



**KINGDOM OF CAMBODIA**

**PHNOM PENH WATER SUPPLY AUTHORITY**

**Urban Water Supply Management  
in PHNOM PENH, CAMBODIA**

**PRESENTED BY MR. LONG NARO  
DEPUTY DIRECTOR GENERAL OF PPWSA**

**26 November 2015**

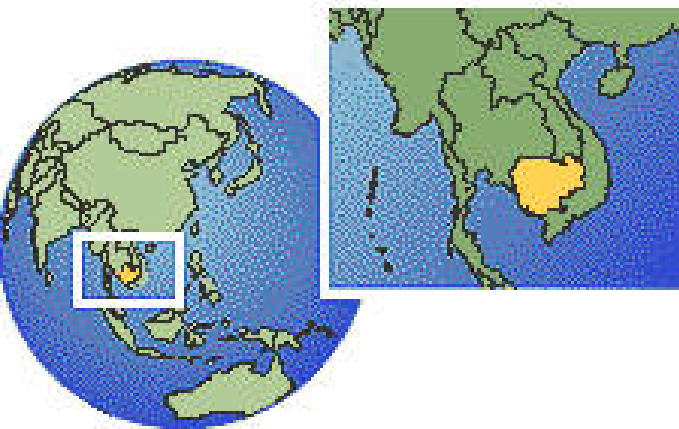


# Presentation Outline

- I. GENERAL OVERVIEW
- II. PRESENT WATER SUPPLY SYSTEM
- III. EXPANSION OF WATER SYSTEM 2014-2017
- IV. FUTURE PROJECT 2017-2021
- V. EXTERNAL ACTIVITIES AND PARTNERSHIP
- VI. BUSINESS OPPORTUNITIES



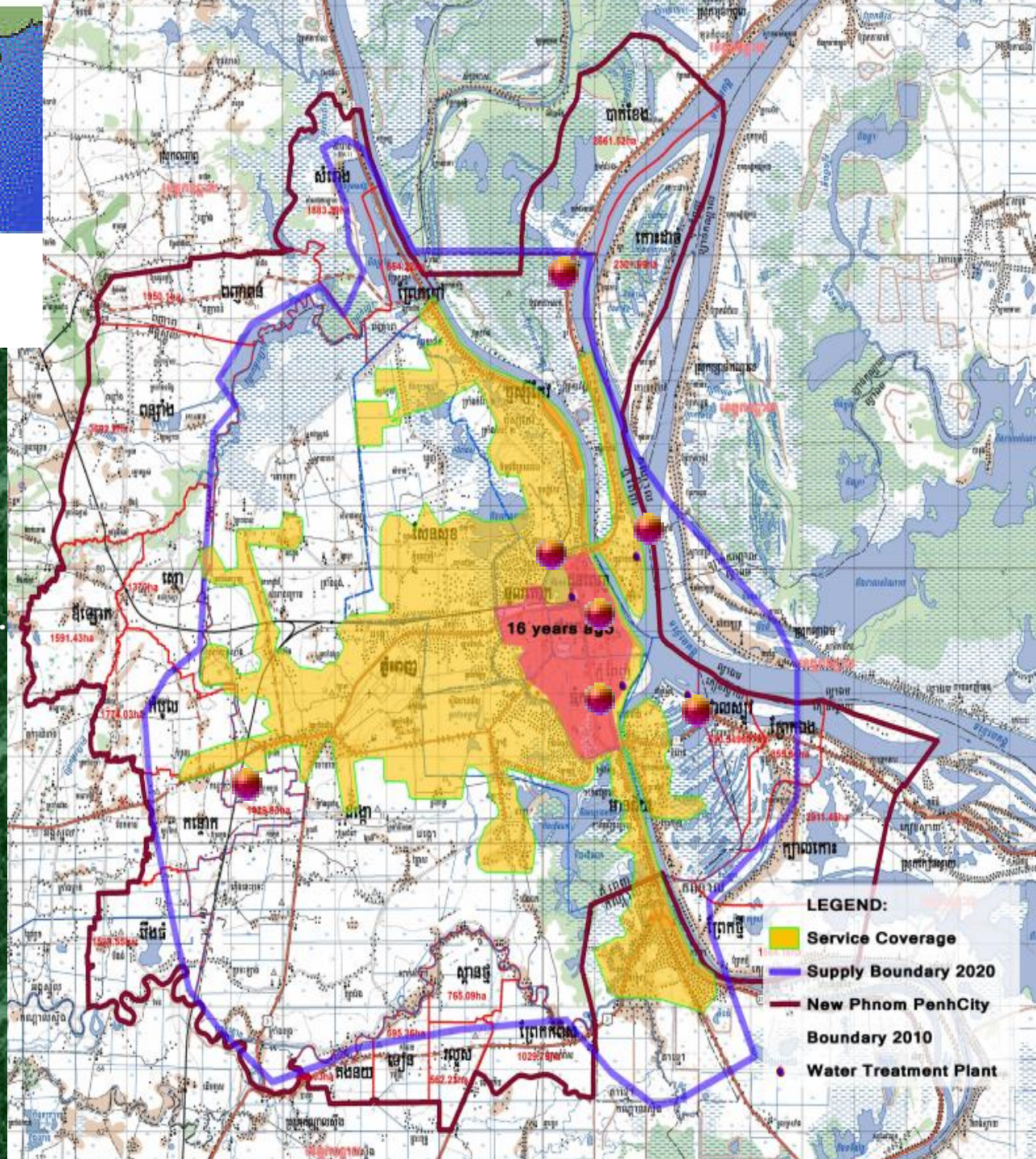




Area: 181,035 km<sup>2</sup>  
 Population : 15,394,276 mil.  
 Capital city : Phnom Penh

# PHNOM PENH

Area: 678.46 km<sup>2</sup>  
 Population: 1,445,902 mil.  
 12 Districts  
 96 Communes





# I. General Overview

- From 1980-1992 was returned back from the civil war. The Phnom Penh Water Supply Company was operated under authority of Phnom Penh Municipality with full subsidiary.
- From 1993-1996 with the support from the Royal Government of Cambodia, foreign donors and international organizations, the Company was transformed into the public enterprise under sub-degree 52, December 1996. New Director General was assigned in September 1993.



# I. General Overview (cont.)

- External Assistance were committed to support PPWSA such as UNDP/World Bank/Asian Development Bank/France/Japan.
- Study on first Master Plan was conducted in 1993 by JICA (1993-2010)
- Urgent rehabilitation and improvement of the existing water supply facilities have began including strengthening of operational management and capacity building to the employees.





# I. General Overview (cont.)

- From August 1997-2012 was formed as public enterprise with full financial and administrative autonomy controlled by Board of Directors.
- Completion of rehabilitation of the existing water supply facilities by starting for expansion of water supply system in 2002 to the suburb area of the city.
- Study on second master plan was funded by JICA for 2005-2020.



## I. General Overview (cont.)

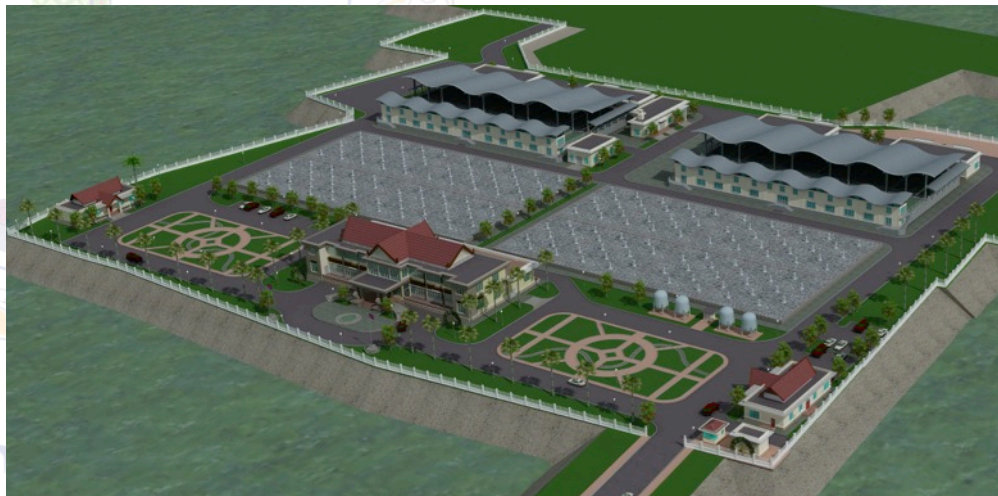
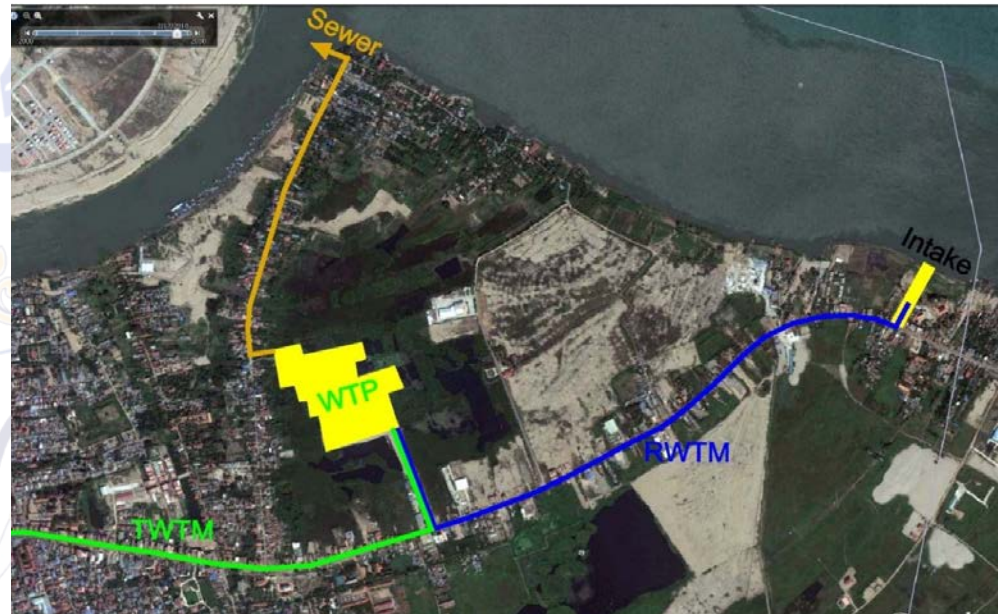
- From April 2012 until now Phnom Penh Water Supply is a public listing enterprise, 15% of asset was sold to the shareholder and 85% is controlled by the government. The enterprise is managed by Board of Director. Former Director General retired in June 2012. A New Director General was assigned in September 2013.

### Foreign Assistance 1993-2014

Foreign Assistance	Grant	Loan
UNDP/World Bank	2,803,000	
World Bank		29,455,000
Asian Development Bank		12,639,000
France	21,248,500	39,461,500
Japan	72,454,440	44,407,560
TOTAL	96,505,940	125,963,060
TOTAL GRANT and LOAN	<b>222,469,000</b>	

# Japanese Assistance

Description	Input
Source of Finance	Loan from JICA for WTP and Intake by AFD (Co-finance)
Type of Contract	Design and Built
Implementation Period	August 2010-February 2013
Contractor	Moya Asia Limited
Consultant	Safege
Capacity	130,000 m <sup>3</sup> /day
Cost of the project for WTP and Intake	40,336,206 USD 14,697,371 USD





# Benefit from the Project (Niroth Phase I)

- Increasing of water production capacity from 300,000 m<sup>3</sup>/day to 430,000m<sup>3</sup>/day.
- 24 hr water supply with average pressure in the network over 20 m.
- Southern/western part of the city receiving better service.
- Water quality complied to WHO standard with full time water quality monitoring system.



# Benefit from the Project (Niroth Phase I )

- Full automation for the operational management of water treatment plant.
- Optimization of energy use by introducing variable speed driver ( Invertor).
- Simple water treatment plant process with optimized maintenance cost.
- Most of the design such as sizing, space, backwash system and electrical facilities have been prepared for Niroth Phase II followed Master Plan.

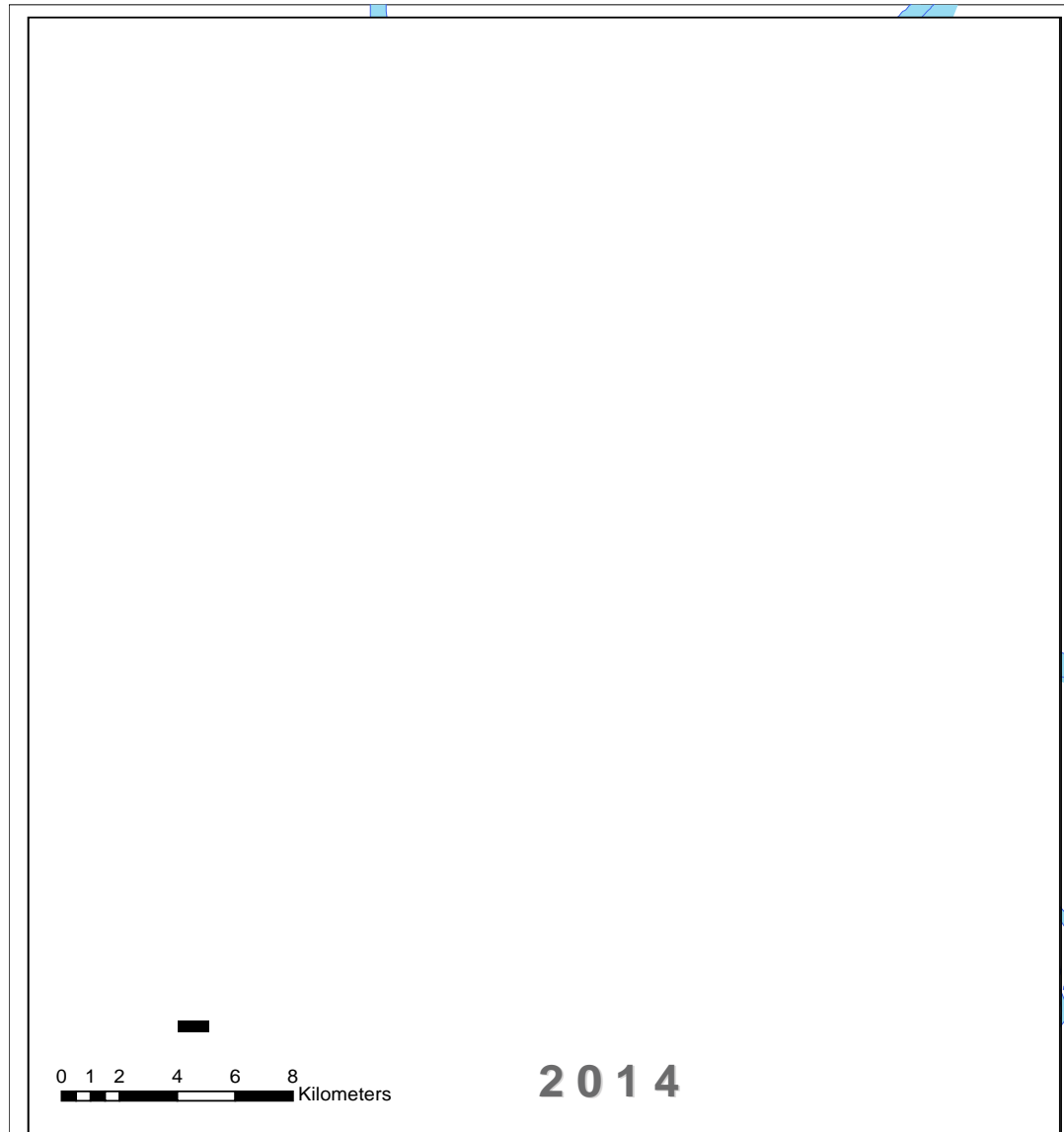




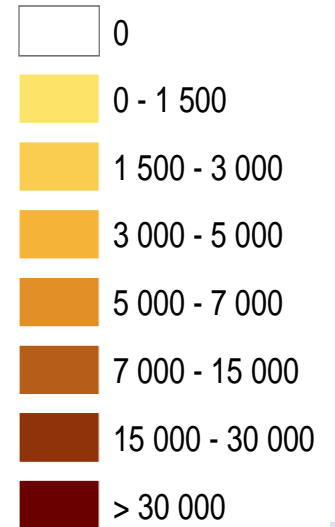
# Niroth Phase I



# Evolution of Water Consumption in Each Sangkat (commune) in 2014, After Completion of Niroth Phase I .



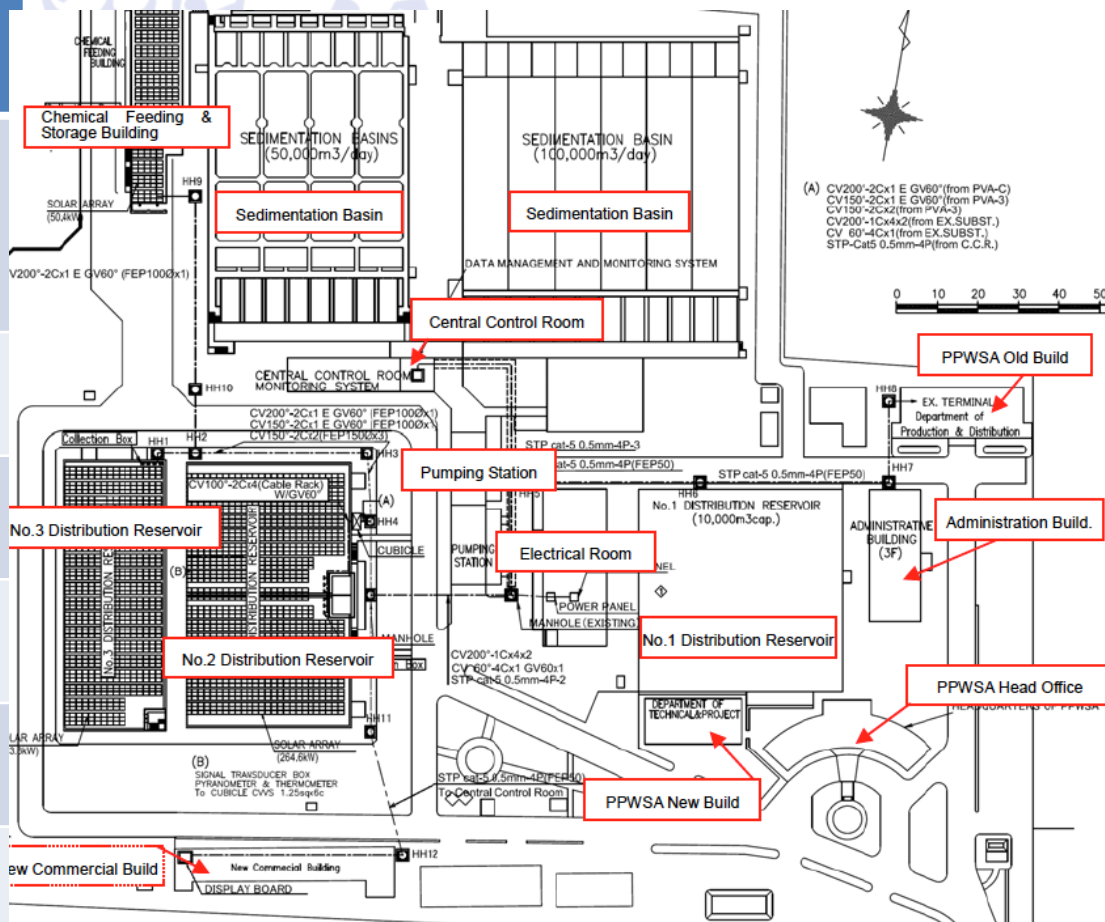
Colour code for  
consumption (m<sup>3</sup>/day):





# Japanese Assistance (Grant Aid)

Description	Input
Implementation Period	July 2012-June 2013
Contractor	Marubeni
Consultant	NEWJEC
Installed Capacity	777 kWh
PV module 215 w	3,624 Pcs
Cost of the project	720,000,000 JPY



WATER SUPPLY

# Benefit from the Project (Solar Energy)

Description	Unit	Quantity
Solar energy generation (777kWh)	kWh/year	< 1,000,000
Average electricity consumption At Phum Prek WTP	kWh/year	16,321,000
Average electricity cost	USD/kWh	0.2
Annual electricity saving	USD	200,000
Annual electricity cost	USD	3,231,960
Solar energy saving	%	6% to 8%
CO <sub>2</sub> reduction	Tons/year	640





# II. Present Water Supply System

## A. Water Production

### Production Capacity : 430,000 m<sup>3</sup>/day

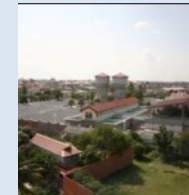
#### Phum Prek WTP

- Capacity: 150,000m<sup>3</sup>/day
- Year of Activation: 1966
- End of Rehabilitation: 1995 and expansion 2003



#### Chrouy Changva WTP

- Capacity: 140,000m<sup>3</sup>/day
- Year of Activation: 1895
- End of Rehabilitation: 2003 and expansion Phase II 2010



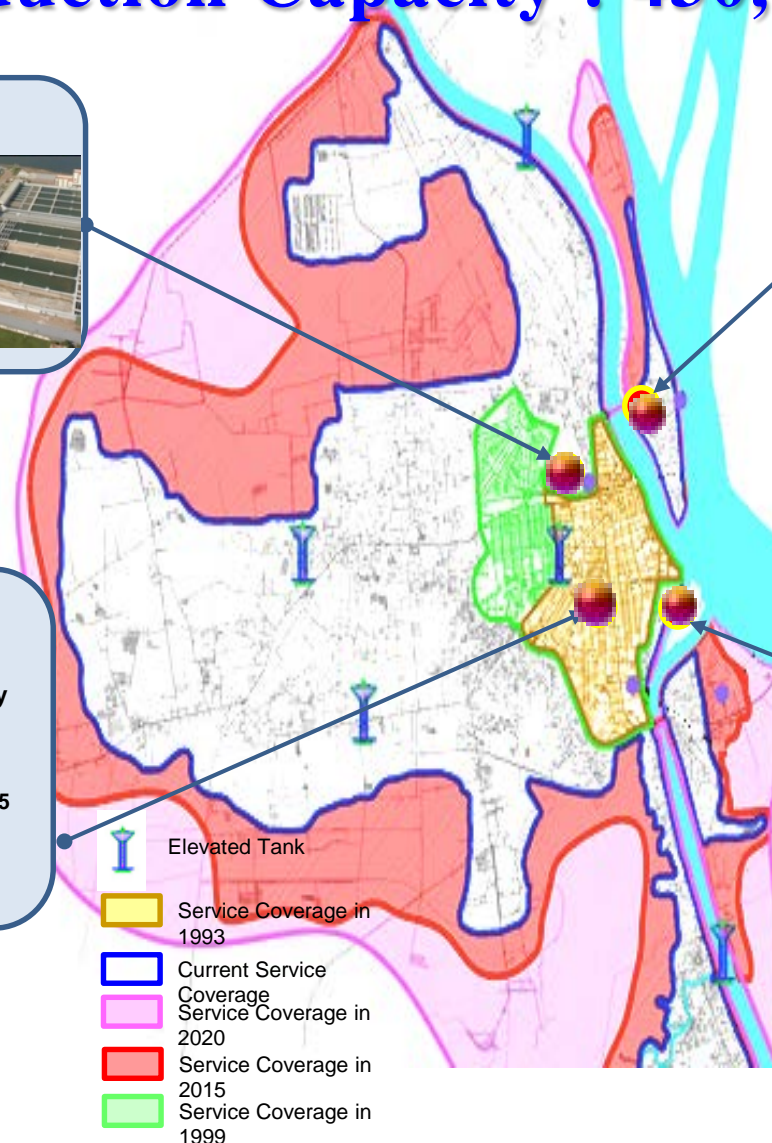
#### Chamkamorn WTP

- Capacity: 20,000m<sup>3</sup>/day
- Year of Activation: 1958
- End of Rehabilitation: 1995



#### Niroth WTP

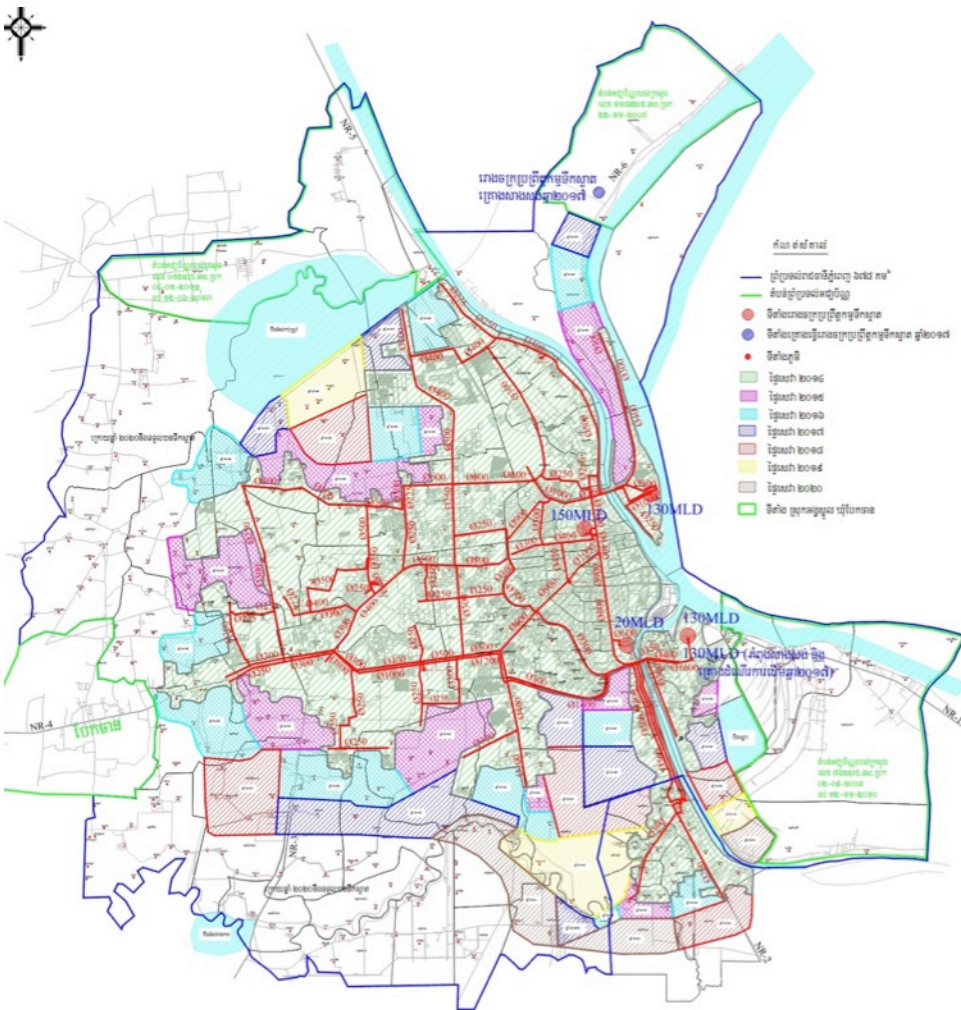
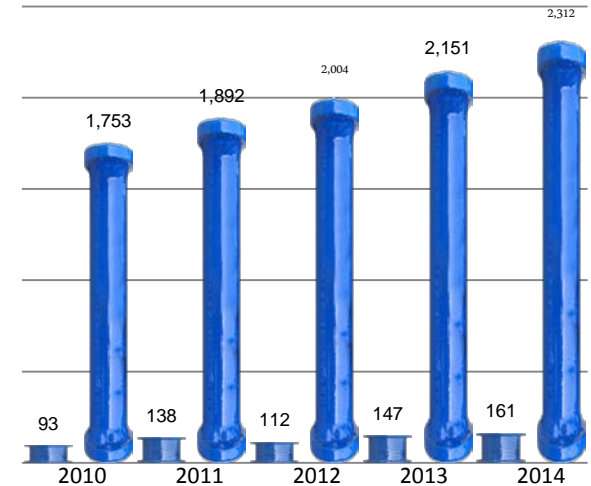
- Stage I 130,000m<sup>3</sup>/day 2010- 2013
- Stage II 130,000m<sup>3</sup>/da 2014- 2017



# II. Present Water Supply System (cont.)

## B. Water Network

Length of Constructed Pipe



- Water Transmission Main 500-1600 mm diameter : Ductile Cast Iron Pipe.
- Main Distribution Pipe 250-400 mm diameter: Ductile Cast Iron Pipe
- Distribution Pipe from 50 to 200 mm dia. : HDPE
- House connection : HDPE and volumetric meter.



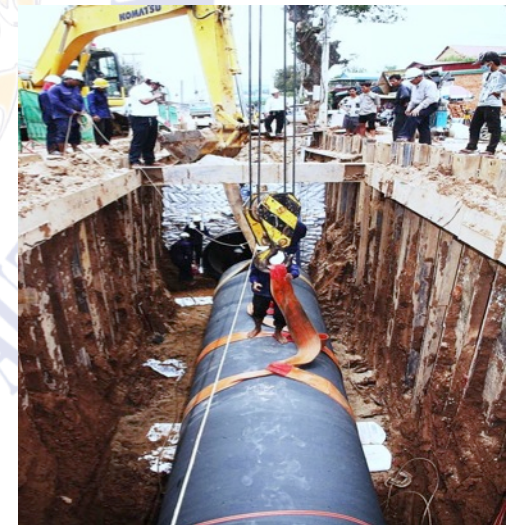
# Result of Operational Management

1993	INDICATORS	2014
20	Staff / 1,000 connections	<b>2.97</b>
65,000	Production capacity, m <sup>3</sup> /day	<b>430,000</b>
???	Water quality	<b>WHO</b>
280 km	Distribution	<b>2,312 km</b>
20%	Coverage area	<b>85%</b>
10 hr/d	Supply duration	<b>24 hr/d</b>
0.2 bar	Supply pressure	<b>2 bar</b>
26,881	Number of connections	<b>270,812</b>
72%	NRW	<b>7.72%</b>
48%	Collection efficiency	<b>99.9%</b>
150%	Operation ratio	<b>35.56%</b>
N/A	Return on revenue	<b>24.84%</b>
N/A	Return on net asset	<b>7.06%</b>
N/A	Current ratio	<b>4.57 times</b>
N/A	Debt service coverage	<b>2.57 times</b>
N/A	Accounts receivable	<b>21 days</b>

# II. EXPANSION PROJECT 2014-217

## On-going Project

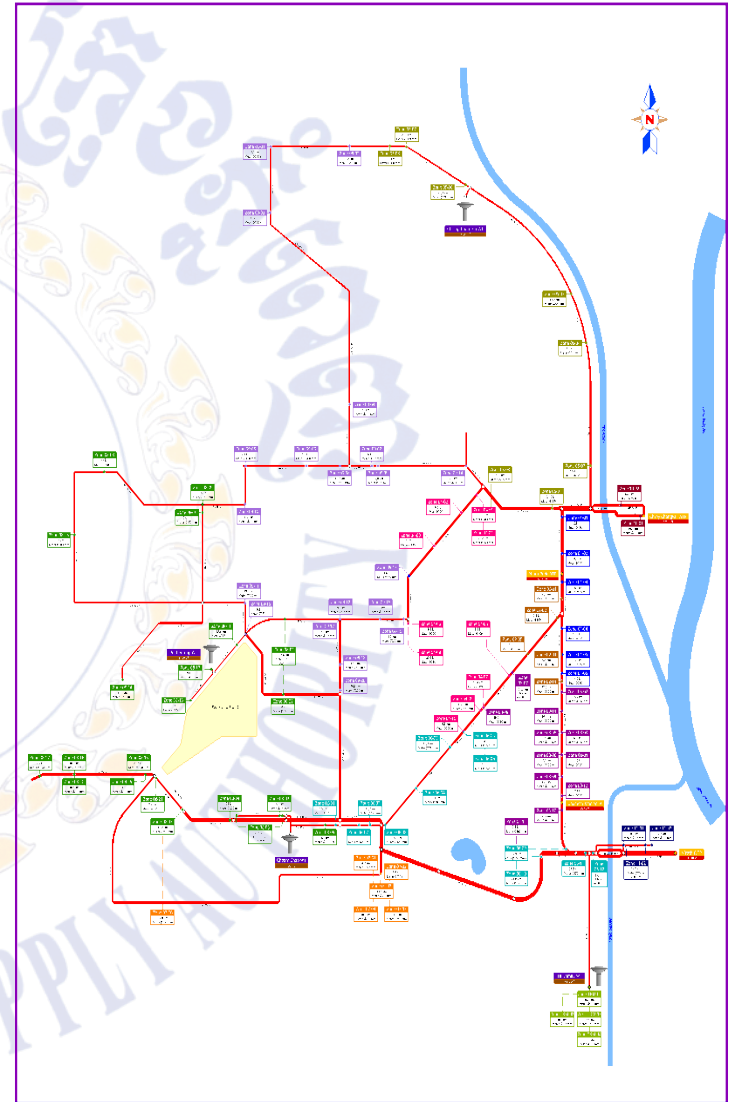
- Source of Financing : AFD (France).
- AFD Loan No. : CKH 1121 01F
- Amount of Loan : 30,000,000 Euro
- Project duration : 2013-2017
- PPWSA counterpart : cover 90 % civil work payment for construction of Niroth Phase II. 100% of civil work payment for installation of water transmission and distribution pipe.
- Description of the Project :
  - Expansion of Niroth Phase II  
130,000 m<sup>3</sup>/day





# On-going Project (cont.)

- Replacement of district meters with additional district meters from 41 to 117 Zonings.
- Replacement of existing telemeter by autonomous GSM data logger for data transmission such as flow pressure.
- Improvement/upgrading of existing SCADA by making the SCADA accessible through a web interface.
- Installation of GIS system for the Asset Management, (distribution mapping, customer mapping).





# On-going Project (cont.)

- Expansion of Water Transmission Main of 36 km.
- Expansion of Distribution Pipe of 500 km.



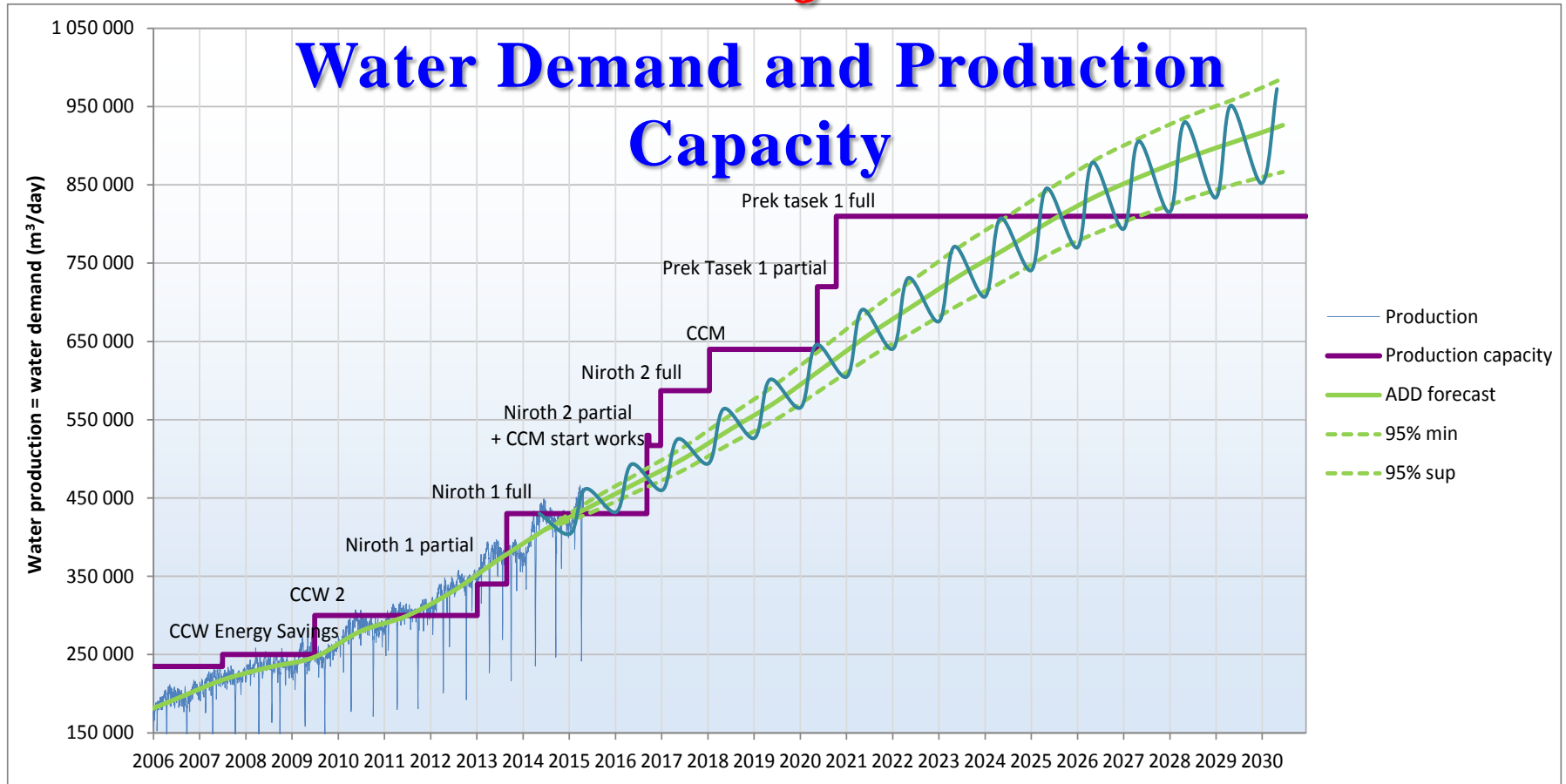


# On-going Project (cont.)

## Summary of Project Budget 2014-2017

ITEM	DESCRIPTION OF THE PROJECT	AFD FINANCE	PPWSA FINANCE	Total
1.	Niroth Phase II	14,025,520	12,256,315	26,281,835
2.	Consultant Service	1,893,913		1,893,913
3.	Water Transmission Main	8,764,850	4,382,425	13,147,275
4.	Distribution Pipe	4,204,255	1,657,624	5,861,878
5.	GIS Project	486,277		486,277
6.	Flow-meter	284,180		284,180
7.	GSM data logger +SCADA	400,000		400,000
8.	Installation cost for zoning		360,000	360,000
9.	<b>Contingency</b>	3,001,200		3,001,200
<b>Grand Total</b>		<b>33,000,000</b>	<b>18,656,364</b>	<b>51,716,558</b>

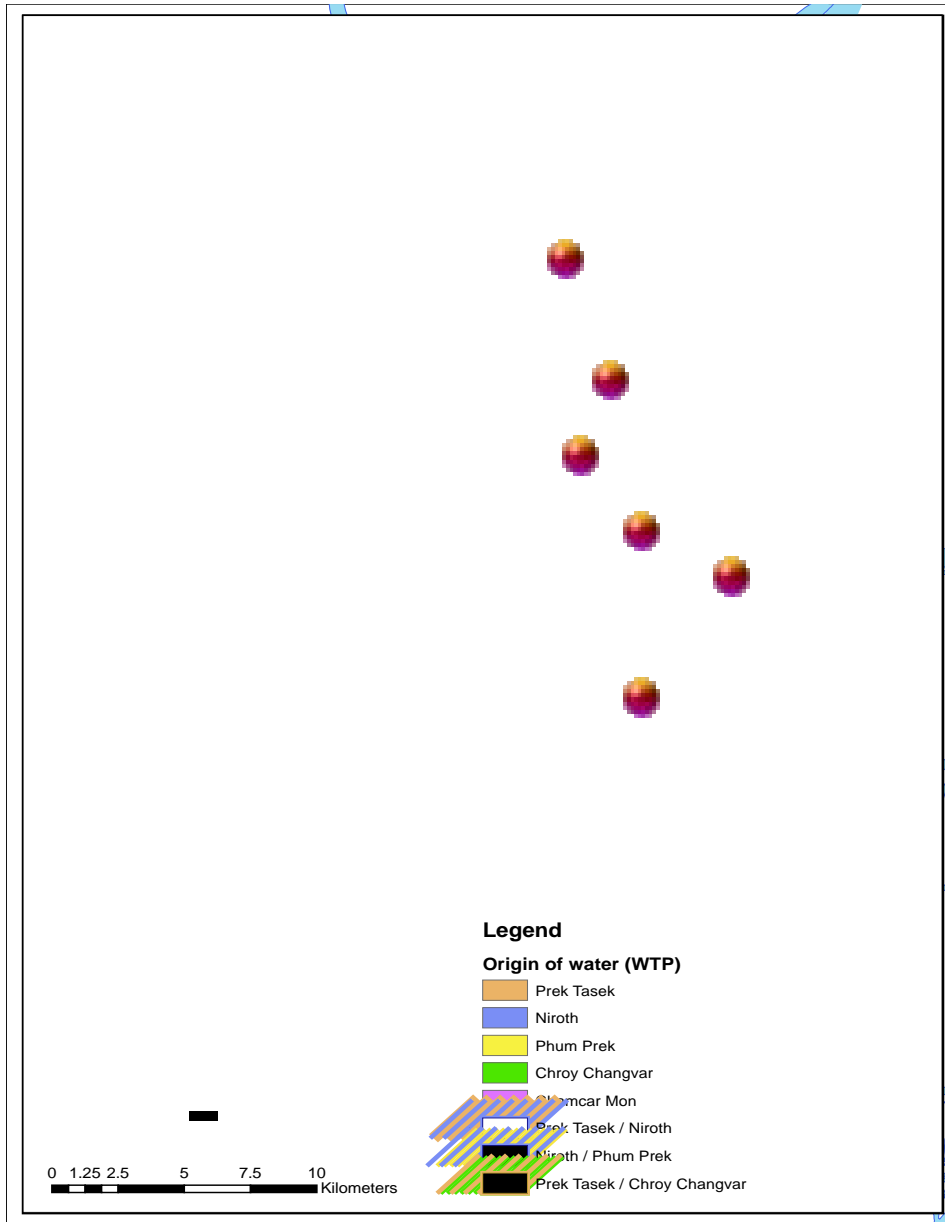
# IV. Future Project 2017-2021



Year	2015	2016	2017	2018	2019	2020	2021
DEMAND	445,500	475,800	506,500	543,200	578,700	620,000	664,100
PRODUCTION	430,000	470,000	540,000	592,000	592,000	592,000	762,000
NEW PLANT		60,000	70,000	52,000	<b>50,000</b>		170,000



# 1) Geographical repartition of the water demand

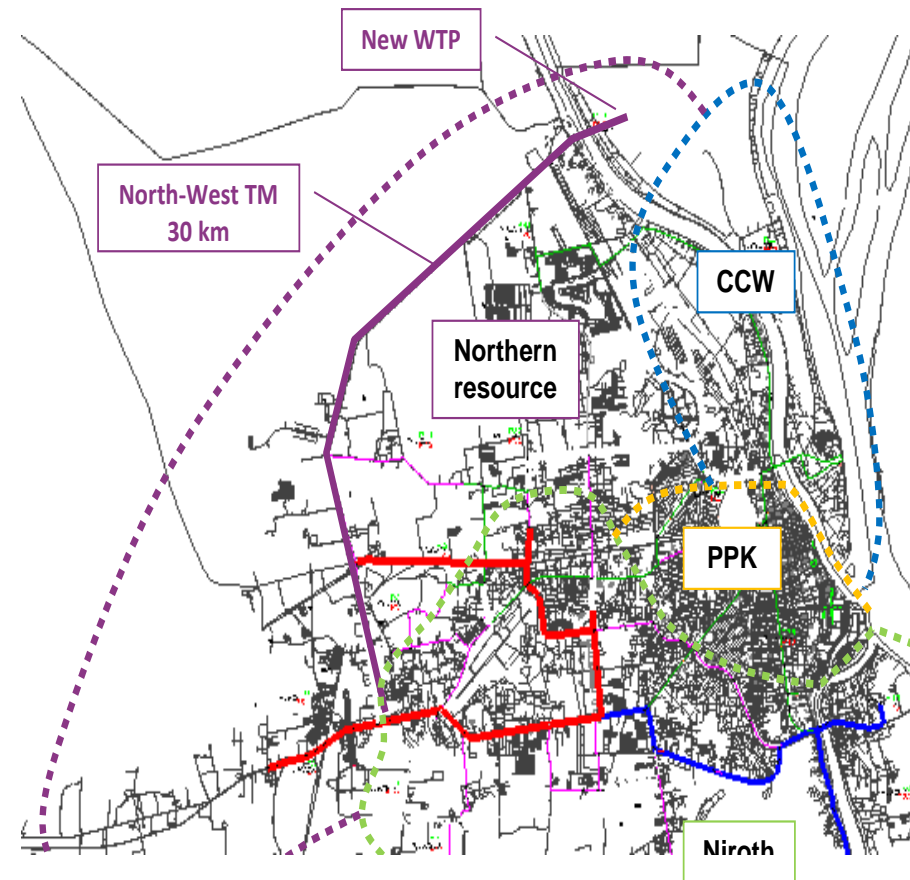
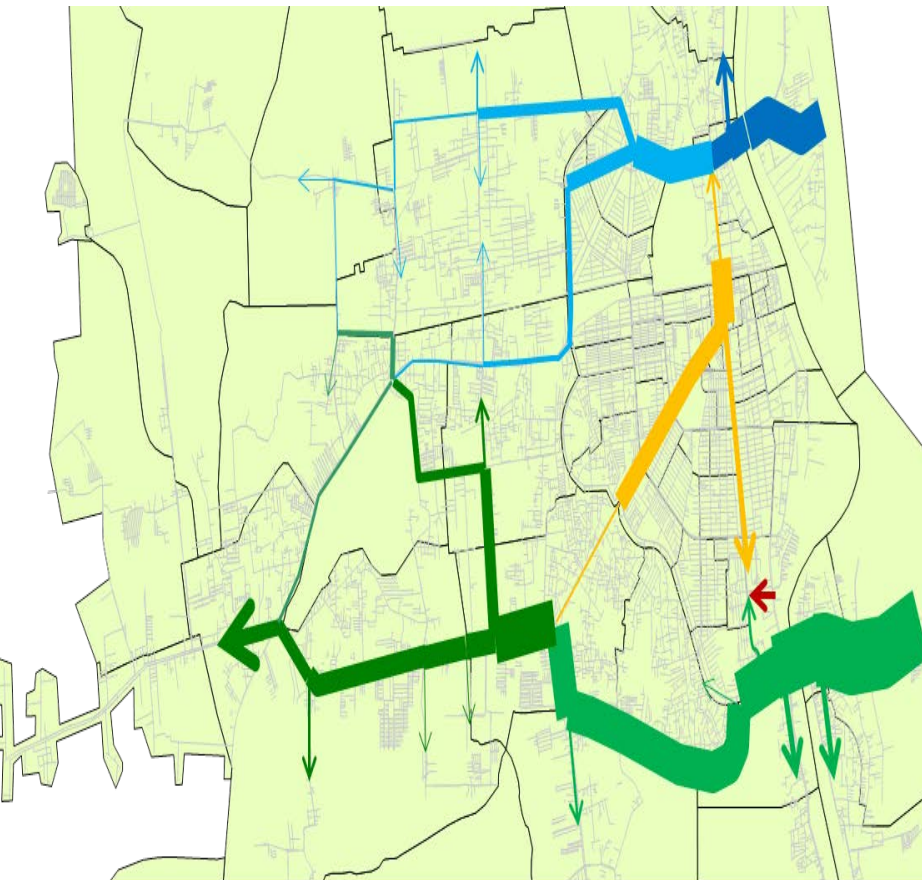


- The following map was created by allocating to each existing WTP (including Niroth 2) a service area corresponding to their respective production capacities and the Transmission Mains architecture. All unserved areas were subsequently allocated to the new Northern Resource which shall be called Prek Tasek WTP.
- That map shows that the service area of existing WTPs will be significantly shrunked, especially Niroth which will barely serve Chom Chao anymore.
- The service area of Prek Tasek is in the shape of a bow that stretches from the north to the south-west of the city. Evolution of water demand will lead to a non-optimal map of water transmission whereby very long water transfers will be rendered necessary. That is because existing WTPs will not be able to serve those areas anymore.
- *Therefore, in addition to the overall production capacity deficit by 2030, a second problem arises which is the service areas of each WTP. It may not be optimal to produce 100% of future needs from the north when a significant part of the deficit will be located in the south.*

## 2) Transmission Network

How the new WPF are going to be integrated in the overall Phnom Penh water transmission network?

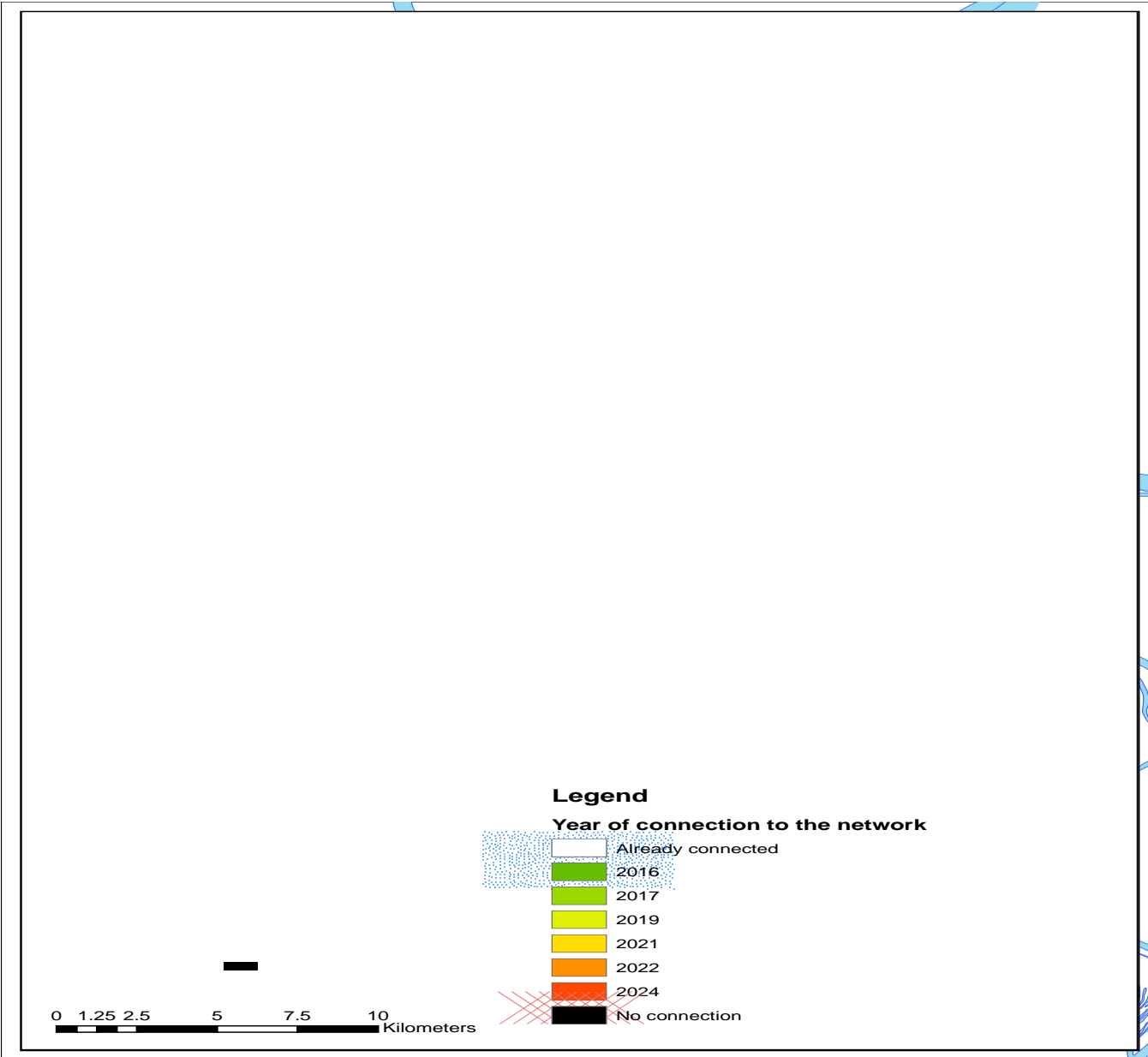
The following figure provides an example of a flow matrix, the thickness of the arrows representing the daily flow in each pipe and the colour representing the origin of the water. In grey are the existing water distribution pipes.





### 3) Network expansion

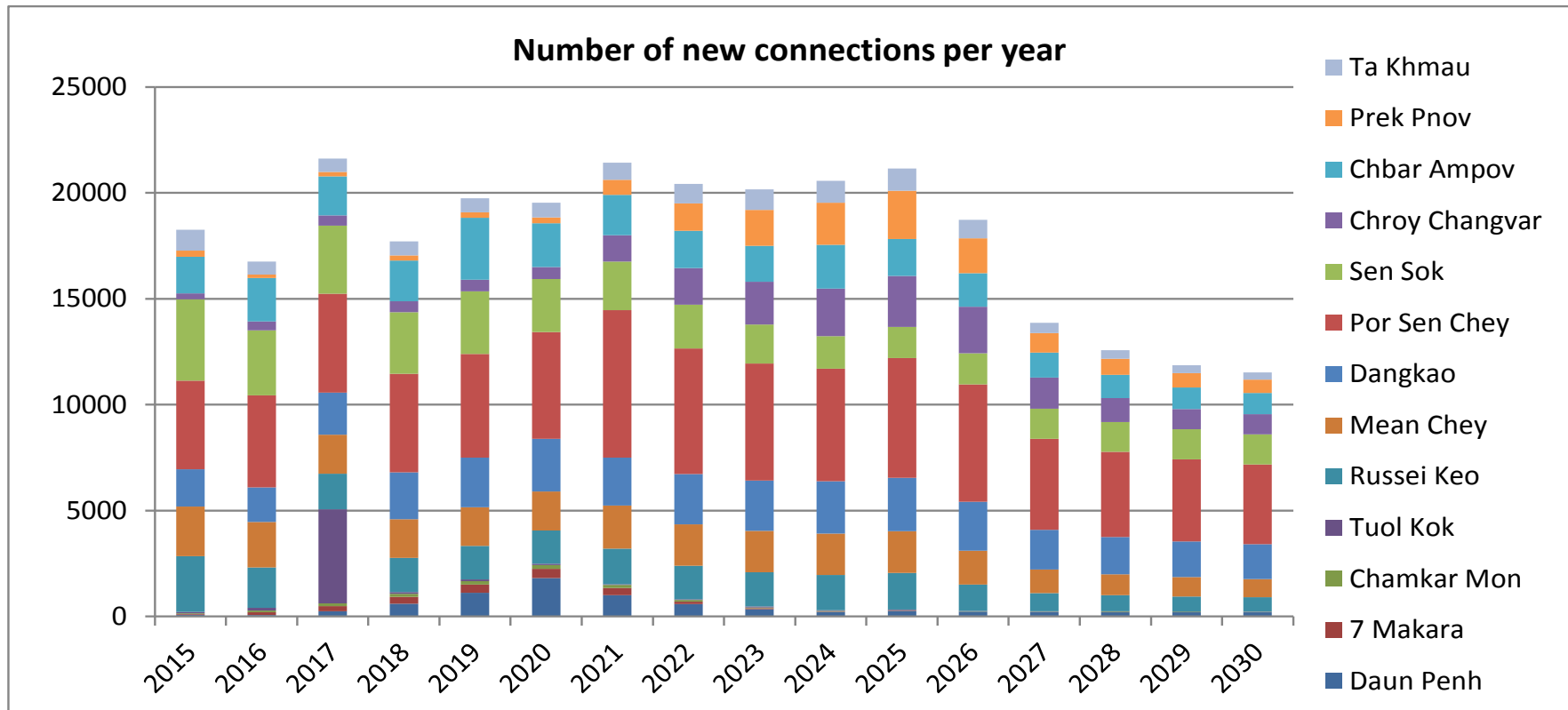
In considering network expansion over the period 2015-2030, we considered that 12 additional sangkats would get connected, whereas the remaining 10 would not get water from the network by 2030.



## 4) Number of connections

Those figures are high, but we would like to remind that the GPPWSS feasibility study plan 16 000 new connections which seemed excessive by the time; but two years later, actual figures – in a context of lack of water resource – were already above 18 000 connections/year.

Therefore we believe that a forecast of 16 000 to 21 000 new connections per year is ambitious but yet realistic, and those numbers can be achieved by PPWSA.





# 5) CAPEX

Cost estimates are based on real rates observed for Niroth 1 and Niroth 2 construction, modified when necessary, and adjusted for 2017 costs.

	170 MLD Phase I	170MLD Phase II	340 MLD Total	Chamcar Morn 52 MLD	West Resource 50 MLD	TOTAL in USD
<b>1</b>	<b>Water Production Facilities 170 MLD</b>					
General Cost	5,860,006	5,860,006	11,720,012	2,961,000	2,353,627	<b>17,034,639</b>
E&M Equipment	24,026,783	15,818,360	39,845,143	8,287,500	5,422,596	<b>53,555,239</b>
Civil Works	38,633,355	19,789,343	58,422,698	9,975,000	8,282,186	<b>76,679,884</b>
<b>Total WPF</b>	<b>68,520,144</b>	<b>41,467,709</b>	<b>109,987,853</b>	<b>21,223,500</b>	<b>16,058,409</b>	<b>147,269,762</b>
<b>2</b>	<b>Raw Water Transmission Main</b>					
Pipe & Fitting	7,652,598		7,652,598	258,200		7,910,798
Pipe Laying	3,816,299		3,816,299	103,300		3,919,599
<b>Total RWTM</b>	<b>11,468,897</b>	<b>0</b>	<b>11,468,897</b>	<b>361,500</b>		<b>11,830,397</b>
<b>3</b>	<b>Treated Water Transmission Main</b>					
Pipe & Fitting	25,974,800		25,974,800	183,000		26,157,800
Pipe Laying	10,389,920		10,389,920	67,200		10,457,120
<b>Total TWTM</b>	<b>36,364,720</b>		<b>36,364,720</b>	<b>250,200</b>		<b>36,614,920</b>
<b>4</b>	<b>Consultant Service</b>					
Project supervision	4,653,350	1,658,708	6,312,058	1,041,400	642,366	7,995,824
<b>Total Consultant Service</b>	<b>4,653,350</b>	<b>1,658,708</b>	<b>6,312,058</b>	<b>1,041,400</b>	<b>642,366</b>	<b>7,995,824</b>
<b>5</b>	<b>Contingencies</b>					
Physical Contingencies	2,538,672	1,293,793	3,832,465	980,300	501,002	
Price Contingencies	5,816,688	2,073,385	7,890,073	1,307,100	802,920	
<b>Total Contingencies</b>	<b>8,355,360</b>	<b>3,367,178</b>	<b>11,722,538</b>	<b>2,287,400</b>	<b>1,303,922</b>	<b>0</b>
<b>TOTAL PROJECT COST</b>	<b>129,362,471</b>	<b>46,493,595</b>	<b>175,856,066</b>	<b>25,164,000</b>	<b>18,004,697</b>	<b>203,710,903</b>
<i>Financing from loan</i>	<i>76,502,898</i>	<i>26,704,253</i>	<i>103,207,151</i>	<i>15,098,400</i>	<i>10,802,818</i>	<i>129,108,369</i>
<i>PPWSA own funds</i>	<i>52,839,574</i>	<i>19,789,343</i>	<i>72,628,917</i>	<i>10,065,600</i>	<i>7,201,879</i>	<i>89,896,396</i>

# V. EXTERNAL ACTIVITIES AND PARTNERSHIP

Water Supply and Sanitation subsidiary was created on 19<sup>th</sup> April 2012, under the control of Phnom Penh Water Supply Authority (PPWSA) and located in PPWSA compound. The main tasks of the subsidiary is to manage daily activities for the installation of water transmission and distributing pipeline accordance with the annual plan of PPWSA, cooperating with Water Production and Water Distribution Department for the major water leakage repairing of water pipe and to act as private company on behalf of PPWSA to cooperate with private partnership to perform extra income on the field of clean water and sanitation specialized on design, supervision, construction, capacity building and NRW contract in the country and abroad.

Person in-charge : **Mr. Long Naro, Deputy Director General of PPWSA**

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# V. EXTERNAL ACTIVITIES AND PARTNERSHIP

## Title of the Project : The Project for replacement and Expansion of Water Distribution System in the Provincial Capital (Project No. I)

1	Location of Project	Pursat and Battambang Provincial Capital
2	Type of Project	Sub-contractor to Kubota Construction Company
3	Project Period	2012-2013
4.1	Project Scope	<b>Pursat Province</b>
	Expansion Length	9,440 m
	Replacement Length	5,160 m
4.2	Project Scope	<b>Battambang Province</b>
	Pipe Expansion Length	24,480 m
	Pipe Replacement Length	21,550 m
	Service Pipe Length	25,580 m
5	Financing Source	JICA Grant Aid





# V. EXTERNAL ACTIVITIES AND PARTNERSHIP

## Title of the Project : The Project for Expansion of Water Supply System in Kompong Cham and Battambang Provincial Capitals (Project No. II)

1	Location of Project	Kompong Cham and Battambang Provincial Capital
2	Type of Project	Sub-contractor to Kubota Construction Company (Civil Works)
3	Project Period	2014-2016
4	Project Scope	Pipe installation of raw water transmission main and distribution pipeline
Battambang Province		53,850 m
Kompong Cham Province		49,300 m
5	Financing Source	JICA Grant Aid



## VI. BUSINESS OPPORTUNITIES

Based on the UN report in the first half of 2015, 277 million people in Asia and the Pacific still lacked access to safe drinking water despite significant progress since 1990. To meet sustainable development goal No. 6 (SDG) by 2030 “ Universal and Equitable Access to Safe and Affordable Drinking Water for All”, PPWSA has commit and cooperate with government, external financing organizations and investors to overcome the programme as presented in the slide for “ Future Project”. Within this regards,the business opportunities for the consultant contractors, manufacturers and suppliers could not absent to the following field:

1. Consultant for design and supervision of constructions.
2. Contractor for construction of water treatment plan.
3. Manufacturers for pumps, valve, HDPE pipe, DCIP pipe, electrical equipment and other.
4. Contractors work with the PPWSA-subsiidiary for the other project in the country.





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