

Lancang-Mekong Cooperation Special Fund Projects

# Executive Summary Report of the Research on Lancang-Mekong Water Environment Standards and Guidelines for Textile Industrial Parks



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## 1. Background

As a saying goes, “shared river, shared future”. Lancang-Mekong countries face similar problems and challenges in the pursuit of environmental protection and sustainable development. The countries have all agreed to build a Lancang-Mekong community of shared future by seeking complementary advantages and mutual promotion between Lancang-Mekong Cooperation (LMC) and other sub-regional mechanisms through cooperation in production capacity, innovation, people’s livelihood and environmental protection, with emphasis placed on building the Mekong-Lancang Economic Development Belt.

Improving the ecological environment, protecting and making reasonable use of water resources, and working together to implement the “Green Lancang-Mekong Initiative” is an important direction towards which the cooperation among Lancang-Mekong countries moves. Having come to the stage of rapid industrialization and urbanization, the countries are witnessing similar water environment pollution problems. Problems such as water pollution, drinking water security, and industrial and agricultural water stress, which are caused by domestic sewage and industrial wastewater as a result of population growth and industrial and agricultural development, are increasingly prominent, threatening environmental and human health.

To maintain integrated water environment protection in the river basin, a sound water management system should be established to cover a wide range of areas from water resource allocation and utilization to wastewater collection and treatment, from planning and design of water or water-related projects to ecological restoration of water environment, and from routine water environment management to emergency water pollution incident response and management. However, capabilities of water resource management, water environment protection and water pollution control vary from country to country given different levels of economic and social development. Some countries have established sound water environment management systems and standards, and supporting pollution prevention and control technologies and facilities, while some still lack relevant legislations and facilities, resulting in increasingly severe water pollution. In this context, it is necessary to launch regional cooperation in water environment management and promote exchanges of experience and



Figure 1 Proportions of textile and apparel exports from the six Lancang-Mekong countries in the global total<sup>2</sup>

<sup>1</sup> Source: United Nations Economic Commission for Europe (UNECE)

<sup>2</sup> Source: ITC (international trade data): <http://www.intracen.org/itc/market-info-tools/trade-statistics/>  
 Monthly Bulletin of China Customs Statistics: <http://www.customs.gov.cn/customs/302249/302274/302277/index.html>

know-how, in a bid to improve the water environment management capability of different countries.

The textile and apparel industry is a crucial livelihood industry in capacity cooperation among Lancang-Mekong countries. Statistics show that the textile and apparel industry in Lancang-Mekong countries is an important supply chain for the global fashion industry, as the combined textile and apparel exports from the six countries in the region account for 41% of the global total (see Figure 1). With further implementation of the Belt and Road Initiative (BRI) and China's accelerated layout of going out, the textile and apparel industry in Lancang-Mekong countries will continue to increase by size and significance. Meanwhile, this industry is considered as the world's second largest polluter and water consumer, where wastewater discharged accounts for 20%<sup>1</sup> of the global industrial wastewater discharged. Wastewater discharged from processes such as printing and dyeing, and finishing is abundant, rich in organic pollutants, highly alkaline and variable in quality, and therefore falls within the scope of unmanageable industrial wastewater.

From the preliminary studies on China's investment in sustainable development of textile industrial parks in Mekong countries, we have learned that building sustainable textile industrial parks is an effective model that provides environmental, economic and social benefits. In consequence, this research, by focusing on textile industrial parks, will probe into the status of water environment management in textile industrial parks in the region, analyze the challenges to water environment management there and study water environment management standards for textile industrial parks in the Lancang-Mekong region, thereby providing stakeholders of water environment management in textile industrial parks in the region with management suggestions, references and guidance.

## 2. Water Environment Management Challenges and Needs of Textile Industrial Parks in Lancang-Mekong Countries

### 2.1 Status of the textile industry and textile industrial parks in Lancang-Mekong countries

Water environment management challenges and needs of textile industrial parks in Lancang-Mekong countries are closely bound with the level of economic development, supporting infrastructure for the textile industry and the size of the textile industry in each country.

From the perspective of supporting infrastructure and size of the textile industry, China has the world's largest textile and apparel industry with complete supporting infrastructure, and has established an entire industry chain system covering raw material supply, design and R&D, textile dyeing and processing, manufacturing of three terminal products, operation and retail. The textile and apparel industry in the five Mekong countries is still at the early stage of rapid development, with a general imbalance in supporting infrastructure upstream and downstream the industry. Specifically, Thailand and Viet Nam have formed a relatively complete textile industry chain dominated by apparel manufacturing, where printing and dyeing enterprises account for a low proportion. For example, dyeing and finishing enterprises in Thailand occupy only 4% of all textile and apparel enterprises there. Cambodia, Myanmar and Laos have almost no large textile or dyeing enterprises, relying on imported yarn and fabric.

Country	Number of textile and apparel enterprises	Textile and apparel exports (in USD 100 million)	Proportion of apparel (including accessory) exports	Proportion of textile exports	Proportion of textile and apparel exports in domestic total commodity exports (excluding trade in services)
China	37017	2771.24	57.01%	42.99%	11.11%
Viet Nam	7000	391.29	80.80%	19.20%	13.48%
Thailand	9000	75.70	50.76%	49.24%	3.03%
Cambodia	500	127.51	98.46%	1.54%	66.07%
Myanmar	600	42.43	97.48%	2.52%	25.56%
Lao People's Democratic Republic	100	2.83	94.84%	5.16%	5.14%

The construction and scale of textile industrial parks also vary from country to country. China witnesses a significant cluster effect in its textile industry and has established hundreds of large, distinctive industrial clusters to improve the competitiveness of the industry in the region through collaboration, efficient allocation of resources and economies of scale effect. Industrial parks, as a new carrier for the transformation and upgrading of the textile industry and industrial clusters in the region, have begun to shift towards green, low-carbon and circular development. Take printing and dyeing clusters for example. China has embarked on the establishment of industrial parks for printing and dyeing enterprises since the beginning of the 12th Five-Year Plan (FYP) period, with a view to promoting restructuring, transformation and upgrading of the textile printing and dyeing sector through the industrial park model.

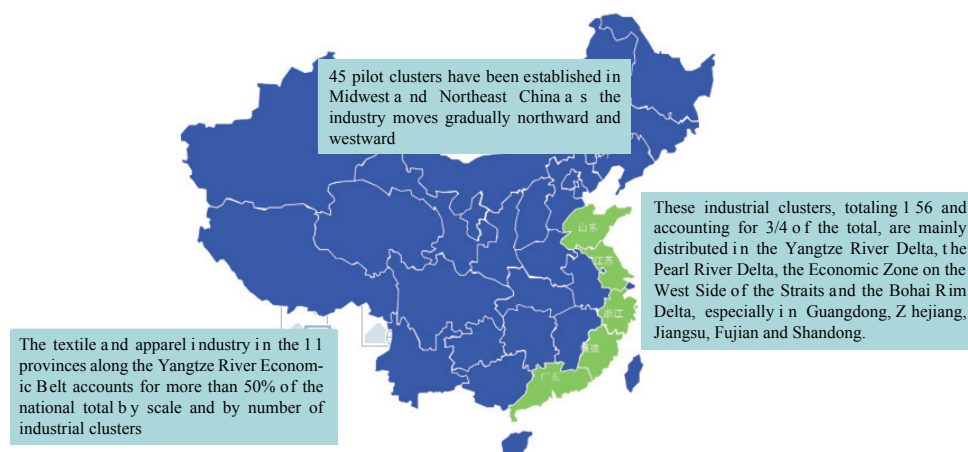


Figure 2 Distribution of China's leading textile industrial clusters

The textile and apparel industry in the five Mekong countries is also exhibiting a scale and clustering development trend, despite a small number and scale of industrial parks, which indicates that the industry is still in its infancy. Viet Nam has eight textile industrial parks nationwide and a “textile economic circle” around Ho Chi Minh City; Myanmar has set up a textile industrial cluster in Sagaing Region and plans to build special textile and apparel industrial zones in Yangon and Mandalay; Cambodian textile processing industry is mainly distributed in its capital Phnom Penh and Sihanoukville, with the former home to Anda Industrial Park and Phnom Penh Special Economic Zone and the latter to Sihanoukville Special Economic Zone with complete infrastructure.

## 2.2 Water environment management challenges

Influenced by the construction of supporting infrastructure for the industry, development scale of the industry and development status of industrial parks, textile industrial parks in different countries are faced with different water environment management pressure, challenges and needs. The textile industry in Myanmar, Laos and Cambodia is dominated by apparel manufacturing, which produces less typical pollutants; in addition, the textile industry on the one hand is a part of investment and on the other hand undertakes the mission of promoting local economic development and earning foreign exchange from exports, so the environmental stress there is low. Thailand and Viet Nam have in place a complete industry chain, including the heavily polluting dyeing and finishing processes, and carry out environmental management and pollution prevention and control mainly as per relevant national requirements for industry.

These factors directly or indirectly influence water environment management needs and management levels of textile industrial parks in different countries. **China, for example, has years of experience in water environment governance and industrial park management, with water environment management in industrial parks having improved from sewage treatment alone to integrated management, including water resource utilization and sewage reuse, and treatment and monitoring facilities in industrial parks also upgraded, but water environment management in textile industrial parks still faces many challenges,** especially in comprehensive industrial parks where textile enterprises are settled:

**1) There are no uniform discharge standards for centralized sewage treatment facilities in industrial parks.** Currently, industrial parks generally adopt Class I Grade A standards for municipal wastewater treatment plants as discharge requirements. However, for sectors like printing and dyeing which are subject to strict discharge standards for effluent quality, once Class I Grade A standards are not consistent with industry standards, industrial parks will not be certain which standards should apply and this might cause the quality of effluent from sewage treatment plants to be “unacceptable”, i.e., meeting Class I Grade A standards rather than industry standards (or vice versa).

**2) Characteristics of wastewater pollutants discharged by enterprises in industrial parks are unclear, and drainage systems on the enterprise side contain regulatory loopholes and operational risks.** The operating capacity of pretreatment facilities varies from enterprise to enterprise, and the quantity and concentration of typical pollutants discharged by sectors such as printing and dyeing cannot be effectively monitored, increasing the operating difficulty of downstream pollutant treatment facilities. Industrial wastewater from enterprises is often collected together with domestic sewage and pretreated in a centralized way, which easily causes diluted or unacceptable discharge of pollutants, illicit discharge and leakage.

**3) Treatment processes of downstream centralized sewage treatment plants do not match quality characteristics of wastewater discharged.** Centralized sewage treatment plants mainly employ traditional biological treatment processes based on activated sludge or biofilm process, which are highly mismatched with industrial wastewater featured complicated pollutant structure, low biodegradability, strong bio-inhibition, frequent fluctuations in water quality and quantity, high total nitrogen (TN) and total phosphorus (TP) concentrations, and high salinity, leading to inefficient treatment, poor operational stability, sludge loss and high risks.

**4) Centralized sewage treatment plants in industrial parks lack sound emergency systems.** Conventional advanced treatment processes adopted by some centralized sewage treatment plants, such as coagulation and filtration, cannot deal with the impacts of abnormal operation or sewage far above permitted levels discharged by enterprises, in which case only rejecting water inflow can be passively adopted, thus affecting normal production in industrial parks.

**In the five Mekong countries, both the textile and apparel industry and relevant industrial parks are in their infancy, without sound systems and supporting mechanisms for water environment management in the industry, so they face different difficulties from China, such as unsound environment management systems, inadequate environment management capacity and absence of supporting infrastructure.** Main problems at the present stage include:

**1) There are no dedicated, systematic guiding laws and regulations and implementation rules,** including environmental impact assessment (EIA), environmental access, discharge permits, explicit pollutant discharge standards, pollution monitoring and reporting mechanisms, and subject of environmental pollution liability. Currently, existing environmental management policies and requirements of each country are mainly found in the country's industrial environment management system, as there are basically no systematic guiding laws, regulations or implementation rules for the textile industry and industrial parks or systematic planning and top-level design for water environment management at the industrial level, impairing the intensity and efficiency of water environment management by enterprises from top down.

**2) Government agencies lack adequate environmental management capability** due to understaffing and weak technical and equipment support, resulting in poor regulation. Thailand, for example, has enacted industrial wastewater management standards and environmental monitoring requirements, but in each province only three industrial officials and 40 pollution control officials monitor pollution discharge from 120,000 factories nationwide<sup>3</sup>, implying inefficient regulation; monitoring tools, even those for basic pH measurement, are in shortage, let alone professional equipment and personnel for pollutant concentration testing, water quality testing and analysis.

**3) There is a shortage of infrastructure.** Among others, infrastructure include centralized sewage treatment facilities and sewage collection pipe networks matching the types of industrial wastewater, metering facilities for water resource management in enterprises and industrial parks, and water pollution discharge monitoring facilities. In an investigation, we find that some industrial parks still have no centralized sewage treatment facilities. Treatment processes and capacity of existing centralized sewage treatment facilities are often "mismatched" with the types of industrial water, so the treatment is inefficient. The construction of pollution pipe networks in some industrial parks lags behind, failing to guarantee the collection and treatment of all industrial and domestic wastewater in these industrial parks. There are basically no environmental monitoring facilities, which makes it hard to ensure that wastewater discharged meets relevant standards when governments lack adequate law enforcement capability.

**4) Industrial parks lack environmental management awareness and capacity.** Administrative organizations of most industrial parks lack environmental management awareness and attach more importance to economic factors and social responsibility in investment attraction and routine operation and management, but neglect the importance of environmental management. In addition, Mekong countries lack sufficient administrative authority and therefore play a limited stewardship role in reality. Some entities managing centralized sewage treatment facilities have few or even no clues as to basic information such as the number and types of enterprises in industrial parks, types of wastewater, key pollutants, discharge characteristics and discharge amount.

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<sup>3</sup> Source: WEPA International Workshop on Industrial Wastewater Management, September 26, 2017.



**5) The concept of systematic management of water environment is yet to be established.** As indicated by an investigation, water environment management in textile industrial parks in these countries focuses on water pollution control, i.e., wastewater discharge management, which is at the concentration control stage, with the idea of pollutant cap control not yet be introduced; there are no policy requirements for effective utilization of water resources, including water conservation and wastewater recycling, but some enterprises and industrial parks have carried out corresponding practice for the purpose of cost saving.

### 2.3 Water environment management needs

Given all these challenges, water environment management needs of the international textile industry and textile industrial parks in the Mekong River basin can be satisfied in four aspects:

**1) Establishment and improvement of policies and supporting systems in the industry:** industry planning and management policies in line with national water management and eco-environmental management strategies, including industry access conditions and water quality standards; standards and recommended processes and equipment for key water consumption and wastewater discharge links; systems in connection with efficient utilization of water resources and water pollution prevention and control, e.g., paid water use, water saving management contract, water efficiency pacemaker, cleaner production management, discharge permit, pollutant discharge fees, environmental monitoring and reporting, risk prevention and emergency management systems.

**2) Improvement of environment management capability:** improved capabilities of environmental authorities and watchdogs, including clear distribution of environmental regulation powers and responsibilities between governments, adequate staff with corresponding management knowledge and skills, effective technological and equipment support, e.g., testing and analysis technologies for water quality testing; rational coordination of the responsibilities and powers of the administrative organizations of industrial parks, e.g., management committees, in terms of environmental management.

**3) Infrastructure construction:** industrial parks should be equipped with wastewater treatment facilities and sewage pipe networks in line with their operational planning, with sufficient treatment capacity and treatment processes and facilities that match the types of wastewater discharged; water consumption measuring instruments and sewage reuse facilities and pipe networks, so as to improve water efficiency.

**4) Financial and technological support:** Thailand, Viet Nam, Myanmar and Cambodia are all developing countries, while Laos remains an underdeveloped country. Focusing on economic development, these governments lack the funds required to support environmental management in different industries or import advanced technologies and equipment. More international cooperation on knowledge, capacity, technology and capital is required to support water environment management in the textile industry in different countries.

### 3. Ideas for Promoting Innovation in Water Environment Management in Industrial Parks in Mekong Countries

Since the LMC mechanism was formally launched in March 2016, China has maintained active apparel import and export trade with the five Mekong countries, with their industry chains constantly integrated, and continued to increase its investment in the textile and apparel industry. The five Mekong countries have become one of China's most important textile and apparel trade partners, and their combined share in China's textile and apparel import and export trade continues to rise, which reached USD 29.79 billion in 2018, already exceeding traditional main import markets such as Japan and Hong Kong, China. Through trade and investment cooperation, China has established a complementary and interactive textile industry structure and a more efficient industry chain partnership with Mekong countries.

The current import trade structure reflects that China and the five Mekong countries have built an industry chain of "supply of textile fabric by China – apparel making by Mekong countries"; a significant amount of yarn produced by Viet Nam are exported to China for further weaving, dyeing and finishing, which become an indispensable raw material in China's textile industry chain; some apparel products from Mekong countries have also entered the Chinese market, providing more cost-effective options for Chinese consumers.

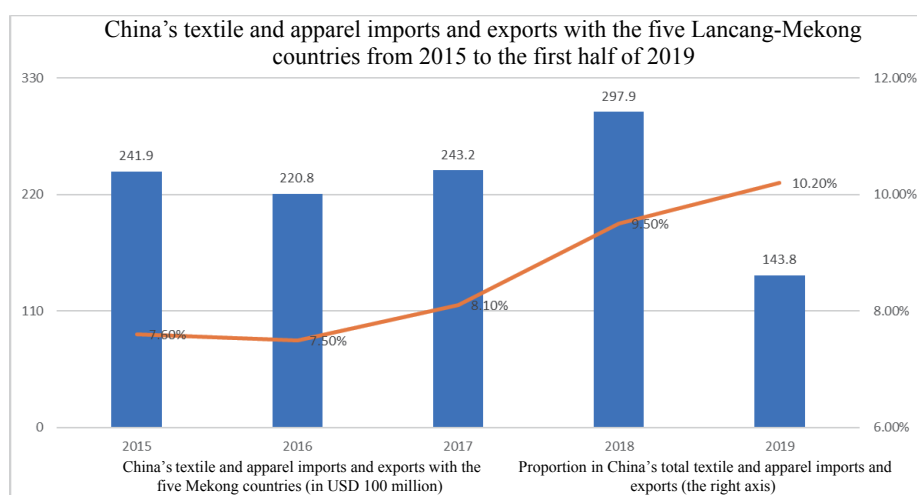


Figure 3 China's textile and apparel imports and exports with the five Mekong countries from 2016 to the first half of 2019<sup>4</sup>

As of 2019, China's investment in Mekong countries went mainly into the two ends of the industry chain (see Figure 4). One is the apparel processing sector. A combination of China's advanced apparel manufacturing technologies and management experience with abundant labor resources in the five Mekong countries has led to the establishment of an apparel processing and manufacturing industry popular among international brand purchasers. The other is the cotton textile sector. Given cotton supply constraints and high-cost cotton imports in China, some Chinese cotton textile enterprises choose to set up overseas processing bases.

<sup>4</sup> Source: China Customs

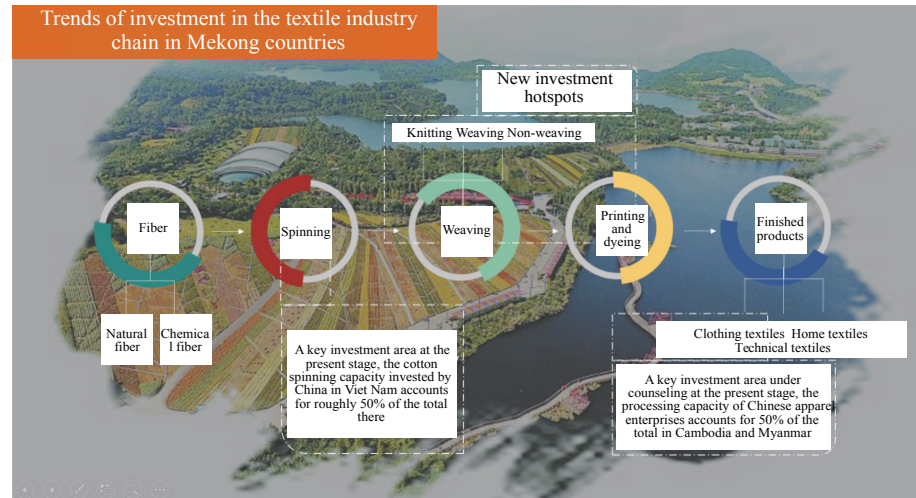


Figure 4 China's new investment hotspots in the textile and apparel industry in Mekong countries

Obviously, as both cotton textile and apparel processing on both ends of the textile industry expand in recent years, establishing a complete industry chain with supporting facilities has become an important development direction of the textile industry in the five Mekong countries, and water-intensive and heavily polluting links, such as fabric weaving, and dyeing and finishing, will become new investment hotspots for Chinese textile and apparel enterprises. Therefore, how to avoid “treatment after pollution” is an issue of common concern to stakeholders in China and Mekong countries.

Top-level design, which means the government enacts sound policies, systems and standards and enforces the same among enterprises, is the most effective way, but this requires more time, capital and other inputs as Mekong countries perform badly in environmental management and lack the capability in this regard. Textile industrial parks in Mekong countries are mostly managed by investment or construction organizations, i.e., Chinese textile and apparel enterprises or investment financial institutions, and government agencies in Mekong countries need to seek multilateral cooperation and support, so as to jointly address water environment problems in the industry. In view of these, it, after all, is efficient to formulate a regional industrial park management standard or guide for investing enterprises based on key challenges to water environment management in the industry, guide volunteer implementation of the standard or guide among pilot enterprises with the support from government agencies and gradually turn it into a regional mandatory standard through continuous improvement in practice. Moreover, this can partly make up for the deficiency of water environment management policy systems and capabilities of the textile industry and industrial parks in Mekong countries.

## 4. Recommendations for the Formulation of the Regional Guidance for Water Environment Management in Textile Industrial Parks

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On the basis of the task force's preliminary investigation into the status of textile industry park management in different countries and analysis of management challenges, we provide the following recommendations on the Regional Guidance for Water Environment Management in Textile Industrial Parks in the principle of scientificity, systematicness, normativity and operability:

### **Firstly, reasonably define the scope of textile industrial parks and water environment management issues**

There are two types of textile industrial parks funded by Chinese textile and apparel enterprises in Mekong countries: one is independent textile industrial parks with supporting facilities for pollution treatment; the other is those settled in comprehensive industrial parks which accommodate not only textile and apparel enterprises, but also other categories of industrial enterprises, with wastewater first pretreated through self-built sewage facilities generally and then discharged to centralized treatment facilities in these industrial parks. Therefore, textile industrial parks, especially those with dyeing and finishing processes, must take into account the characteristics of water pollutants from dyeing and finishing enterprises when selecting wastewater treatment processes, equipment and mode (primary treatment or two-level treatment).

On the other hand, water environment management is a systematic issue involving efficient utilization of water resources, including, water conservation, wastewater reduction, wastewater recycling and discharge of wastewater that meets relevant standards. Currently, discharging wastewater that meets relevant standards is the most concerned issue at the policy or management level, but the issue still faces many challenges. The regional water environment guidance should cover various systematic issues and bring forward guiding principles and recommendations. However, how to ensure discharge of wastewater that meets relevant standards and which discharge standards should be selected should remain a focus.

### **Secondly, reasonably define the roles and positions of key stakeholders of water environment management in textile industrial parks**

Water environment management in textile industrial parks involve a number of key stakeholders, mainly including:

**Competent authorities:** including departments of environment or industry. Competent authorities and their mandates vary from country to country. Generally, utilization of industrial water resources, water quality management and industrial wastewater management are in the charge of different departments. They, in accordance with national laws, are responsible for monitoring the compliance of water environment management in industrial parks and taking measures to punish or regulate non-compliant behaviors.

**Administrative organizations of industrial parks:** operators and administrators of industrial parks. Operators and administrators of textile industrial parks in Mekong countries are mainly investment entities, i.e., enterprises. They, in accordance with national laws, are mainly responsible for promoting compliant production by enterprises and water environment management in industrial parks by formulating park access conditions and administrative regulations, providing relevant supporting infrastructure, organizing capacity building training and offering information disclosure. Administrative organizations of industrial parks should, as the subject of water environment management in industrial parks, coordinate with government agencies to supervise and support enterprises in water environment management.

**Enterprises settled in industrial parks:** enterprises in industrial parks refer to enterprises engaged in production and operation activities within geographic boundaries of industrial parks. Their water environment management practice should first of all meet the requirements of the countries and industrial industries where they are (requirements at the industrial park level should be no lower than those at the national level), and they are encouraged to execute international advanced standards according to their respective development needs and supply chain requirements.

**Third-party environmental management institutions:** third-party environmental pollution control, “a new model where polluters entrust environmental service companies to conduct pollution control by paying fixed fees or paying fees as agreed”, is an emerging business model of pollution control. In April 2016, the former MEP issued the Guiding Opinions on Giving Play to the Role of Environmental Protection in Promoting Supply Structural Reform (No.45 [2016] of the Ministry of Environmental Protection on atmospheric environment management) to encourage industrial parks to introduce third-party environmental management institutions. In the administration of industrial parks, Industrial Estate Authority of Thailand (IEAT) also carries out environmental monitoring by entrusting professional institutions. Third-party environmental pollution control can make up the knowledge and technology gap in industrial park management.

**The public and non-governmental organizations (NGOs):** Mekong countries adopt a tripartite government pattern of government – the public – NGOs, and the public and NGOs play a notable role in social governance. In the process of water environment management in industrial parks, the public and NGOs are supervisors. Industrial parks should try to understand the demands of the public and NGOs for water environment management in the investment, construction and operation, and disclose relevant information in time, so as to reduce possible economic, social and environmental risks.

### **Thirdly, identify the basic principles, key actions and core indicators of regional water environment management in textile industrial parks**

Based on the definition of textile industrial parks and the scope of water environment management, define the general requirements for whole process management, supervision and continuous improvement of water environment in industrial parks, and key actions and core indicators.

The general requirements for industrial park management should include the identification of the scope of management: enterprises and sewage treatment plants in industrial parks. Such general requirements should include environmental access conditions, water environment management targets and principles of implementation, monitoring, assessment and continuous improvement of water environment management.

Key actions that can be taken at the park level are different from those at the enterprise level. Key actions at the park level include without limitation: identify core risks and key links of water environment management in industrial parks, build a park-wide water environment management system, understand the status of water use and water pollution by enterprises in industrial parks, set up a water environment management ledger, implement total water consumption control in industrial parks and in enterprises, establish an indicator system, supervise and evaluate the status of water environment management in industrial parks, regulate the operation of sewage treatment facilities and control typical pollutants in wastewater discharged; promote water environment management capacity building in industrial parks and build an information disclosure platform for water environment management.

Key actions at the enterprise level include: understand and analyze the status of water environment management by enterprises; get support from senior policy makers and embed water management innovation into enterprises' daily operation and management; guide enterprises to carry out fine management of water intake and use statistics and measurement; apply advanced and appropriate water conservancy technologies and equipment, and tap water saving potential; advance green transformation of water treatment from pollution control into low-energy, recycling-based and ecologically safe treatment; improve reclaimed water treatment and reuse; reduce the total wastewater discharged; control the total quantity of typical pollutants in wastewater discharged.

Core indicators of regional water environment management consist of two parts: one is indicators for evaluation of water environment management in industrial parks; the other is the core indicator system established for enterprises in the process of industrial park management.

### **Fourthly, recommend the best reference standards, best reference processes, equipment and other international advanced management platforms for regional water environment management in textile industrial parks**

Based on the survey on international advanced standards and water environment management standards in different countries, provide standard discharge inventories and specify the standard requirements that must be met and recommended advanced discharge standards; based on the core needs of the textile and apparel industry, list the key polluting processes and equipment that should be eliminated; recommend advanced management technologies and equipment to industrial parks and incorporate this as a bonus point into enterprise performance assessment; recommend international advanced management platforms that provide information and technical support for water environment management, and support the operation of the industrial park water environment management system through multilateral cooperation.

## 5. Regional Guidance for Water Environment Management in Textile Industrial Parks

### 5.1 About the Guidance

#### 5.1.1 Normative references

The guidance refers to a broad range of management guidelines or standards for eco-industrial parks and textile industrial parks in China and the international community, mainly including:

- 1) Policies and standards for utilization of water resources and prevention and control of water pollution in China, Viet Nam, Thailand, Cambodia, Myanmar and Laos
- 2) An International Framework for Eco-Industrial Parks, United Nations Industrial Development Organization (UNIDO), World Bank Group (WBG) and German International Cooperation (GIZ)
- 3) Standard for National Demonstration Eco-industrial Parks (HJ 275-2015), Ministry of Environmental Protection of China (MEP)  
Standard for Textile Eco-industrial Demonstration Parks (T/CNTAC 17-2018), China National Textile and Apparel Council (CNTAC)
- 4) Industrial Park Water Stewardship Implementation Guidance, World Wildlife Fund (WWF)
- 5) International Water Stewardship Standard V2.0, The Alliance for Water Stewardship (AWS)
- 6) International sustainable investment policies and guidelines, including the UN Global Compact, UN Principles for Responsible Investment, World Bank's Environmental and Social Sustainability Policies, Environment, Health and Safety Guidelines, and Performance Standards on Environmental and Social Sustainability
- 7) ISO14001: Environmental Management Systems, International Standardization Organization

#### 5.1.2 Terms and definitions

##### (1) Textile Industry

The industry where enterprises processing natural or man-made fibrous materials into yarn, silk, cordage, fabric and their dyed and finished products, including cotton textile, dyeing and finishing, wool textile, dyeing and finishing, bast fiber textile, dyeing and finishing, silk textile, dyeing and finishing, chemical fiber weaving, dyeing and finishing, weaving of knitted or crocheted fabric and its products, manufacturing of home textile products and manufacturing of technical textile products. The textile and apparel industry contains woven garments manufacturing, knitted or crocheted garments manufacturing and accessories manufacturing.

##### (2) Textile Industrial Park

An industrial cluster with legal boundaries within a definite area, where textile enterprises predominate, with a unified administrative or service organization, for example, an industrial zone, an economic development zone, etc.

##### (3) Water Environment Management

“Water”-related environmental management based on the full lifecycle concept, which covers all relevant processes, namely “water supply (intake) – water consumption – wastewater treatment – discharge – wastewater recycling – sludge treatment, disposal and recycling – monitoring and control of typical pollutants – water pollution in an industrial park”. The aim is to raise water efficiency, control water pollution risks and reduce negative impacts of changes in water quantity and quality on the water environment and ecology in an industrial park itself and its surrounding river basin(s).

#### **(4) Key Stakeholder**

An individual or group that is concerned about water environment management performance in an industrial park or is affected by the environmental performance. For the purposes of this Guidance, key stakeholders include national and local government authorities, planners and developers of industrial parks, operators and administrators of industrial parks, enterprises settled in industrial parks, environmental services, financial institutions, international organizations, the public and NGOs, among others. According to their requirements for water environment management in industrial parks and their influence/rights, key stakeholders can be divided into three categories:

1)Core stakeholders: including government authorities, planners and developers of industrial parks, operators and administrators of industrial parks and enterprises settled in industrial parks.

2)Supporting stakeholders: including financial institutions, environmental services, international development organizations, etc.;

3)Stakeholders concerned about water environment management without substantial engagement: including the public, NGOs, environmental organizations, etc.





## 5.2 Regional water environment management in textile industrial parks and its reference indicator system

### 5.2.1 Objectives of water environment management in industrial parks

Water environment management should aim at: taking reasonable measures according to water consumption and discharge in industrial parks and water environment and ecology in the river basin by coordinating governments, enterprises, NGOs, communities and other stakeholders in the river basin for co-participation, where governments are responsible for regulation while administrative organizations and enterprises in industrial parks are responsible for implementation, to control total water consumption in industrial parks, increase water efficiency and wastewater output there and reduce the risk of wastewater discharge to the water environment and ecology in surrounding river basins, thus ensuring the water environment quality and ecological integrity of the river basin as well as water ecosystem health and biodiversity while promoting economic development.

### 5.2.2 Basic principles of water environment management in industrial parks

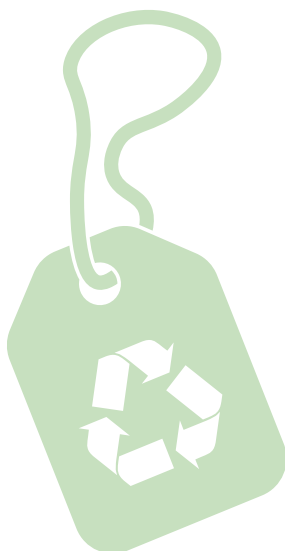
(1) Water environment management in industrial parks should first of all observe national and local environmental laws and regulations, including but not limited to national regulations on water intake, discharge restrictions and key watershed management; national regulations on utilization of water resources; regulations on soil and groundwater pollution; national regulations on conservation of the natural environment and biodiversity; regulations on climate change mitigation and adaptation; and local regulations associated with these national regulations. Where national requirements are less strict than international standards, water environment management in industrial parks should seek to comply with relevant international good practices; otherwise, relevant national and local requirements should prevail.

(2) Water environment management should follow the progressive PLAN-DO-CHECK-ACTION process set forth in the ISO14001: Environmental Management Systems, which enables continuous improvements in water environment management in industrial parks. To be specific, PLAN means planning water environment management targets; DO means carrying out water environment management to achieve the planned targets; CHECK means supervising, monitoring and assessing water environment management in industrial parks according to environmental targets and requirements; ACTION means taking actions to promote continuous improvements in water environment management in industrial parks.

### 5.2.3 Reference indicator system for water environment management in industrial parks and its application

#### (1) Reference indicator system for water environment management in industrial parks

Table 2 lists a reference indicator system for industrial parks in the region. Indicators are set mainly in the light of international standards and guidelines on water stewardship and eco-industrial park management, and cover seven parts such as basic requirements, management systems, infrastructure, water efficiency, water pollution prevention and control, emergency response and information disclosure. Specific indicators and referable indicator values are listed below:



**Table 2 Indicator system for regional water environment management in textile industrial parks**

Core indicators for water environment management in textile industrial parks				
First-level indicators	Second-level indicators	Unit	Reference requirement	Reference description
Basic requirements	Whether water intake and water intake channels in an industrial park meet national and subnational overall planning	%	Yes	Qualitative Mandatory
	Completion of national or subnational key water pollutant cap control targets in an industrial park		All completed	Qualitative Mandatory
	Stable and acceptable discharge of pollutants from key water pollution sources in an industrial park	%	Acceptable	Qualitative Mandatory
Management systems	Where there are specially-assigned functional departments and individuals in charge of water environment management		Yes	Qualitative Mandatory
	Whether water environment management is incorporated into the performance assessment of administrative organizations in an industrial park and whether a corresponding assessment mechanism has been established		Yes	Qualitative Mandatory
	Whether a sound water environment management system and corresponding implementation documents have been developed		Yes	Mandatory Qualitative
Infrastructure	Wastewater pretreatment facilities in enterprises discharging industry-specific pollutants (printing and dyeing enterprises)		Yes	Mandatory Qualitative
	Centralized sewage treatment facilities		Yes	Mandatory Qualitative
	Centralized sewage treatment facilities		Yes	Mandatory Qualitative
	Reclaimed water reuse facilities		Yes	Mandatory Qualitative
	Monitoring facilities		Yes	Mandatory Quantitative
Water efficiency	Productivity of water resources	RMB 10,000/m <sup>3</sup>	NA	Choose any one of the six indicators
	Total fresh water consumption in an industrial park	%	NA	
	Fresh water consumption per unit of industrial value added	m <sup>3</sup> /RMB 10,000	≤8	
		m <sup>3</sup> /RMB 10,000	≤9	
	Industrial water reuse rate	%	≥75	
	Reclaimed water reuse rate	%	≥50	
	Change rate of water footprint intensity in an industrial park	%	≥43	
Elasticity coefficient of fresh water consumption		If the annual average growth rate of industrial value added of an industrial park during the construction period is greater than 0, then the coefficient ≤0.55; otherwise, the coefficient ≥0.55		
Water pollution prevention and control	Wastewater discharge per unit of industrial value added	t/RMB 10,000	≤4	Quantitative Mandatory
	COD discharge per unit of industrial value added	kg/RMB 10,000	≤1	Quantitative Mandatory
	Ammonia nitrogen discharge per unit of industrial value added	kg/RMB 10,000	NA	Quantitative Optional
	Centralized sewage treatment rate	%	NA	
		%	90	
Sludge recycling rate	%	NA		
Emergency response	Perfection of the environmental emergency response mechanism in an industrial park	%	100	Qualitative Mandatory
	Number of major environmental emergencies in an industrial park		0	Mandatory
Information disclosure	Water environment information disclosure rate of key enterprises	%	100	Quantitative Mandatory
	Perfection of the water environment management platform in an industrial park	%	100	Quantitative Mandatory
Capacity building	Water environment management capacity building activities in an industrial park	time/year	≥2	Quantitative Mandatory

## **(2) Sources of reference values of quantitative indicators**

1. Reference indicator values come from the Standard for Textile Eco-industrial Demonstration Parks (T/CNTAC 17-2018)
2. Reference indicator values come from the Standard for National Demonstration Eco-industrial Parks (HJ 275-2015)
3. Overlapped indicators in the Standard for Textile Eco-industrial Demonstration Parks (T/CNTAC 17-2018) and the Standard for National Demonstration Eco-industrial Parks.
4. Reference indicator values are adapted from the Standard for Textile Eco-industrial Demonstration Parks (T/CNTAC 17-2018) and the Standard for National Demonstration Eco-industrial Parks (HJ 275-2015)
5. Indicators determined in accordance with relevant international guidelines, but no explicit reference indicator values are found.
6. Indicator values come from the UNIDO's An International Framework for Eco-Industrial Parks.

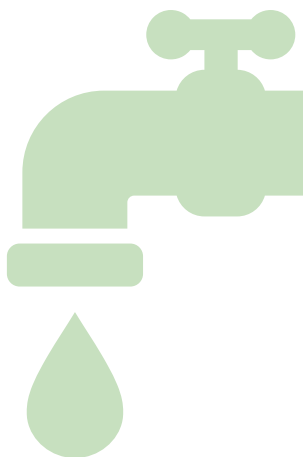
## **(3) Application of the indicator system**

Water environment management in textile industrial parks should first of all meet national environmental regulations and policy requirements of the countries where these industrial parks settle. However, the perfection of policies and standards concerning water environment management in the textile industry and industrial parks, administrative measures and thresholds vary from country to country in the Lancang-Mekong River basin. In terms of wastewater pollutant discharge, for example, standards and thresholds for typical pollutants applied to industrial parks in different countries are directly related to the planning, regulations, governance capabilities, finance and technologies of these countries. Even in a country, different standards contain varying evaluation criteria for the same indicator. For example, in the case of fresh water consumption per unit of industrial value added of eco-industrial parks in China, the threshold for national comprehensive industrial parks is no greater than 9m<sup>3</sup>/RMB 10,000 while that for textile industrial parks is 8m<sup>3</sup>/RMB 10,000.

In this case, it is only possible to provide a guiding framework on water environment management in industrial parks through identification and selection of key indicators, rather than develop a regional guidance containing unified standard values. In the planning and operation, industrial parks can determine their respective core issues and elements of water environment management in line with the framework, including basic requirements to be met, management systems and infrastructure that should be put in place, quantifiable performance evaluation indicators, etc. Competent authorities and administrative organizations of textile industrial parks in different countries should develop a water environment management evaluation system that meets particular national conditions, for the purpose of management, appraisal and continuous improvement. Industrial parks may, by setting mandatory and optional indicators and on the basis of their respective development characteristics, select appropriate assessment indicators and assess the level of water environment management according to whether these indicators are met; or they can establish a hierarchical evaluation system which contains the basic requirement of meeting national requirements and the bonus point of complying with international good practices, thereby guiding industrial parks to be aligned to international advanced practices through horizontal comparison and assessment.

## **(4) Definitions and computing methods of some reference indicators**

Water environment management system: organizations required by the administrative organization of an industrial park to set, implement, attain, assess and maintain water environment targets, and their responsibilities, planned activities, operating procedures, processes and resources, among others. By reference to the mature international standard ISO14000: Environmental Management Systems, a water environment management system of an industrial park should contain:



- Policies and plans: policies, performance targets and indicators, and plans and schemes of water environment management in the industrial park

- Implementation and operation: system documents concerning water environment management in the industrial park, organizational structure and responsibilities, capacity building and training.

- Inspection and correction: monitoring and performance appraisal of water environment management in the industrial park, and related corrective and preventive measures.

Stable and acceptable discharge of pollutants from key water pollution source in an industrial park: stable and acceptable discharge of pollutants from key pollution sources (e.g., printing and dyeing facilities) in the industrial park.

Wastewater pretreatment facilities in enterprises discharging industry-specific pollutants (printing and dyeing enterprises): industrial enterprises that might influence the normal operation of the centralized sewage treatment facility in an industrial park, such as printing and dyeing, leather processing and chemical enterprises, should establish independent wastewater treatment or pretreatment facilities, enhance the treatment of specific and toxic pollutants, and then discharge wastewater into the centralized treatment facility after it meets certain discharge requirements (national standards or requirements of sewage treatment plants in the industrial park) and does not influence the operation of the facility. Such secondary centralized treatment model is a common practice for sewage treatment in the textile dyeing and finishing sector.

Centralized sewage treatment facilities: wastewater discharged from all industrial enterprises in an industrial park enters the centralized sewage treatment facility in or outside the industrial park after it is pre-treated to meet centralized treatment requirements.

Reclaimed water reuse facilities: sewage that has been treated in a centralized manner and meets certain standards is then treated by reclaimed water treatment facilities for reuse. Generally, the physico-chemical treatment process is employed and reclaimed water is mainly reused as industrial, landscape and urban miscellaneous water.

Monitoring facilities: facilities that monitor key discharging enterprises and the centralized sewage treatment facility in an industrial park, including automatic monitoring facilities and manual periodic monitoring facilities.

Productivity of water resources: the total output value of fresh water resources consumed by industry. The higher the indicator, the higher the water efficiency.

Elasticity coefficient of fresh water consumption: the ratio of the annual average growth rate of industrial fresh water consumption by industrial enterprises in an industrial park during the construction period to the annual average growth rate of industrial value added during the construction period. Specifically, industrial fresh water consumption means the sum of water taken by the water consumption unit or system of an industrial enterprise in an industrial park from any source of water and used for the first time by the enterprise for production and living, excluding domestic water that is separately measured and domestic wastewater that is separately discharged (not mixed with industrial wastewater).

Water consumption per unit of industrial value added: the amount of fresh water resources consumed by industrial enterprises in an industrial park for each unit of industrial value added.

Industrial water reuse rate: the ratio of industrial reused water consumption in the process of production to the total industrial water consumption in an industrial park.

Reclaimed water reuse rate: the ratio of the reused reclaimed water to the total discharge from sewage treatment plants in an industrial park. Here, reclaimed water means water treated by sewage treatment plants in an industrial park and then purified through the reclamation process so as to meet the reclaimed water quality standards. Reclaimed water is mainly reused to recharge the groundwater in or outside an industrial park or for industrial, agricultural, forestry, animal husbandry and domestic non-drinking uses, landscape and environmental uses, etc.

Wastewater discharge per unit of industrial value added: industrial wastewater discharged by industrial enterprises in an industrial park for each unit of industrial value added, excluding wastewater for cascade use by enterprises and domestic wastewater discharged by residents in the industrial park.

COD discharge and ammonia nitrogen discharge per unit of industrial value added: the sum of COD and ammonia nitrogen discharged by industrial enterprises in an industrial park for each unit of industrial value added. COD and ammonia nitrogen are typical pollutants in the printing and dyeing sector.

Centralized sewage treatment rate: the proportion of industrial sewage treated by the centralized sewage treatment facility in an industrial park in the total industrial sewage discharged in the industrial park, excluding domestic wastewater discharged by residents in the industrial park.

Centralized sludge treatment rate: the proportion of sludge, produced by sewage pretreatment facilities and the centralized treatment facility in an industrial park, that is recycled or treated harmlessly.

Perfection of the emergency response mechanism for water environment risks in an industrial park: the administrative organization of an industrial park should 1) carry out assessment of water environment risks in the industrial park and identify possible major environmental emergencies; 2) establish an environmental emergency response mechanism and develop a corresponding contingency plan; 3) set up a comprehensive or professional environmental rescue team and reserve necessary environmental emergency supplies and equipment; 4) organize environmental contingency plan training and emergency drills. The reference evaluation criterion can be set as: each requirement weighs 25% and if all requirements are met, then the result is 100%.

A contingency plan should contain the setting of an emergency office, graded warning and corresponding emergency procedures, among others. Specific emergency operations include:

- Accept reports on environmental emergencies, investigate into the causes, nature and development of environmental emergencies and respond to the same immediately.
- Report environmental pollution and ecological destruction incidents that have taken place in the industrial park to the administrative organization of the industrial park and the environmental authority.
- Participate in relevant emergency rescue.
- Deal with environmental pollution caused by environmental emergencies in the industrial park and direct the corresponding emergency response squad to handle such emergencies.
- Guide the public to take protective measures and assist relevant departments in with appropriate disinfection and decontamination.

Environmental emergencies can be divided into two categories: environmental pollution incidents and ecological destruction incidents. Possible water environment emergencies include water pollution incidents, e.g., unacceptable sewage discharge, and leakage-caused groundwater pollution or large-scale water pollution due to the failure to control the spread of the pollution. Industrial parks should develop contingency plans by the severity, degree of emergency, hazard and sphere of influence of environmental emergencies.

Number of major environmental emergencies in an industrial park: the number of various environmental emergencies in an industrial park since the base year of the construction planning (the base year inclusive).

Environmental information disclosure rate of key enterprises: the proportion of enterprises that disclose information on water environment management in all of the key discharging enterprises in an industrial park. Information on water environment management includes enterprises' basic information, discharge information and operation of polluting facilities.

Industrial parks should determine key units engaged in water environment management,

including key discharging enterprises and key water-consuming enterprises, by synthesizing factors such as the environmental capacity and the requirements of the key pollutant cap control target, and types, quantity and concentrations of pollutants discharged by enterprises and institutions in respective jurisdictions.

Perfection of the water environment management platform in an industrial park: the perfection of the platform where the administrative organization of an industrial park discloses the information on water environment management in the industrial park by establishing a special column or management information network. Specific actions should include 1) release information on water environment management on a regular basis; 2) release data on key indicators on water environment management and whether these indicators are met; 3) release information on advanced processes, technologies and equipment of the industrial park in water conservation, reclaimed water recycling and sewage treatment on a regular basis; 4) release information on key discharging enterprises in the industrial park on a regular basis. The reference evaluation criterion can be set as: each requirement weighs 25% and if all requirements are met, then the result is 100%.

Water environment management capacity building activities in an industrial park: training and propaganda activities, themed “water environment management”, organized by the administrative organization of an industrial park for enterprises and employees in the industrial park by coordinating internal and external resources. Such activities can be organized in the form of seminars, technical/experience exchanges, release and learning of handbooks, etc. The administrative organization should archive relevant materials and photos of each activity.

### 5.3 Guidelines for the administration of multiple stakeholders of regional water environment management in textile industrial parks

#### 5.3.1 Identification of key stakeholders of regional water environment management in textile industrial parks

Water environment management in textile industrial parks should be led by competent authorities of industrial parks, which should coordinate national and local government agencies and other stakeholders, make clear the responsibilities and roles of all parties and gradually establish a sound operating mechanism “led by the government, driven by the market, governed by law, supported by policies, propped up by technologies and engaging the public”, in a bid to optimize the allocation of resources and maximize environmental and economic benefits through consultation and cooperation.

**(1) Government authorities:** departments that play a leading role in promoting water environment management in industrial parks, including national and local government agencies, regulators, etc. Government authorities guide water environment management in industrial parks through the formulation, implementation and regulation of water environment management policies, systems and measures, thus protecting regional water environment quality and water ecology health.

**(2) Planners and developers of industrial parks:** in charge of site selection, industrial planning, overall layout, infrastructure construction and implementation plans in connection with industrial parks, including industrial parks planned under the leadership of government agencies and investment institutions or enterprises in the private sector. Reasonable planning can help prevent water environment management risks from the source and cut down water environment management costs.

**(3) Operators and administrators of industrial parks:** in charge of the operation and administration of industrial parks, including investment attraction, operation of public facilities, daily management, etc. Operators and administrators of textile industrial parks in Mekong countries are mostly investment enterprises. They are responsible for formulating access conditions and water environment management systems including service, monitoring, safeguard and information platform systems in line with national regulations and industrial

park planning, so as to promote legal production by enterprises and water environment management in industrial parks. Administrative organizations of industrial parks should be the subject of water environment management in industrial parks and should therefore cooperate with government agencies in supervising and supporting water environment management by enterprises in industrial parks.

#### **(4) Enterprises settled in industrial parks**

Enterprises engaged in production and operation activities within geographic boundaries of industrial parks. These enterprises should first of all align their practices in water environment management to national and industrial park requirements (the latter should not be less strict than the former) and are encouraged to execute international advanced standards in line with their respective development needs and supply chain requirements. They are mainly responsible for establishing lifecycle water environment management systems, carrying out water conservation, cascade utilization of water resources and wastewater reuse by promoting cleaner production, technology and equipment innovation, and design of green products, optimizing sewage governance models, processes and facilities, and reducing environmental risks caused by sewage discharge.

#### **(5) Financial institutions and investors**

Given its high requirements for environmental improvement technologies and high costs and risks, water environment management in industrial parks exhibits great demand for venture capital and green credit from financial institutions. Financial institutions offer financial support to industrial parks/enterprises through green finance and green credit.

#### **(6) Environmental service enterprises**

Third-party environmental pollution control is a new model where polluters entrust environmental service enterprises to conduct pollution control by paying fixed fees or paying fees as agreed, and can offer good environmental governance services to administrative organizations of industrial parks.

#### **(7) The public and NGOs**

The public and NGOs act as supervisors of water environment management in industrial parks. Industrial parks should try to understand the demands of the public and NGOs for water environment management in the investment, construction and operation, and disclose relevant information in time, so as to reduce possible economic, social and environmental risks.

### **5.3.2 Recommendations for key stakeholders of water environment management in industrial parks**

We find from a preliminary investigation that the level of water environment management in textile industrial parks in Lancang-Mekong countries is related to the level of economic development, the size of the textile industry and the status of integrated environmental management in each country. Moreover, these countries vary from each other in the construction of policy systems and standards for water environment management in the textile and apparel industry and in industrial parks and the enforcement of laws and regulations, directly or indirectly affecting the water environment management needs of textile industrial parks in different countries. Currently, water environment management needs of the textile industry and textile industrial parks in Mekong countries can be satisfied in the following four aspects: establishment and improvement of policies and supporting systems, improvement of oversight and implementation capabilities, infrastructure construction and financial and technological support. Therefore, the administration of textile industrial parks in Lancang-Mekong countries should remain policy-driven, supplemented by financial, technological and capacity support. Specific recommendations include:

**Firstly, compliance is the core driver of water environment management in textile industrial parks. Government agencies should establish a sound policy system and supporting systems to guide the practice of water environment management in textile industrial parks.**

Reference policy systems and supporting systems include:

### (1) Policy systems

- Formulate development planning for the textile industry from the perspective of top-level design in accordance with national policies and planning concerning utilization of water resources and prevention and control of water pollution, and set water consumption and water pollutant control targets in the textile industry. Water intake per unit of industrial value added, wastewater reuse rate and the proportion of reduced total major pollutant (e.g., COD) discharge in the textile industry can be selected as management indicators.

- Formulate and implement measures in the light of the development planning of the industry, and guide the development of the industry by promoting structural adjustment and boosting industrial and technological innovation. For example, restrictions or bans on dyeing and finishing enterprises can be introduced for key river basins or natural reserves.

- Make clear requirements for water environment management in the printing and dyeing sector. Requirements and standards for the consideration of key river basins, access to water, application of advanced processes and equipment, and wastewater discharge in the process of enterprise layout should be laid down.

- Develop catalogues for eliminating backward processes, technologies and equipment in the textile industry (especially the printing and dyeing sector), and those for recommending advanced processes, technologies and equipment, so as to promote process, technology and equipment advances and guide healthy development of the industry.

- Formulate wastewater treatment and discharge standards and supporting manuals for the textile and apparel industry. Make clear the wastewater treatment process, the construction of supporting facilities and science-based discharge emissions and supporting technical guidance, e.g., monitoring methods, establish discharge permit and online monitoring systems to ensure acceptable discharge of wastewater.





- Make clear policies and standards textile industrial parks should abide by and main regulators, establish environmental management standards or guidelines for textile industrial parks, formulate industrial park management evaluation systems, and guide and encourage industrial parks to carry out advanced environmental management practice.

## (2) Main supporting systems

### • EIA system

Establish an EIA system for textile industrial parks. EIA in textile industrial parks consists of strategic environmental assessment (SEA) specific to industrial parks and environmental impact assessment (EIA) specific to enterprises. At the planning stage, textile industrial parks should carry out EIA in line with the industry planning and policy requirements such as regional water environment planning and pollutant cap control, to assess the positive and negative impacts of industrial park construction and operation on the environment and society, including environmental impacts on surrounding river basins and waters. When settling themselves in industrial parks, enterprises should carry out EIA as required by the industrial park and the country and develop an appropriate environmental management and monitoring plan (EMMP) and social management and monitoring plan (SMMP) to prevent and reduce possible impacts of construction and operation on regional water environment and ecosystems.

### • Discharge permit system

Establish a discharge permit system for water pollution discharge from industrial parks. Enterprises or institutions directly or indirectly discharging industrial wastewater into waters should obtain a discharge permit in accordance with state regulations before doing so. Operators of centralized treatment facilities in industrial parks should also obtain a discharge permit. Specific measures and implementation procedures for discharge permits are stipulated by the State Council.

## (3) Economic management of the environment

Whilst establishing a sound legal framework, governments may control water pollution by economic means. Specific economic management tools that can be referenced include:

**Pollutant discharge fee system:** industrial enterprises, commercial institutions and service agencies discharging pollutants into the environment or above the prescribed limits should pay pollutant discharge fees as per domestic laws and relevant provisions. The system reflects the “Polluter Pays” principle and links the responsibility for pollution prevention and control to polluters’ economic benefits, urging polluters to control pollutant discharge through independent management.

Responsibilities of polluters in industrial parks should be clearly defined. Polluters that do not directly discharge sewage into the environment in industrial parks may not pay pollutant discharge fees, while operators of sewage plants in industrial parks are pollutants and should pay pollutant discharge fees.

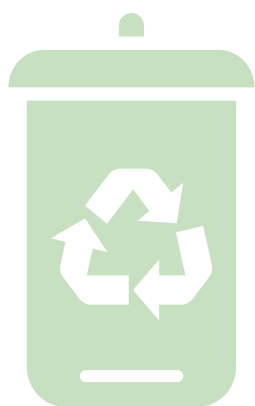
**Economic penalties and indemnities:** economic penalties and indemnities should be imposed on polluters for economic and environmental losses incurred from pollutant discharge, thus raising pollution costs from the perspective of end-of-pipe treatment and facilitate enterprises to reduce pollutant discharge.

**Environmental protection tax system:** entities directly discharging water pollutants into the environment should pay taxes in accordance with national or local environmental protection tax regulations and inventories of taxable pollutants (including atmospheric and water pollutants, solid waste, etc.). Environmental protection tax can encourage polluters to reduce pollutant discharge through tax reliefs. Payers of water pollution taxes in industrial parks should be clearly defined. Rather than polluters that do not directly discharge sewage into the environment, operators of sewage plants in industrial parks should pay water pollution taxes in accordance with the law.

Environmental protection tax is levied on water pollutant discharges, which increases

production costs and allows commodity prices to accurately reflect the price enterprises pay for their production and operation activities that pollute the water environment, so as to stimulate enterprises to reduce the discharge of water pollutants and promote conscious restoration and improvement of the water environment after production. This embodies the prevention-oriented water environment protection strategy.

**Pollution rights trading:** the government determines the total quantity of pollutants discharged into the environment in a certain area within a given period and confirms discharge allowances allocated to specific polluters; any polluter who has discharged pollutants in excess of the allowance allocated to him should buy corresponding pollution rights. Pollution rights trading can control the total quantity of pollutants discharged and minimize environmental expenses whilst promoting regional economic development.



**Secondly, an environmental access system combining SEA and EIA should be established for industrial parks, so that industrial parks, as system integration units, can efficiently utilize water resources and minimize the spread of water pollutants outside.**

Environmental access to industrial parks lies in two levels: one is park-specific environmental access against industrial parks, which means imposing environmental constraints on regional industrial development and construction in accordance with national and local laws and regulations as well as relevant policies and plans, with an aim to safeguard water ecology functions and water environment quality in the river basin and in the region. Planners and developers of industrial parks should ensure reasonable planning at the investment stage in the light of national access requirements and carry out SEA to prevent water environment management risks from the source and reduce management costs.

In the planning, industrial parks should:

(1) Consider elements of planning such as site selection, development orientation, objectives, industrial structure, layout and scale, and their compliance of relevant industrial development policies, environmental protection and pollution control policies, laws and regulations on the protection of natural reserves and other crucial environmentally sensitive areas and environmental regulations on total regional water consumption and total pollutant discharge.

(2) Consider locations of water resources and how to lay water supply pipelines, sewage transmission pipelines and reclaimed water reuse pipelines according to their industrial structures and water consumption and drainage needs, make clear where pretreated industrial wastewater from enterprises and wastewater from sewage treatment plants go and develop unified plans.

(3) Make clear the construction sites, treatment processes and capacities of sewage treatment facilities, reclaimed water recycling facilities and other water environment pollution control facilities according their industrial structures, layouts and scales, and develop monitoring plans by taking into account their or local environmental monitoring capabilities to ensure stable operation of these facilities.

(4) Determine their respective contingency plans in response to water environmental risks, including main sources of risks, key goals of water environment and ecology protection, effective emergency response mechanisms, to prevent potential environmental risks and hazards from turning into environmental accidents and emergencies.

Enterprises should meet certain access conditions when being settled in industrial parks. Operators and administrators of industrial parks may screen out enterprises to be settled by setting access conditions, which include the state of art of production processes, policies for the sector and the industry, environmental function zoning in the jurisdiction, relevance of industrial park planning, etc.

**Thirdly, third-party environmental pollution control in industrial parks should be promoted, so as to provide industrial parks and local governments in the river basin with good environmental management services through contract management.**

Local governments and operators of industrial parks should be encouraged to introduce environmental service enterprises, establish an innovative mechanism featuring polluter accountability, third-party pollution control, government regulation and social supervision in the principle of “paid pollution control, shared responsibilities, centralized governance and policy incentives” and improve the third-party pollution control system. Administrative organizations of industrial parks can entrust third-party organizations engaged in environmental pollution control to offer environmental governance, monitoring, facility operation and other comprehensive contract-based environmental services on a “bundling” basis. Third-party environmental pollution control can make up for the deficiency of knowledge and technologies in the management of industrial parks and constrain enterprise practice through market mechanisms and economic levers.

**Fourthly, financial institutions and international development organizations should be driven to participate in water environment management in industrial parks and surrounding river basins, provide financial and technical support through pilot projects and guide water environment management in industrial parks.**

Environmental management in industrial parks requires heavy capital investment, no matter at the construction stage or at the operation stage, which some enterprises or investors often cannot afford. Measures such as promoting the establishment of a green financial system, formulating a list of preferentially supported credit projects, issuing green bonds and setting up green development funds can motivate and support investors, developers, operators and administrators of industrial parks to strengthen input and allocation for water environment management. Some international organizations, including UNIDO and WWF, have established sound management frameworks and standard systems in promoting water management and the development of eco-industrial parks, and worked with international financial organizations or local finance to launch pilot projects that push forward the practice of regional water management in industrial parks.

Mekong countries have not yet established a sound water environment management system and supporting mechanisms for the textile industry, with both textile industrial parks and the textile industry in their infancy, so they need more support from international financial institutions and development organizations given the levels of economic, social and technological development in these countries. Coordinating with all stakeholders and pursuing an operating mechanism featuring government leadership, implementation by administrative organizations and enterprises in industrial parks, support from financial institutions and international development organizations and supervision by the public and third-party organizations is an effective way to explore advanced management and practice patterns and boost regional water environment management in textile industrial parks.



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About LMEC: Lancang-Mekong Environmental Cooperation(LMEC), established in 2017 in Beijing, China, aims to boost the capacity of environmental governance of each country and achieve regional sustainable development through the promotion of environmental cooperation among the Lancang-Mekong Countries.