

GICC 2018

Cambodia Urban Sewerage System

By

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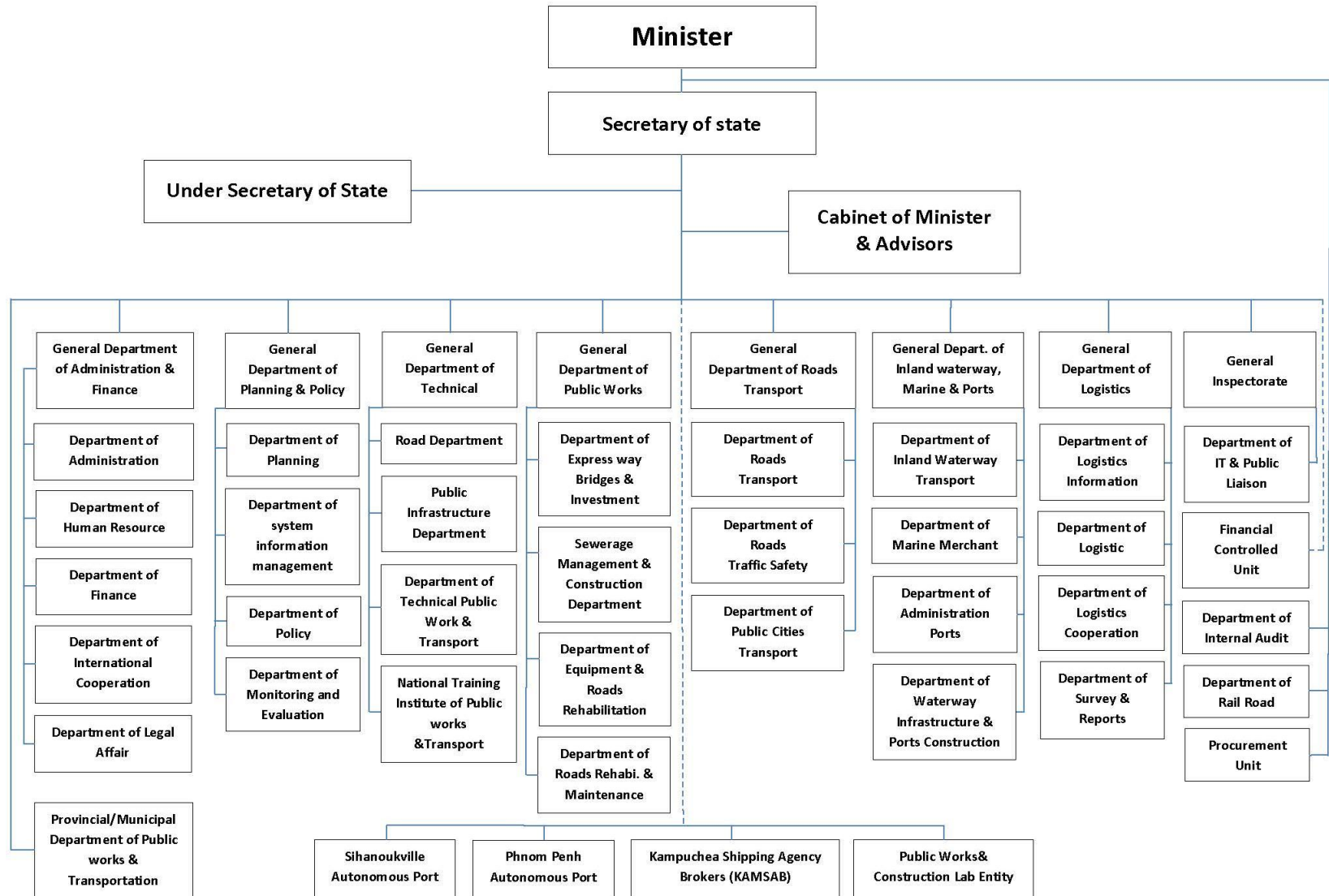
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Cambodia's Profile

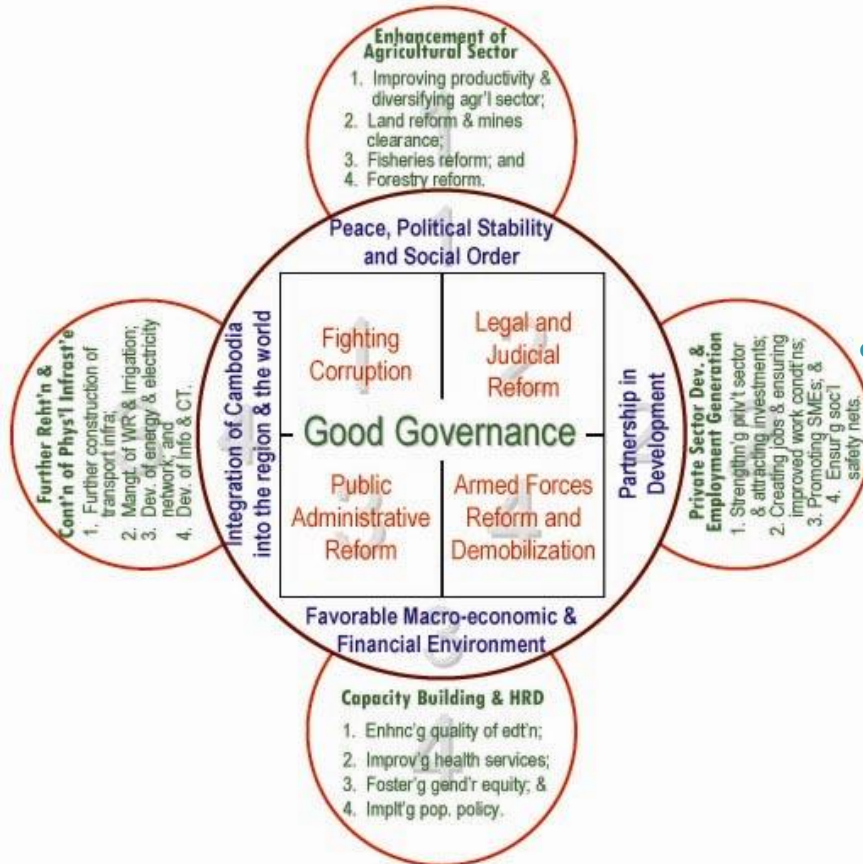


- ✓ **Population: 16.07 millions**
- ✓ **Land Area: 181, 035 km²**
- ✓ **Density: 88.76 person/km²**
- ✓ **Capital City: Phnom Penh**
(Population: 1.9 millions)

MPWT Organization Chart



Strategy and Goal



- **Rectangular Strategy-Good Governance:**

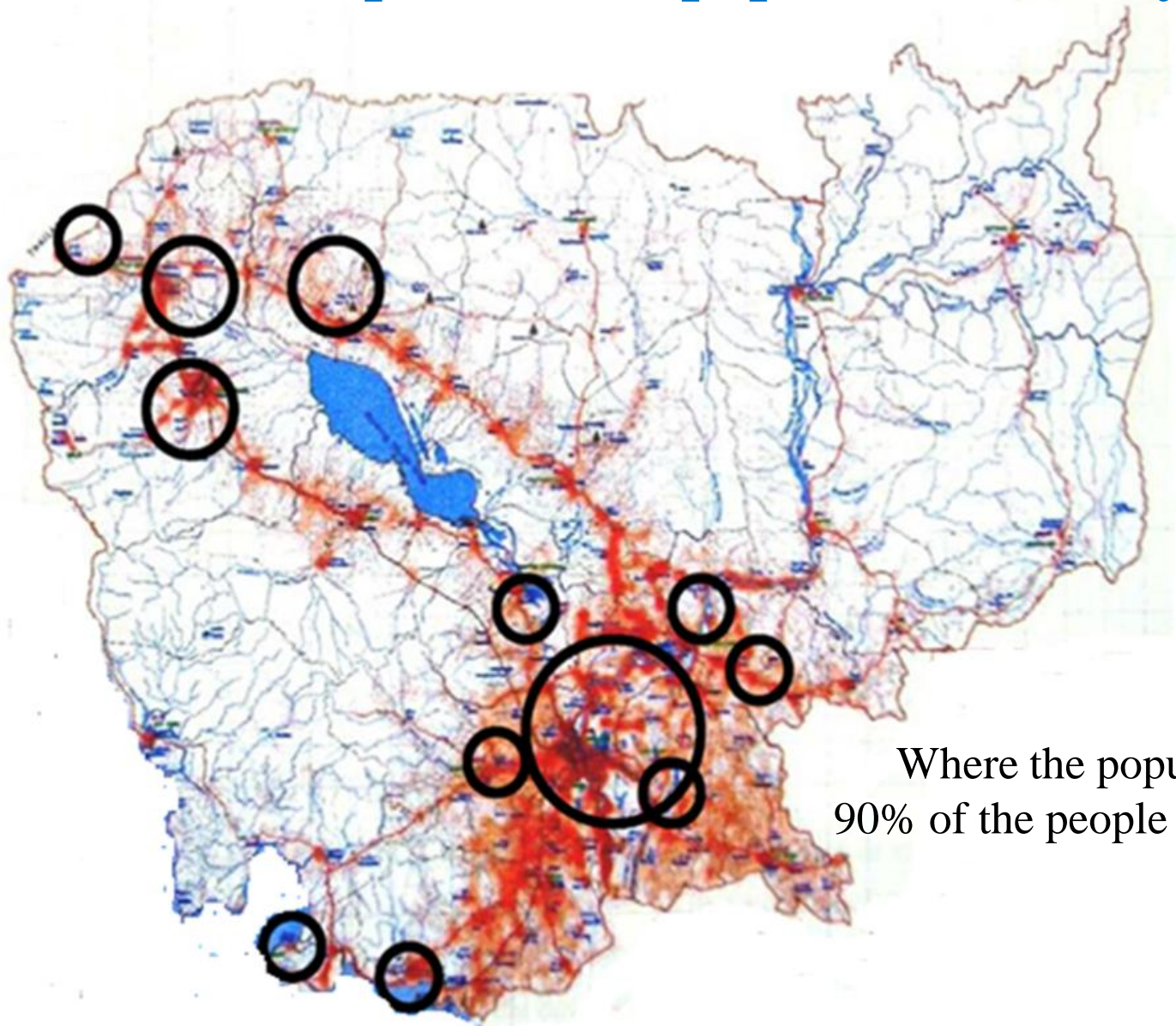
Promotion of Economic Growth;

Generation of Employment;

Implementation of Governance Action Plan (AP); and Enhancing Efficiency and Effectiveness in implementing the reform programs.

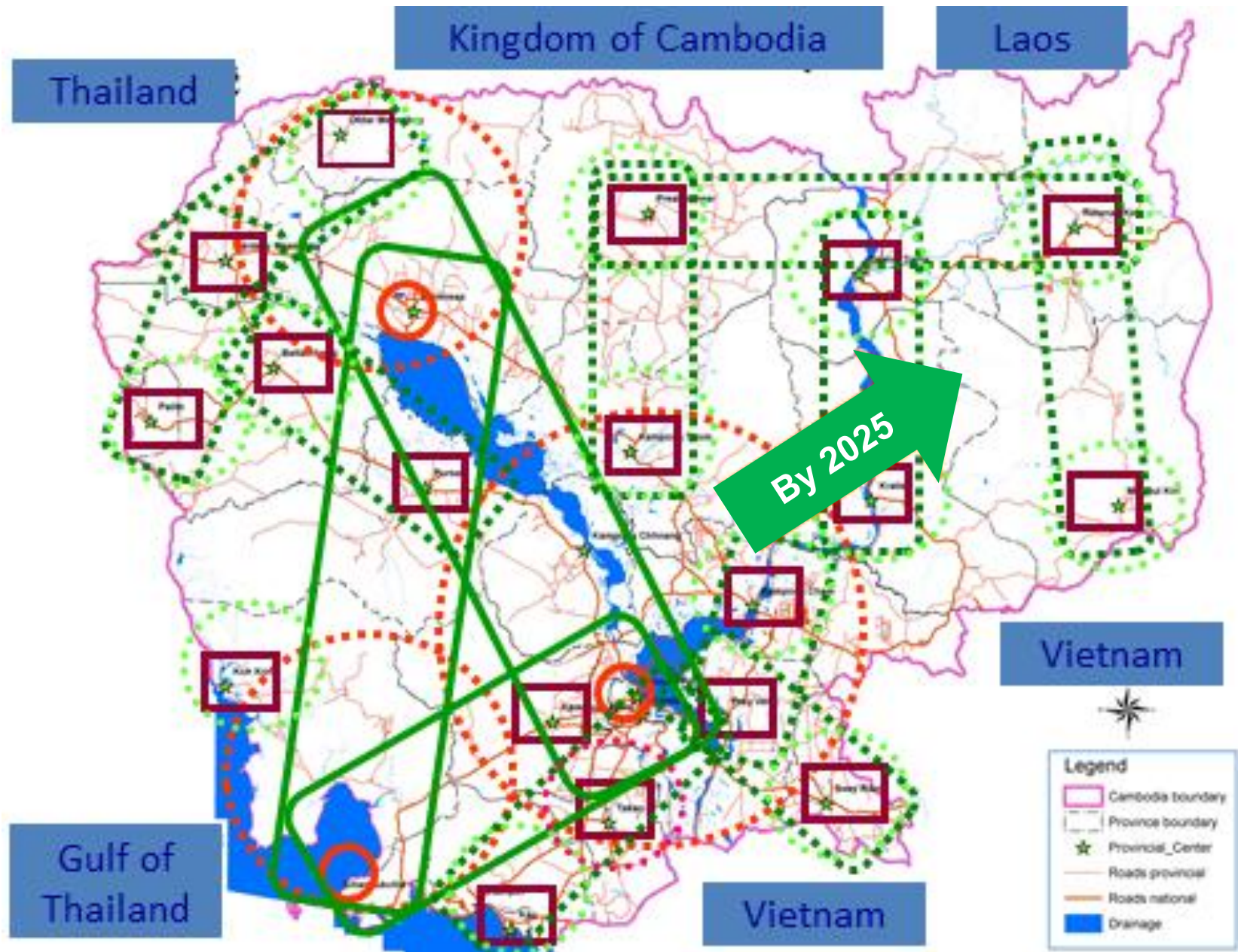
- **The Government of Cambodia (GOC) has adopted the Millennium Development Goal (MDG) targets for water supply and sanitation, specifying that, by 2025, 90% of the urban population and 80% of the rural population should have access to safe water, and that 85% of the urban population and 80% of the rural population should have access to improved sanitation.**

Distribution of urban areas corresponds with population density



Where the population lives
90% of the people live in 40%
of the area

Urban Development Concept



Concept Sewerage Management

•Geographical Relief

- 1.The water network in Cambodia is divided into three systems: The Mekong River system, the Tonle Sap Lake system and the Coastal Zone. The hydrological systems are central to life in Cambodia and Phnom Penh itself is located on the confluence of three important rivers; the Mekong, the Tonle Sab and the Bassac.
- 2.The Tonle Sap System includes the Tonle Sap Lake, the Tonle Sap River and their Tributaries. The Tonle Sap Lake is the greatest source of fish in Cambodia and as a result experiences the greatest population density as many people rely on the lake as a form of income.

•Treats to Wetlands in Cambodia

- 1.Point source of pollution to wetlands comes from industry and urban sewerage. Regardless of the relatively small amount of raw sewerage, its direct discharge into the environment without primary treatment raises concerns over pollution loads in associated waters.

•The Tonle Sap Biosphere Reserve

- 1.Biosphere Reserves (BR) are areas of terrestrial coastal ecosystems promoting solutions to reconcile the conservation of biodiversity which it's sustainable use. They are intended to fulfill three basic functions including conservation, development and logistic function. The Tonle Sap Lake was designated a Biosphere Reserve upon approval for its inclusion in the World Network of Biosphere Reserves by the International Coordinating Council for UNESCO's Man and Biosphere (MAB) reserve programmed in 1997. The designation reflects the importance of the Tonle Sap Lake ecosystem for its ecological function and for supporting socio-economic development and the maintenance of associated cultural values.

•The Coastal Zone

- 1.The coastal zone (CZ) of Cambodia extends for 435km and consists of estuaries, bays and 64 islands of various sizes. Most of the coastal population is concentrated in Sihanoukville where urban services and employment opportunities are available and in Kampot, where good soil conditions and access to water enables rice culture. Cambodia does not yet a complement of coastal and marine environmental policies. As development pressures are rapidly mounting there is an urgent need for safeguards to be put in place that will allow economic development while ensuring the sustained quality of coastal and marine environments and the resources they provide.

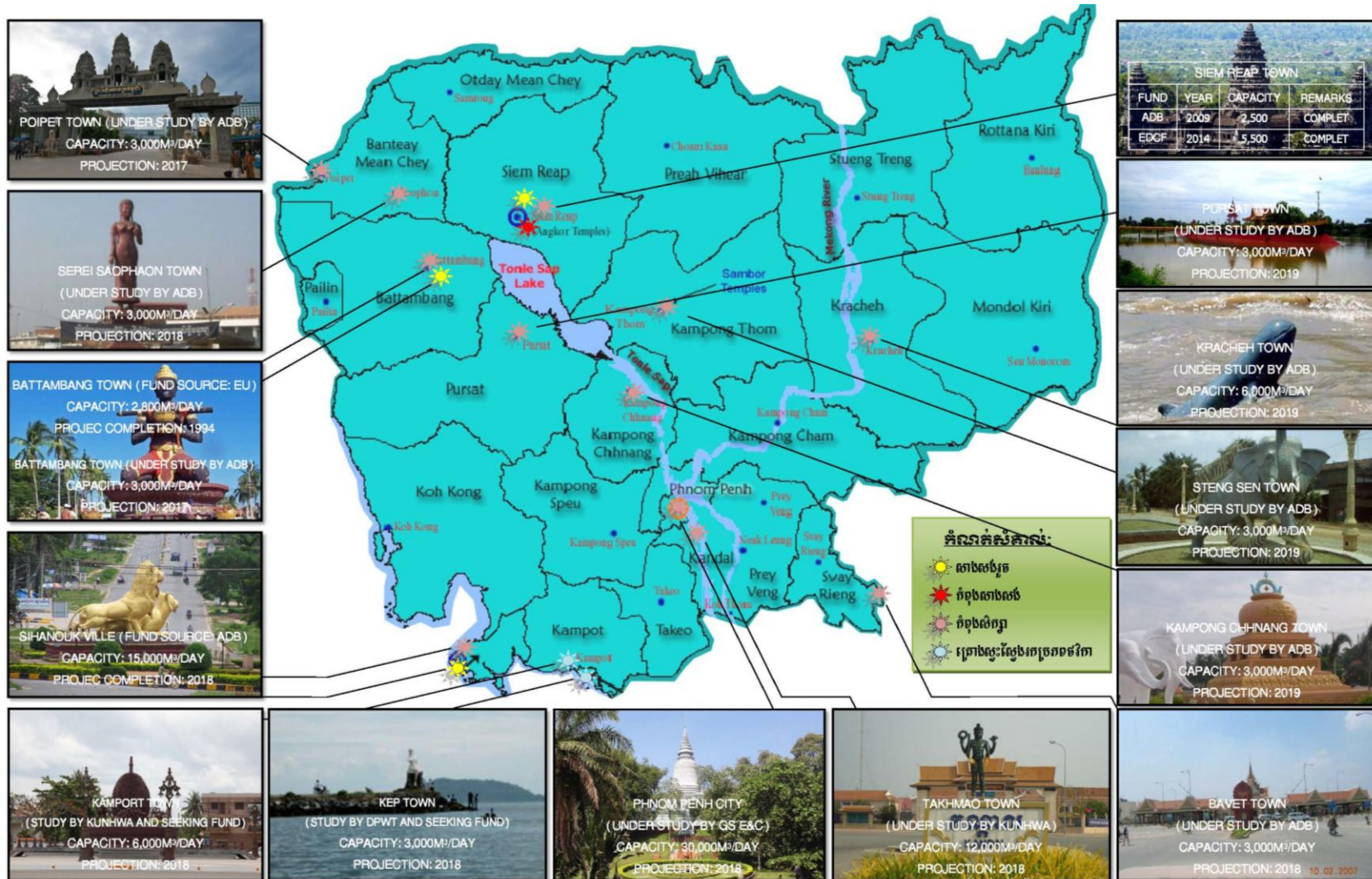
•Development Plan

- 1.Development strategy which contributes to the regional development and poverty reduction. The long term plan to develop the Multiple Economic Development Zones.
- 2.The priority wastewater management plan: *Short term plan*: Sihanoukville and Siem Reap Town; *Medium term plan*: Kampot, Kep, Poipet, Battambang, Bavet, Pursat, Serei Sophon and Stueng Saen Town; *Long term plan*: Phnom Penh City, Takhmao Town and some other towns along the Mekong River and around the Tonle Sap Lake.

•Target Plan

- 1.The National Program outlines priorities and projects for each sector of the economy. Regarding the physical infrastructure, one main priority is said to be linking of the three designated growth poles Phnom Penh, Coastal Zone and Siem Reap. The CZ is a priority not only tourism and also for industrial development, while the areas around *Kampot* and *Sihanoukville* Town will be target for the wastewater management as a priority.

Priority Towns

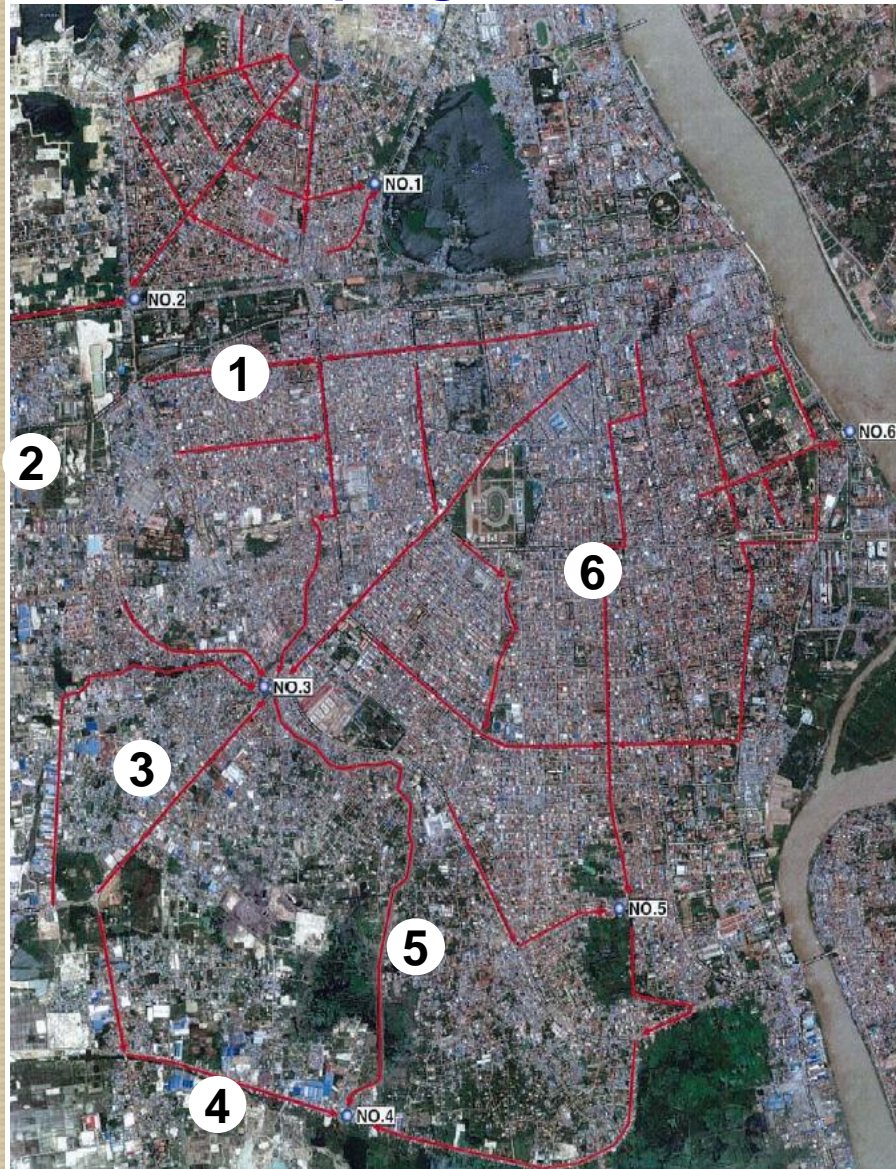


Previous & Ongoing Project

No .	Project Name	Funding Agency	Loan Amount for Civil Works only	Project Cover Area	Loan Agreement Year	Completion Year
1	Emergency Rehabilitation Project for Water Supply and Sanitation in Battambang	EU	Grant (N.A)	East Part of Town Center about 200 ha.	1992	1994
2	Provincial Towns Improvement Project, (Part C: Wastewater Management System, and Part D: Local Governance and Resource Mobilization, in in Sihanoukville	ADB Loan No.: 1725 - CAM (SF) and 2013 - CAM (SF)	USD 11.19 M	Cover an area of 221.5 ha with 3,368 service connections	02 Feb. 2000	31 March 2007
3	Mekong Tourism Development Project, Part A1: Siem Reap Wastewater Management System	ADB Loan No.: 1969 - CAM (SF)	USD 14.37 M	About 530 ha	7 Feb. 2003	31 Dec. 2009
4	Siem Reap Urban Development Project Drainage & Wastewater Master Plan Study, Priority Works	AFD, French	Grant:US\$4 M	East Part Siem Reap Town Drainage	2008	2009
5	Siem Reap Sewerage System and Improvement of Siem Reap River	Korea Eximbank	USD 26 M	Cover of 934 ha (East 365ha+ West 569ha)	2011	2014
6	GMS: Southern Economic Corridor Towns Development	ADB	USD 55 M	Cover 4 Corridor Towns	2014	2018
7	Integrated Urban Environmental Management in the Tonle Sap Basin	ADB	USD 52 M	Cover Pursat & Kampong Chhnang Town	2016	2021
8	GMS: Second Corridor Towns Development	ADB	USD 38 M	Cover Kampot & Sihanoukville Town	2016	2020
9	Improvement of Siem Reap River Phase II Project	Korea Eximbank	USD 13 M	Siem Reap Town	2016	2019
10	Provincial Water Supply & Sanitation Project	ADB	USD 66 M	Sihanoukville, Battambang, Siem Reap & Kampong Cham	2017	2022
11	Ta Khmau Sewerage System	Korea Eximbank	USD 64 M	Ta Khmau Town	2017	2022
12	Fourth GMS Corridor Towns Development	ADB	USD 88 M	Krong Kep, Kampong Cham & Stung Treng Town	2018	2022
13	Integrated Urban Environmental Management in the Tonle Sap Basin II	ADB	USD 87 M	Cover Kampong Chhnang, Pursat, Serei Saophoan & Steung Sen, Town	2019	2024
14	Phnom Penh Sewerage Master Plan Study	JICA		Phnom Penh Metropolitan	2015	2016
15	Major Towns Urban Sewerage Master Plan	MPWT		Ta Khmau, Sihanoukville & Siem Reap	2018	2020

Phnom Penh Surface Water Quality

Sampling Location

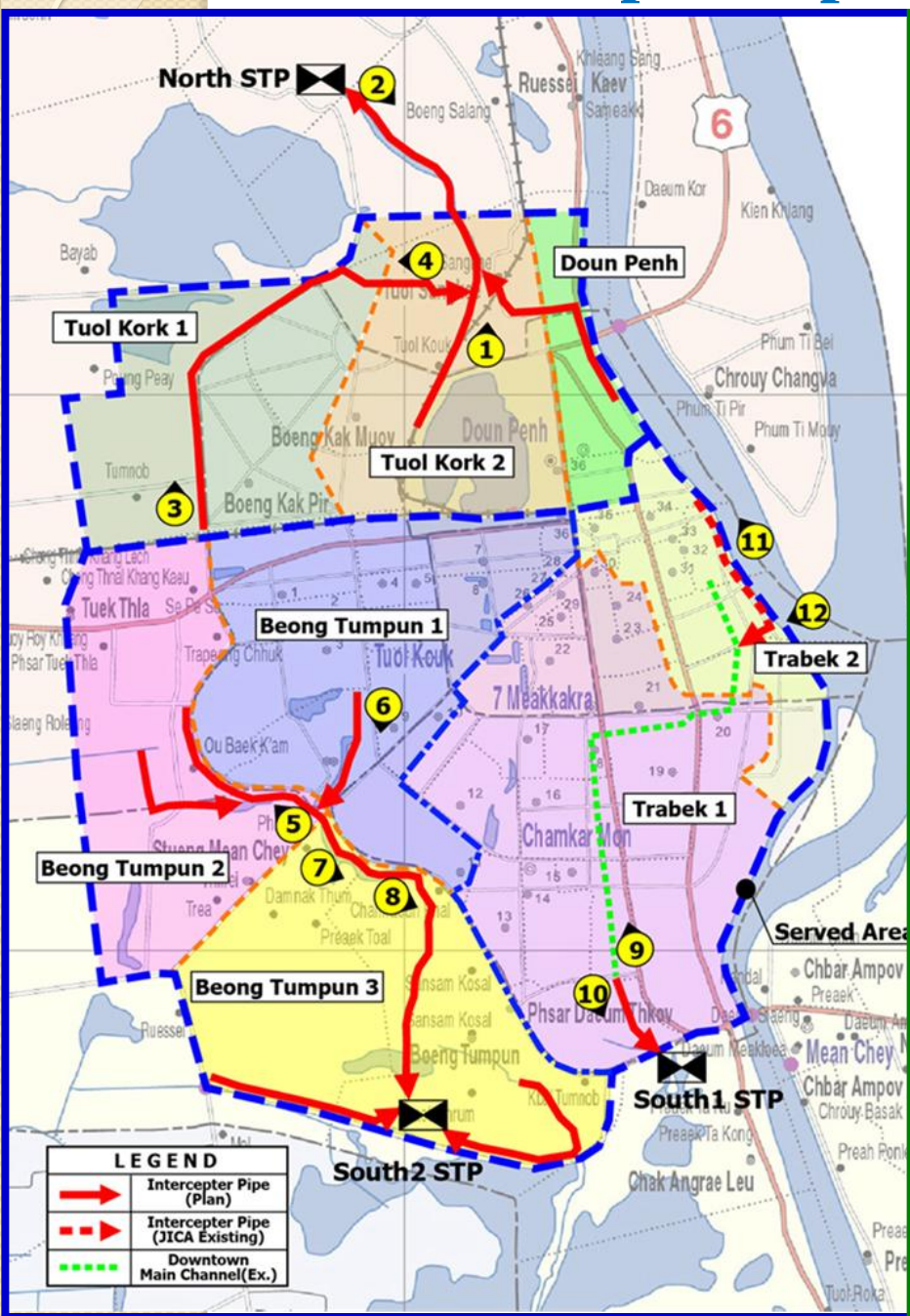


Water quality

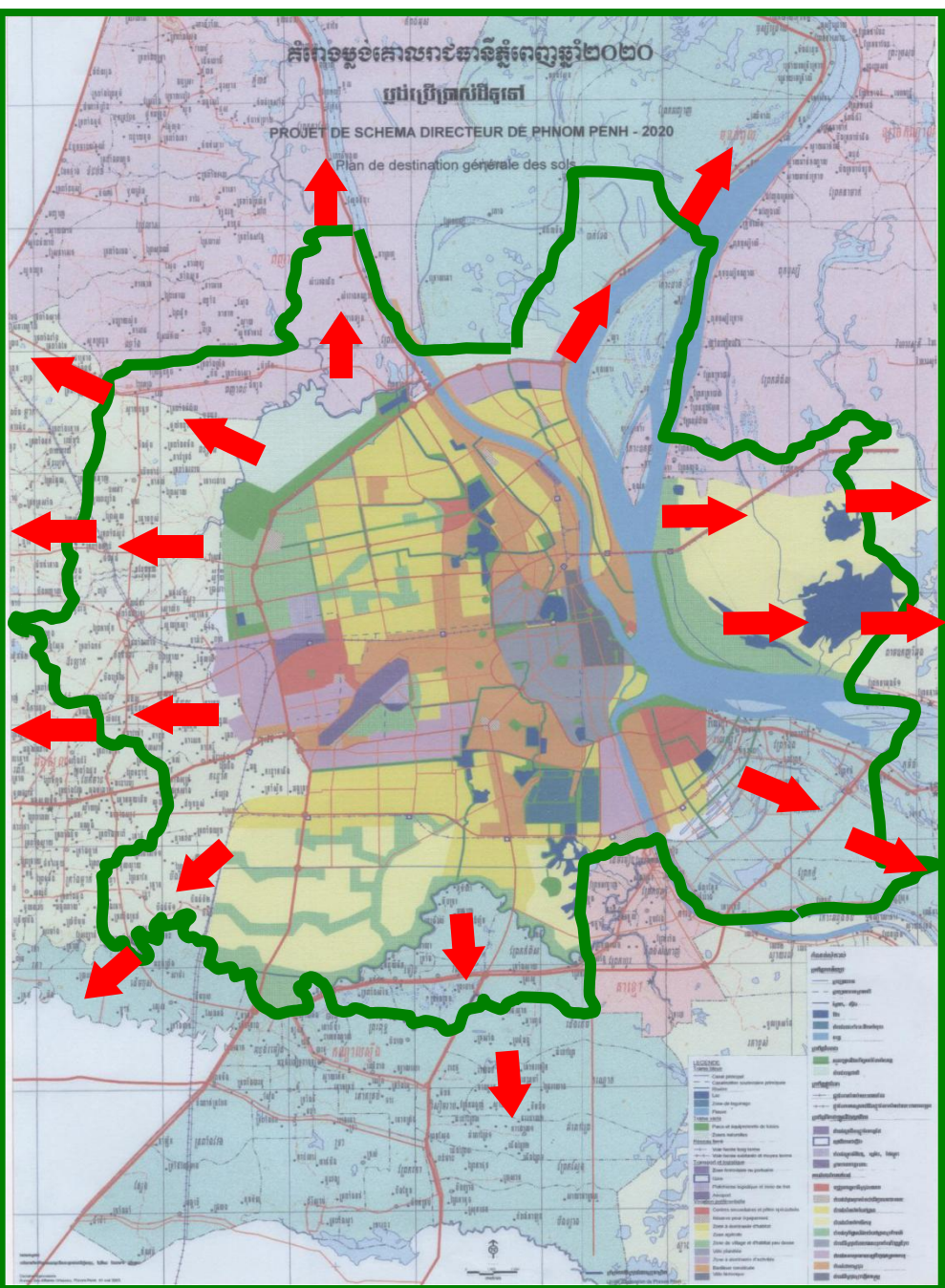
	BOD	SS	CO D	T-N	T-P
1	103.2	183.0	56.1	38.8	4.0
2	24.6	32.5	23.4	15.5	1.6
3	27.3	68.0	24.0	20.6	2.3
4	26.7	67.0	25.3	19.3	2.1
5	147.6	142.0	54.1	30.9	3.3
6	110.4	56.0	52.2	40.8	4.1

Sampling date : 2010.08.08

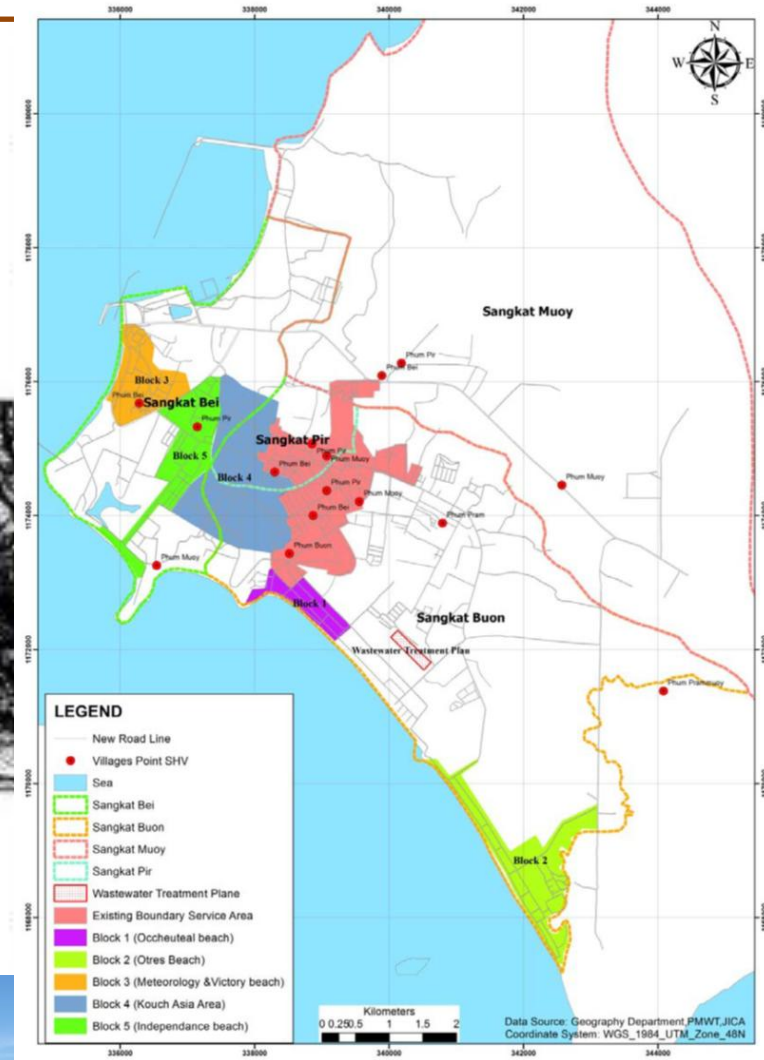
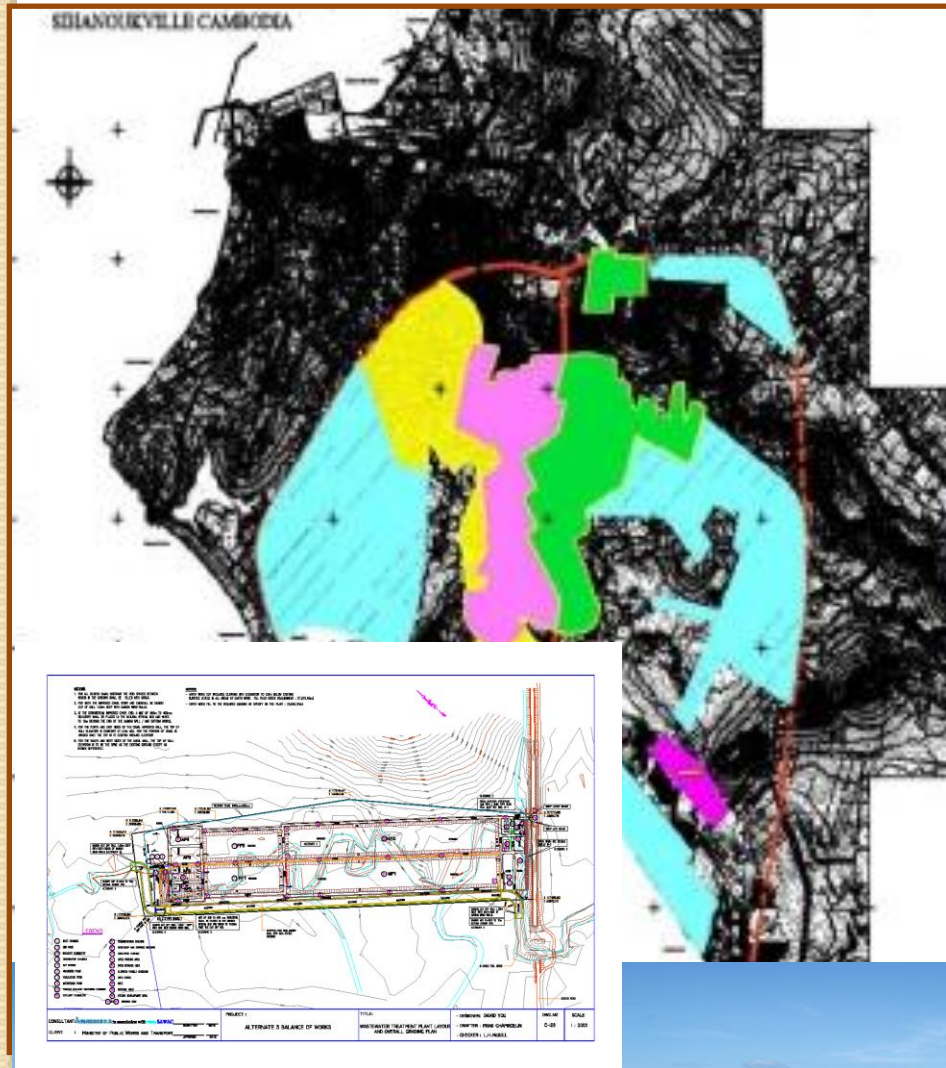
Phnom Penh Interceptor Pipe



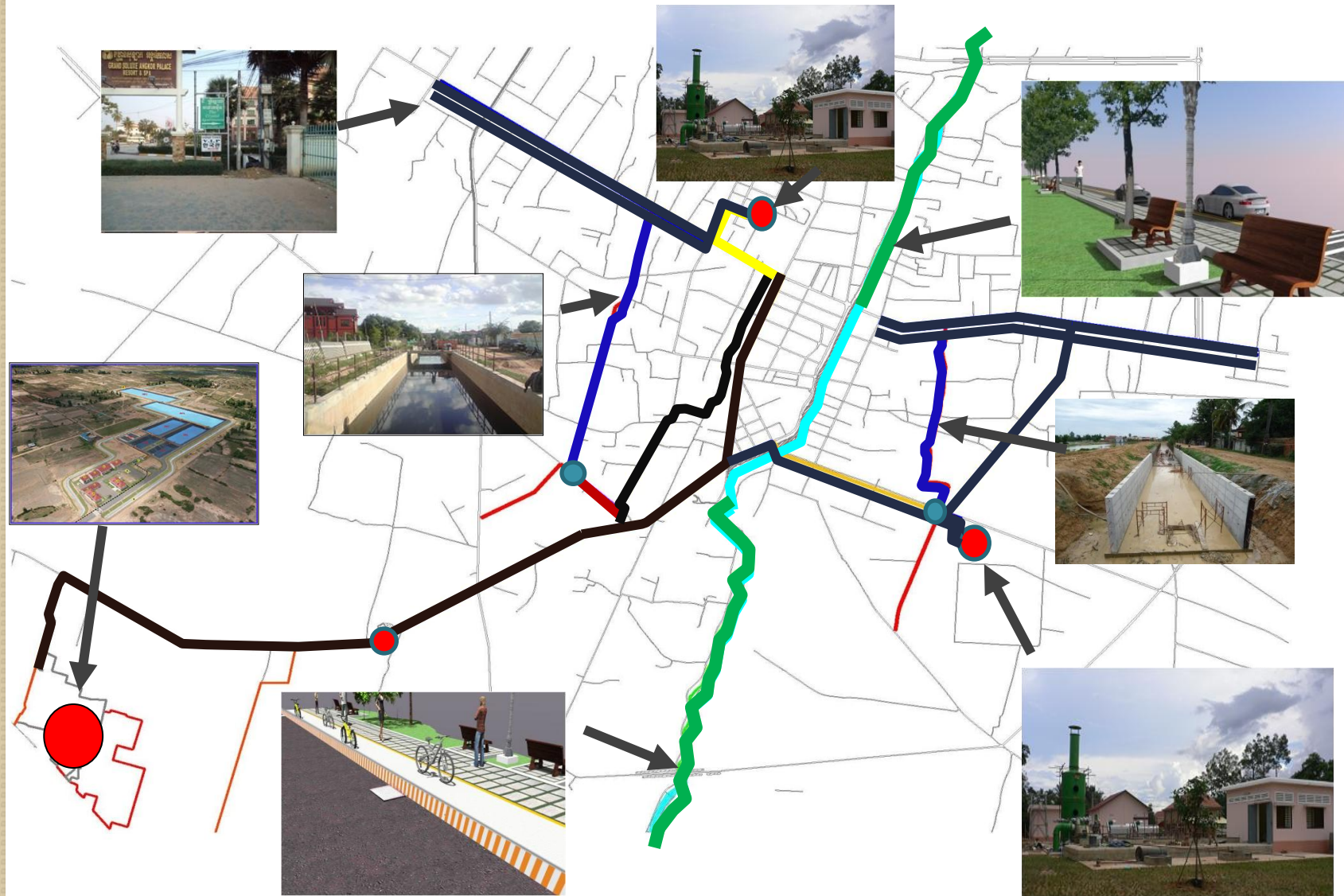
Phnom Penh in 2020



Sihanoukville Sewage Management

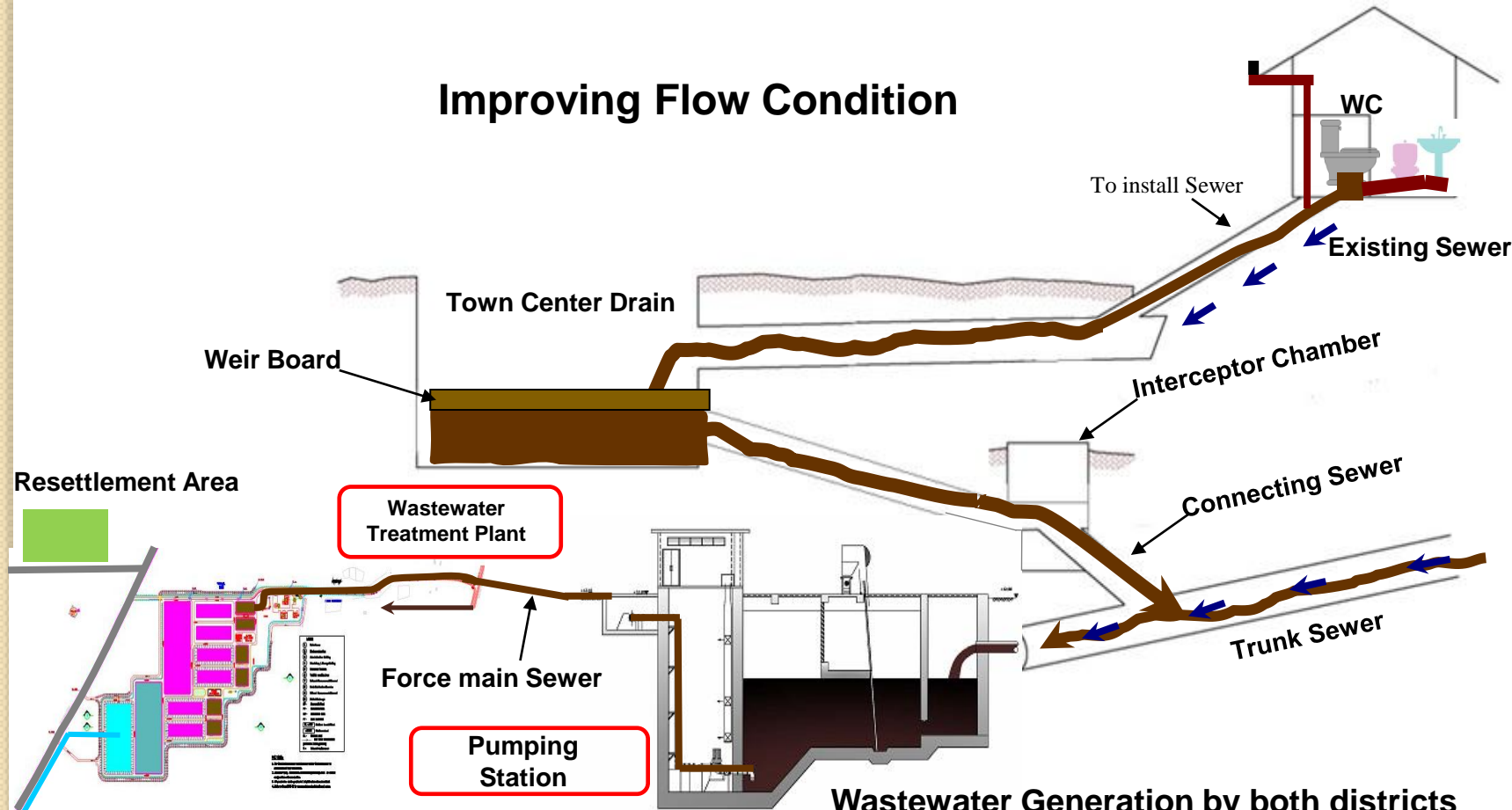


Siem Reap Sewage Management



Siem Reap Sewer Flow Process

Improving Flow Condition



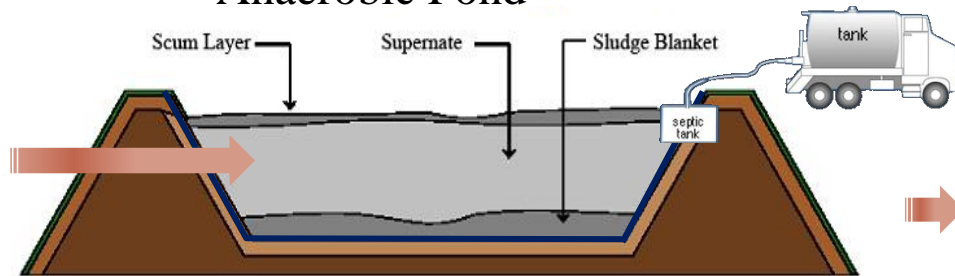
Wastewater Generation by both districts

Description	2010	2015	2020	2025	2030
East	3,915	4,907	6,049	7,379	8,909
West	7,484	9,250	11,310	13,716	16,526
Total	11,399	14,157	17,359	21,095	25,435

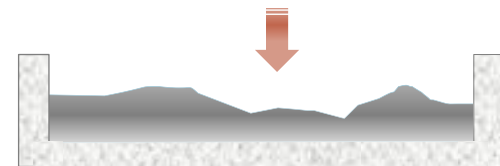
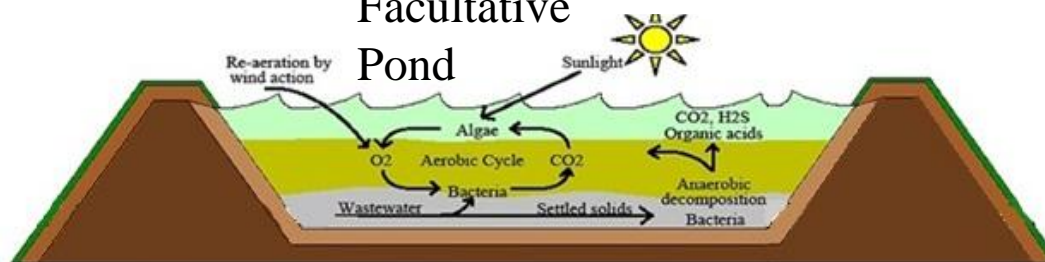


Concept Design Treatment Plant

Anaerobic Pond

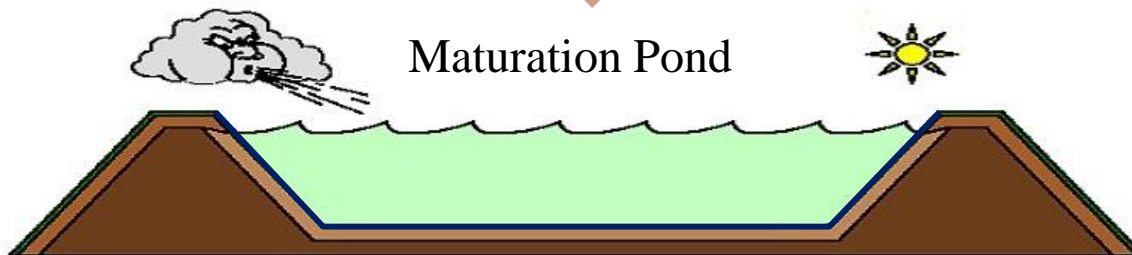


Facultative Pond



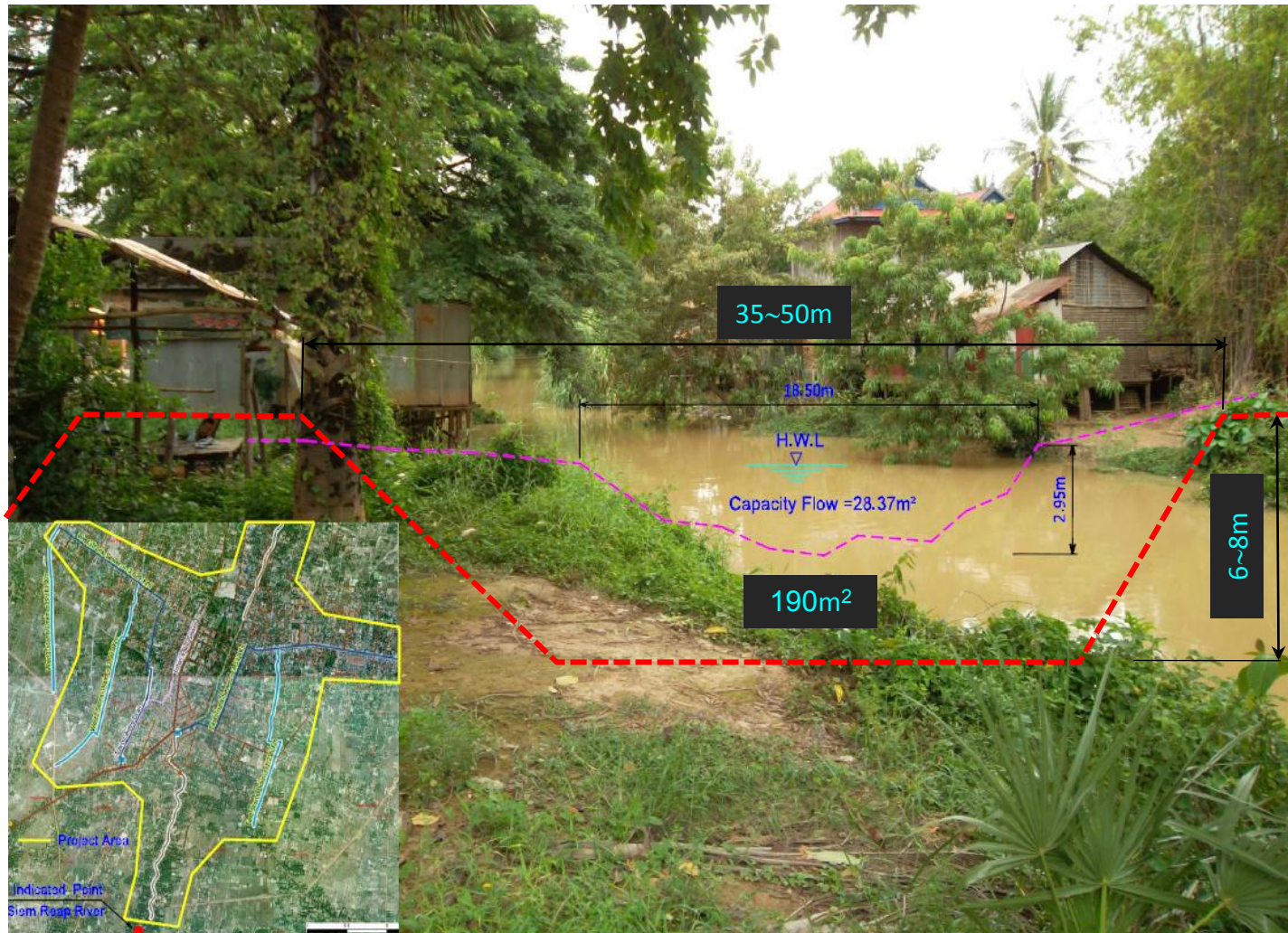
Sludge Drying Beds

Maturation Pond



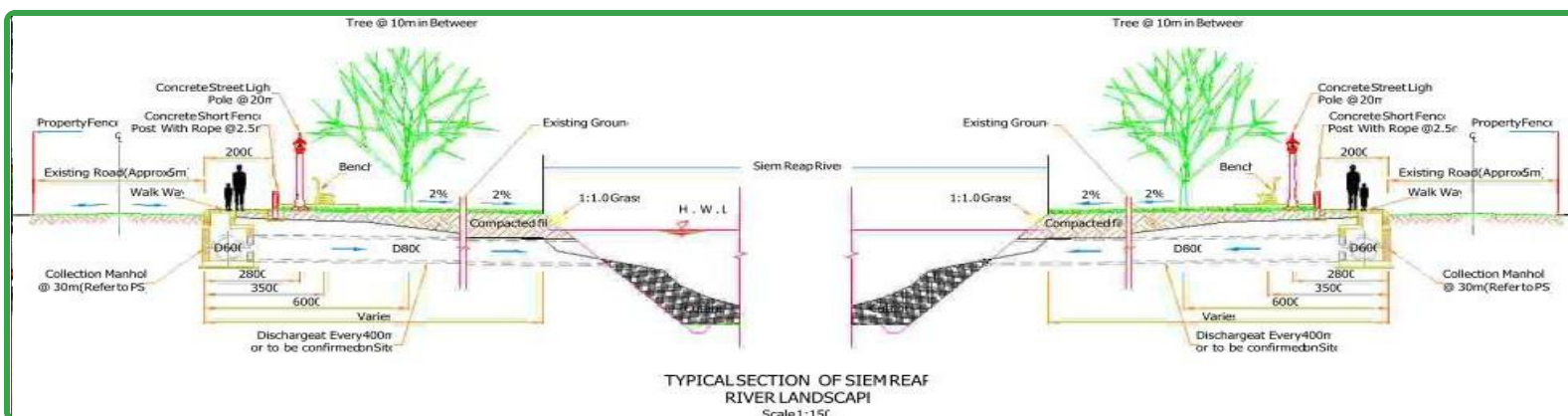
Discharge

How to improve the River



Siem Reap River & Flow Regulation

Siem Reap River Improvement Project (KHM-18)



After Project Implementation

Surface Water Quality Standard

Water quality standard in public water areas for bio-diversity conservation in Cambodia

No.	Parameters	Unit	Standard value
River			
1	pH		6.5-8.5
2	BOD ₅	mg/l	1-10
3	Suspended Solid	mg/l	25-100
4	Dissolved Oxygen	mg/l	2-7.5
5	Coliform	MPN/100ml	<5000
Lakes and Reservoirs			
1	pH		6.5-8.5
2	COD	mg/l	1-8
3	Suspended Solid	mg/l	1-15
4	Dissolved Oxygen	mg/l	2-7.5
5	Coliform	MPN/100ml	<1000
6	Total Nitrogen	mg/l	0.1-0.6
7	Total Phosphorus	mg/l	0.005-0.05
Coastal water			
1	pH		7-8.3
2	COD	mg/l	2-8
3	Dissolved Oxygen	mg/l	2-7.5
4	Coliform	MPN/100ml	<1000
5	Oil content	mg/l	0
6	Total Nitrogen	mg/l	0.2-1
7	Total Phosphorus	mg/l	0.02-0.09

Source: Annex 4, Sub-Decree on Water Pollution Control, 1999

Problem and Constraint

- The present situation of sewerage and drainage is alarming, **flooding during the raining season, climate resilience** and requires urgent intervention to address the issues;
- A further deterioration is expected through rapid town development, land use & zoning development and **the basic infrastructures** (flood protection, water flow regulation system, town center drain, diver channel...);
- At present, there is no sewerage and drainage **sector master plan** for the towns or country,
- Not adequate human resources, empowerment and financial resources for O&M and management of the sewer system;

Necessary Countermeasure

- Establishment of **legislation and laws** for wastewater management institutions for the empowerment/enforcement, Capacity building and resources mobilization.
- Master plan for the wastewater management & related **basic infrastructure** of each urban area and towns throughout the country is urgently required;
- Encouragement of **Private Sector Participation**.



Thank you