iii) sustainable development. At present, Thailand consumes 90.4% of its fresh water for agricultural activities, while upper-middle- and high-income countries consume only 67.8 and 40.8% respectively. Therefore, Thailand is now developing strategic plans for proper water management for the next 20 years. The plans take the following concerns into consideration: (i) the principle of a water basin integrated framework and sustainable water management; (ii) government policies and the national economic and social development plan; (iii) the United Nation's Sustainable Development Goals. The strategies are still under discussion and not yet finalized at this moment. However, the plans will certainly hold significant weight in government project funding in the next 20 years. All of the water-related projects will be carried out with the plans as a guideline. Meanwhile, each project will maintain the concepts of culture, tradition, geography and demography to obtain the highest compatibility with Thai society. Copyright © 2018 John Wiley & Sons, Ltd.

KEY WORDS: water management; strategic plans; Thailand 4.0 model; middle-income trap

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RÉSUMÉ

Le gouvernement de la Thaïlande encourage maintenant le modèle Thaïlande 4.0 pour échapper à son piège de pays à niveau moyennement développé. Le modèle utilise une « économie fondée sur la valeur » de l'innovation pour atteindre le niveau de revenu élevé. Trois éléments principaux sont: (i) l'économie fondée sur le savoir; (ii) une société qui intègre tout le monde avec un accès équitable; (iii) le développement durable. À l'heure actuelle, la Thaïlande consacre 90.4% de son eau douce aux activités agricoles, tandis que les pays à revenu moyen supérieur et les pays à revenu élevé ne consomment que 67.8 et 40.8 % respectivement. Par conséquent, la Thaïlande développe actuellement des plans stratégiques pour une gestion adéquate de l'eau pour les 20 prochaines années. Les plans tiennent compte des préoccupations suivantes: (i) le principe de gestion intégrée du bassin versant hydrographique et de la gestion durable de l'eau; (ii) les politiques gouvernementales et le plan national de développement économique et social; (iii) les Objectifs du développement durable des Nations Unies. Les stratégies sont toujours en discussion et ne sont pas encore finalisées à ce jour. Cependant, les projets auront certainement un poids considérable dans les financements gouvernementaux au cours des 20 prochaines années. Tous les projets liés à l'eau seront adoptés par référence aux lignes directrices des plans stratégiques. Chaque projet tiendra les concepts de culture, de tradition, de géographie et de démographie pour obtenir la plus grande compatibilité avec la société thaïlandaise. Copyright © 2018 John Wiley & Sons, Ltd.

MOTS CLÉS: gestion de l'eau; plans stratégiques; Thaïlande, modèle 4.0; piège du niveau de vie moyennement élevé

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INTRODUCTION

Thailand has emphasized water availability for all groups of people since it is the most basic element for regional development. Freshwater resources are distributed for different usage, including domestic consumption, agriculture, industry, transportation, energy and ecology preservation. With the challenges of climate change and the middle-income trap as well as an increase in water demand, Thailand is striving to bring about better water management, which is inseparable from these issues. Water management strategies have been drafted with the aim of achieving desirable results within the next 20 years. However, the suitability of the strategies is still in question as the country has never had a long-term water strategy plan. Challenges and constraints are bound to emerge. At the same time these are opportunities for relevant parties, i.e. officials, academics, civil society, to work on in developing water strategy plans.

GEOGRAPHY

The Kingdom of Thailand is situated in tropical South East Asia on the Indochina peninsula surrounded by neighbouring Lao People's Democratic Republic, Cambodia, Myanmar and Malaysia. The country has a total land area of approximately 513 000 km^2 (Figure 1). There are in total 265 200 km^2 of agricultural area of which 49 600 km^2 is irrigated. The northern and the western parts are mountainous areas continuing into Myanmar. The north-eastern part is mainly a plateau where the Mekong River forms the border with Laos. The eastern part, which is adjacent to Cambodia, has short mountain ranges with small basins of short rivers. The southern part is located between the Andaman Sea and the Gulf of Thailand and bordered on the south by Malaysia. The central part of Thailand is a large basin where rivers flow into the Gulf of Thailand, and has been used as fertile paddy area for centuries (International Commission on Irrigation and Drainage (ICID), n.d.).

CLIMATE

Thailand has a tropical climate that is hot and humid across the country. The climate is controlled by seasonal monsoons, i.e. south-west and north-east monsoons. Usually, there are three seasons: summer or pre-monsoon season (mid-February to mid-May), rainy season (mid-May to mid-October) when the south-west monsoon brings warm moist air from the Indian Ocean towards Thailand, and winter season (mid-October to mid-February) when the north-east monsoon brings cold dry air from mainland China to Thailand. Moreover, the Inter Tropical Convergence Zone (ITCZ) also produces a large amount of rainfall over Thailand. The ITCZ arrives in the southern part of Thailand in May, then moves northward and lies across southern China around June to July resulting in dry spells over northern Thailand. Later, the ITCZ moves southward and lies over the northern and north-eastern parts of Thailand in August, then over the central and southern parts in September and October, respectively. In Thailand, the temperature ranges between 18 and 36°C. The average annual rainfall all over the country is around 1700 mm. The highest amount of rainfall occurs during August to September while the lowest occurs around January to February. Due to the influence of monsoons and storms, Thailand experiences more frequent floods and droughts (Meteorological Department, 2015).

Due to the phenomenal flood catastrophe in 2011, Thailand was listed in the bottom 10 of countries for the Global Climate Risk Index (Kreft *et al*., 2017). Using the Climate Change Vulnerable Index (CCVI), Thailand is also considered as one of the 16 countries in the extreme risk category that are most vulnerable to future climate change impacts over the next 30 years (Maplecroft, n.d.). This indicates an urgent need for effective flood mitigation and prevention plans. As a result, Thailand is undergoing countermeasure plans including flood interruption, urban area flood prevention, drainage improvement and flood adaptation.

WATER RESOURCES SITUATION

Annually, Thailand receives rainfall of about 800 billion m^3 yr^{-1}. After deducting evaporation, evapotranspiration and infiltration, the remaining part is 200 billion m^3 of natural flow. Runoff is 79% of the natural flow. The yearly freshwater requirement of the country is about 152 billion m^3. The water demand is divided into 114 billion m^3 for agriculture, 11 billion m^3 for industry and domestic consumption, and 27 billion m^3 for maintaining the ecosystem. There is only 102 billion m^3 of accessible water, and the remaining 50 billion m^3 cannot be allocated. The latter portion mostly consists of the water requirement for rainfed agriculture and a part of domestic consumption. At present, the Thai population is increasing together with economic growth, resulting in greater water demand. Moreover, water requirements for domestic consumption, tourism and industrial activities are continuously growing at an increasing rate. Statistically, by 2027, Thailand will need to secure 5 billion m^3 more water to satisfy increasing demands (Figure 2). The climbing trend shows that Thailand needs to develop proper water management for a possible water shortage (Committee on Water Resources Policy and Management, 2015).

Figure 1. Topographic map of Thailand and neighbouring countries.

However, due to land limitation and environmental issues, water resources development projects are not certain to be approved. While the expansion of irrigated areas has slowed due to lack of water resources, the demand from the Thai population and from agricultural products is increasing each year. There is also the problem of the decrease in forest area, which results in increasing wet season runoff and reducing dry season streamflow. Water is becoming more valuable. As a result, Thailand is paying more attention to water resources management to ensure that the greater water demand is met. Good water policies and innovative practices are subjects for improving water usage

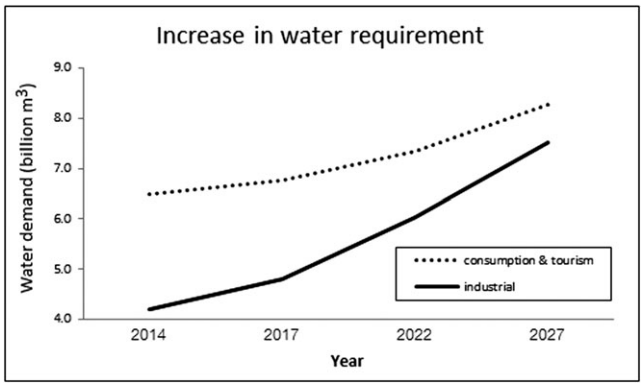

Figure 2. Increasing water demand in Thailand.

in all sectors. Economic growth and natural resources usage are also aimed to be carefully balanced in order to adopt sustainable development.

MIDDLE-INCOME TRAP

After reaching middle-income levels, Thailand has become stuck in the middle-income trap with disparities and imbalanced development for decades. The government is now promoting the Thailand 4.0 model by moving the country from one with abundant cheap, unskilled labour to an innovative 'value-based economy' in order to climb up to the high-income level. The model has three elements as follows: (i) the first aims to enhance the country's standing to become a high-income nation by developing it as a knowledge-based economy by emphasizing research and development, science and technology, creative thinking, and innovation; (ii) the second aims to move towards an 'inclusive society' with equitable access to the fruits of prosperity and development; (iii) the third aims to achieve economic growth and sustainable development without destroying the environment, which means sustainable growth and development.

Concerning Thailand 4.0, the agricultural sector is necessarily relevant since 3 out of 10 Thai citizens work in this sector. It is important to improve the agricultural sector to allow Thai people overall to reach higher development. Water, as a basic resource for agriculture, inevitably requires better management in order to overcome the middle-income trap. In 2014, Thailand had renewable freshwater resources per capita of 3310 m^3, while upper-middle- and high-income countries possessed an average of 8260 and 8730 m^3 respectively (World Bank, 2017a). At the same time 90.4% of freshwater withdrawal in Thailand contributed to agricultural activities, while upper-middle

Table I. Water management strategic plans for the next 20 years

Strategy	Aims
1. Water consumption management	1.1 Ensure freshwater supply for domestic usage in all areas for all citizens with standard sanitization
2. Water supply for agricultural and industrial sectors	2.1 Balance water reserve and water requirement for all activities 2.2 Reduce water loss and increase irrigated water value 2.3 Find new freshwater sources for basic water requirements and maintaining ecological systems 2.4 Find new freshwater sources for industrial activities
3. Flood and related disaster management	3.1 Reduce damage and loss from floods in cities and economic areas which highly impact the country 3.2 Reduce damage and loss from floods in agricultural areas and build resilience for those living in flood-risk areas 3.3 Reduce damage and loss from floods and landslides in flood-risk areas
4. Water quality management	4.1 More than 80% of freshwater resources have fairly good quality. Improve water treatment efficiency. Reduce water pollution from sources. Resolve water degradation in water reservoirs 4.2 Control estuary water salinity
5. River basin forest conservation and restoration, and soil erosion prevention	5.1 Restore degraded river basin forest for at least 40% of the country's area 5.2 Prevent soil erosion and landslides in highland agricultural areas
6. Water management	6.1 Appoint organizations and issue laws and regulations for freshwater resource management, which provide direction and push forward the plans with unity 6.2 Develop decision support systems for both normal and critical situations 6.3 Build capacity and enhance participation in a monitoring system 6.4 Develop systems for monitoring, assessment, and irrigation facilities maintenance

and high-income countries consumed only 67.8 and 40.8% respectively (World Bank, 2017b). If water resources are related to a country's development, these data imply the need for Thailand to think carefully about the goals of water management strategies.

FUTURE DIRECTIONS

Thailand is currently developing strategic plans for proper water management for the next 20 years (Table I) (Committee on Water Resources Policy and Management, 2015). The plans adhere to the principle to river basin integrated frameworks and sustainable water management. At the same time, the plans also take government policies and the national economic and social development plans into consideration. As a result, there are six strategic plans covering all the important aspects of the country. The strategies also correspond to the United Nation's Sustainable Development Goals.

CONCLUSION

The six strategies are still under discussion and are not finalized at this time. However, the plans certainly will have significant weight in government project funding in the next 20 years. Almost all of the water-related projects will be carried out with the plans as a guideline, while always taking economic, social and environmental issues into consideration. Each government project will be grouped by sub-basin location, and be driven as groups of area-based projects. At the same time the concepts of culture, tradition, geography and demography will be used for each project to reach the highest compatibility with Thai society.

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