

Presentation on

State of Urbanization, Water and Wastewater Facilities in Kathmandu Valley and Other Parts of Nepal

Presenter: Er. Sanjeev Bickram Rana

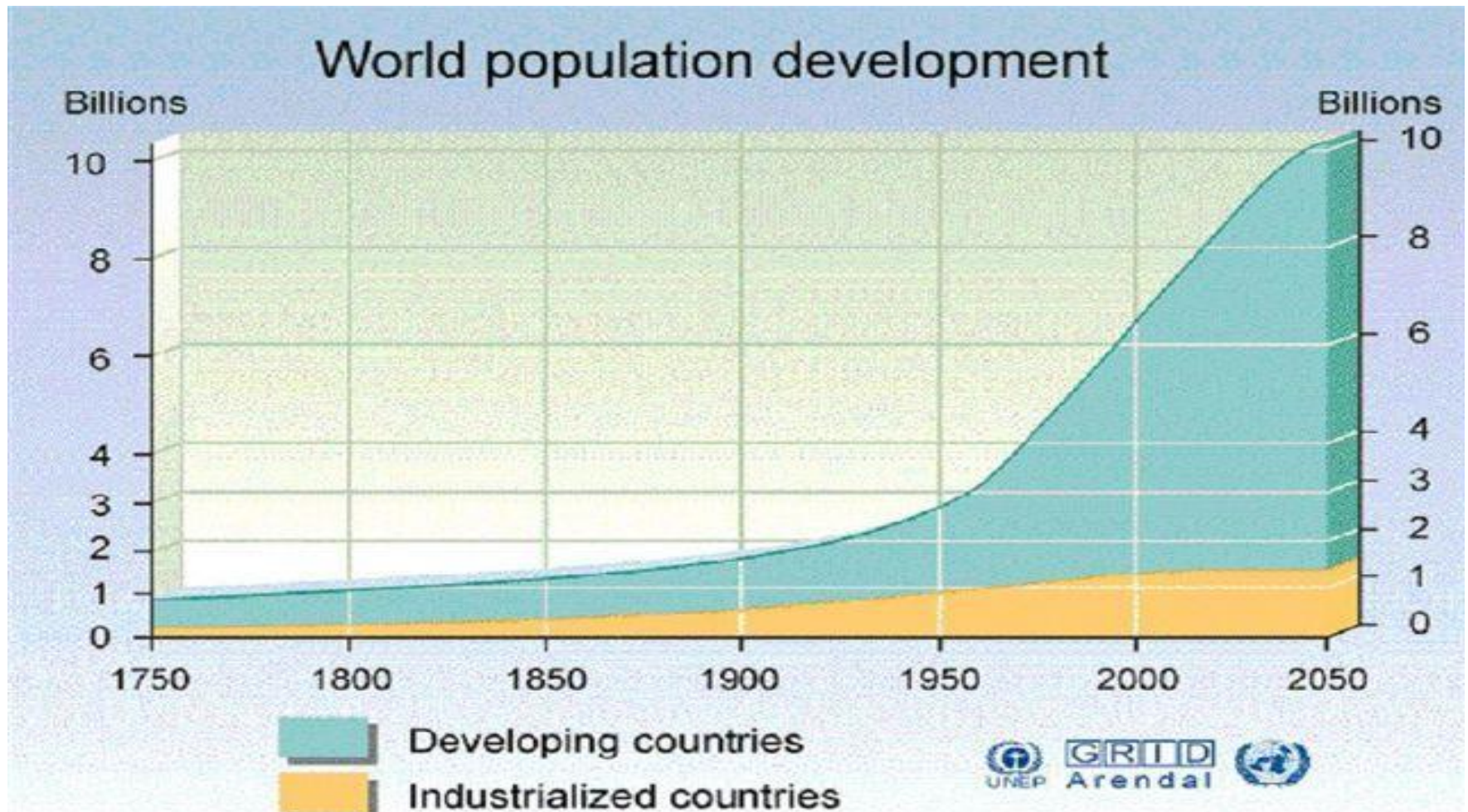
Executive Director, KVWSMB

Aug, 2017

Content:

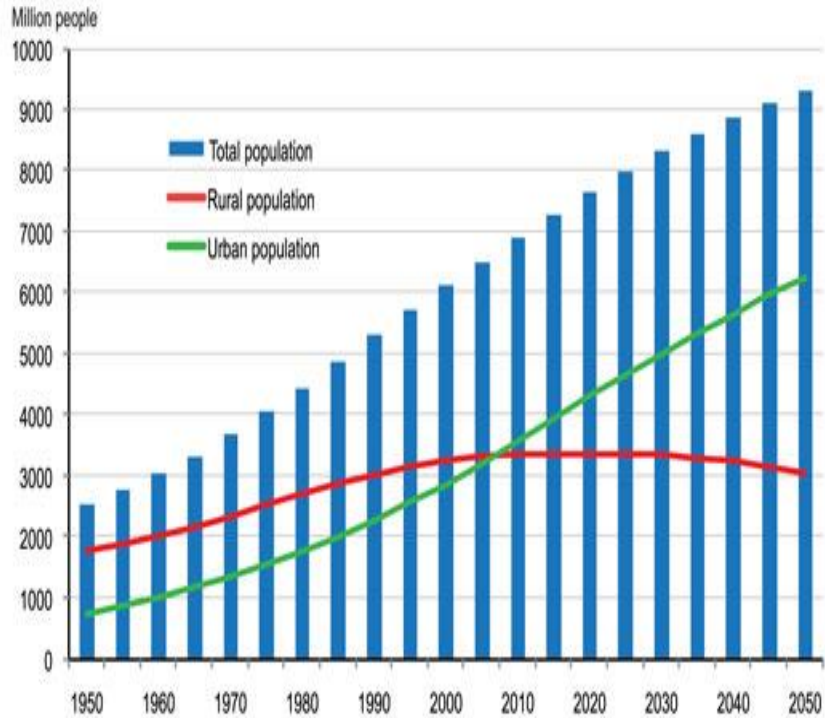
- State of Urbanization
- Present Status of Water Facilities
- Future Plan for Water Management
- Present Status of Wastewater Facilities
- Future Plan for Wastewater Management
- Conclusion

Population Growth



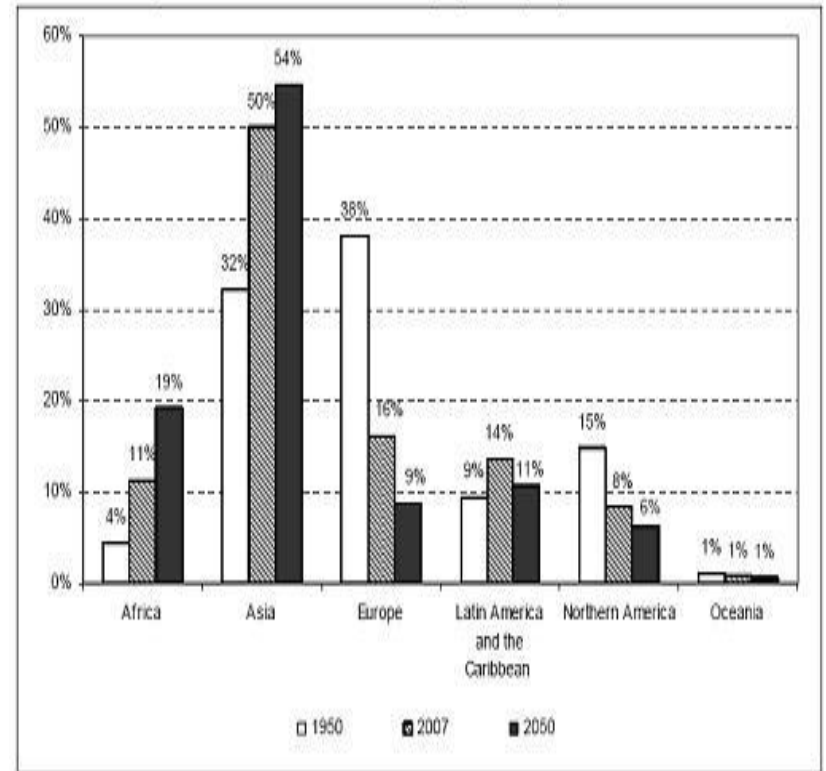
Global human population growth amounts to around 75 million annually, or 1.1% per year. The global population has grown from 1 billion in 1800 to 7 billion in 2012. It is expected to keep growing, where estimates have put the total population at 8.4 billion by mid-2030, and 9.6 billion by mid-2050.

Urban Vs Rural



Source: Drawn from World Urbanization Prospects, the 2011 Revision (UN 2012)

Source: World Urbanization Prospects,
2011



Source : UN Department of Economics &
Social Affairs, 2000

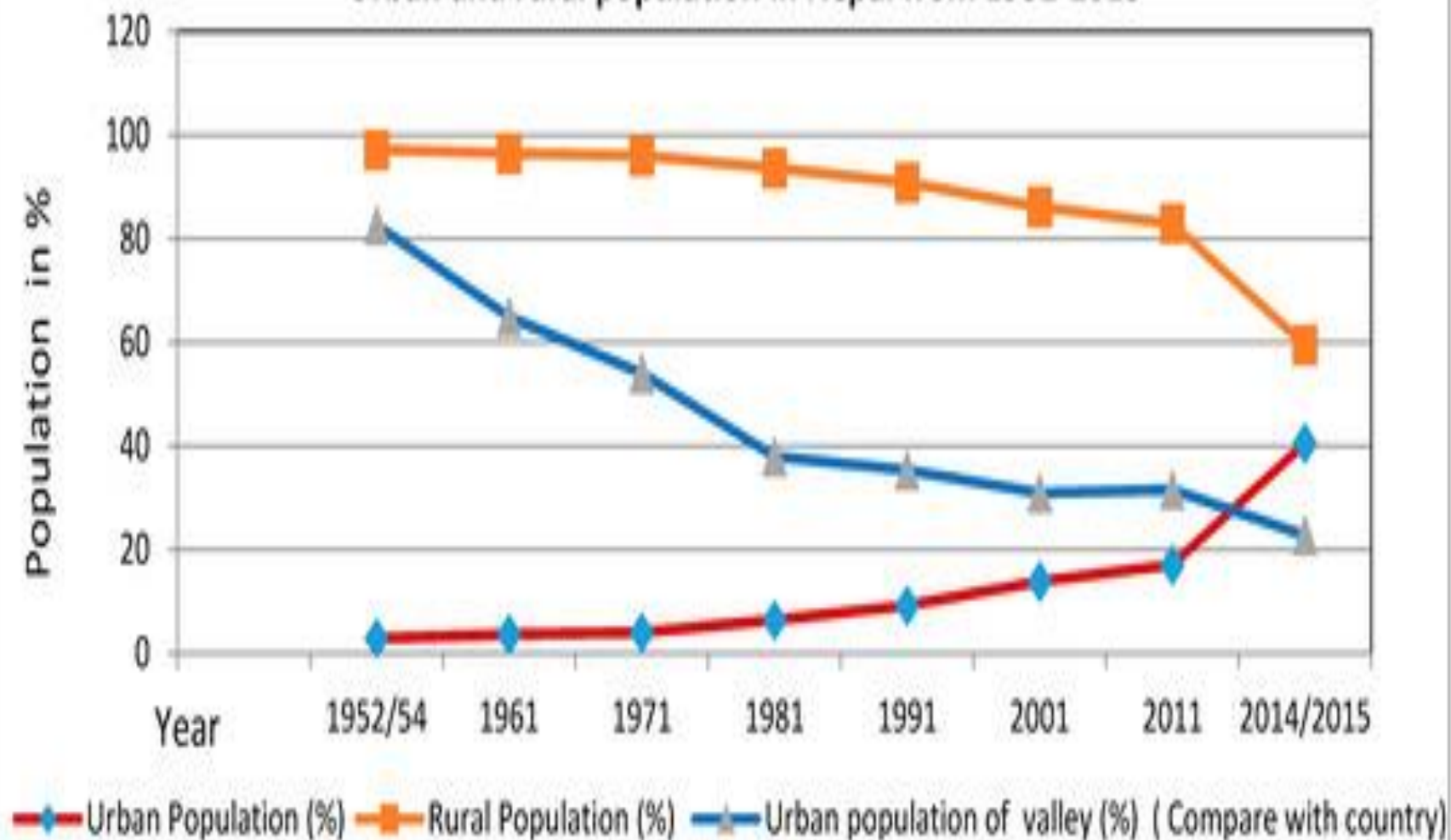
Water & Urban Growth by Numbers:

- Every second the urban population grows by **2 people**.
- **95 %** of the urban expansion in the next decades will take place in the developing world
- In Africa and Asia the urban population is expected to **double** between 2020 -2030.
- One out of four city residents worldwide, **789 million** in total without access to improved sanitation facilities
- **497 million** people in cities rely on shared sanitation. In 1990 this number was **249 million**.

Water & Urban Growth by Numbers:

- **27 %** of the urban dwellers in the developing world don't have access to piped water at home.
- Between 1998 and 2008, **1052 million** urban dwellers gained access to improved drinking water and **813 million** to sanitation. However, the urban population in that period grew by **1089 million** people and thus undermined the progress.

Urban and rural population in Nepal from 1952-2015



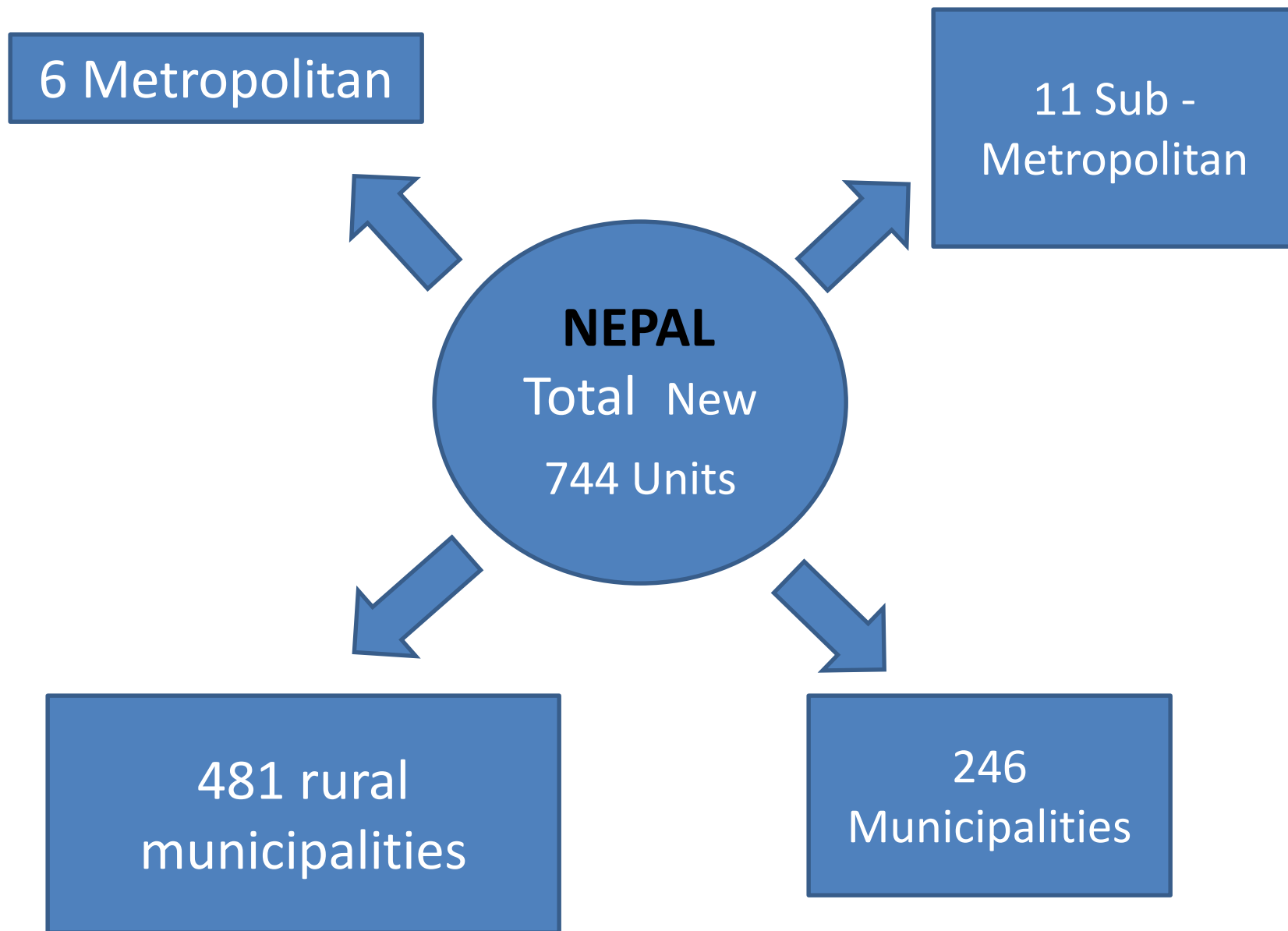
Defining Urban Area

- ❑ Acceptable basis: **Density, occupational structure**
- ❑ Criteria used in Nepal
 - 1952 census: prominent settlement, ≥ 5000 population
 - 1961 census: Urban environment, ≥ 5000 population
 - Municipal Act 1962: Urban environment, $\geq 10,000$ population
 - LSGA 1999: **Metropolitan City** ($\geq 300,000$; NPR 400 m revenue; Urban facilities; already sub-metropolitan); **Sub-metropolitan** ($\geq 100,000$; NPR 100 m revenue; Urban facilities; already Municipality);, **Municipality** (**Tarai** $\geq 20,000$; NPR 5 m revenue; Urban facilities), Municipality (**Hill** $\geq 10,000$; NPR 500,000

Classification of Municipalities

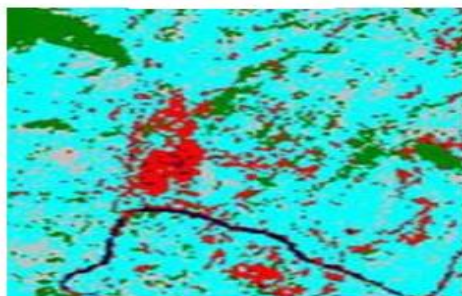
SN	DESCRIPTION	METROPOLITAN	SUB-METROPOLITAN	MUNICIPALITY
1	Minimum population	280000.00	150000.00	20000.00 (10 for hilly areas)
2	Minimum annual income	NRs. 400 million	NRs. 100 million	NRs. 400 thousand
3	Facilities like electricity, drinking water & communication	Yes	Yes	A semi urban area possessing electricity , road, drinking water, communication and similar other basic facilities.
4	Main & other link roads	Yes	Main road of city are pitched	
5	Health services like hospitals , medical colleges etc	Yes	Facility for higher education and health services	
6	Facilities for conducting international sports & games	Yes	Yes	
7	Opportunity for higher education, min one university	Yes	Facilities like gardens, communication & other similar basic	

On March 2017 , GoN decided to adopt 744 local body system

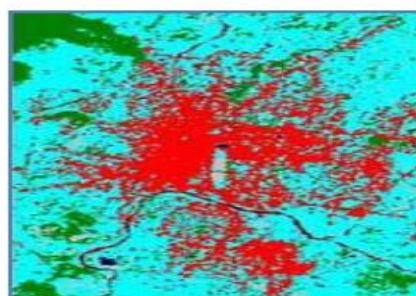


Kathmandu Population: Fivefold Growth during the Last 30 Years

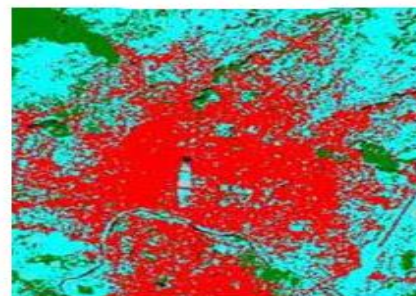
1979



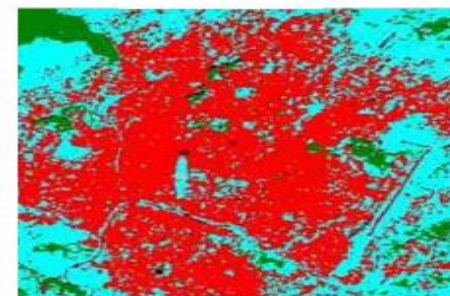
1989



2001



2009



Population Projections of Kathmandu Valley

Area	Year			
	2011	2015	2020	2030
Kathmandu Metropolitan	1,006,656	1,183,349	1,448,864	2,172,434
Lalitpur Sub-metropolitan	223,285	254,477	297,940	408,236
Bhaktapur Municipality	83,893	92,291	101,947	123,708
Kirtipur	66,070	81,340	105,323	174,250
Madhyapur Thimi Municipality	84,259	105,716	140,417	247,788
Urban VDCs in Kathmandu District	451,413	584,458	803,525	1,396,225
Urban VDCs in Lalitpur District	102,343	123,244	154,937	241,284
Urban VDCs in Bhaktapur District	19,904	31,958	56,338	122,601
Total	2,139,697	2,558,707	3,211,166	4,988,401

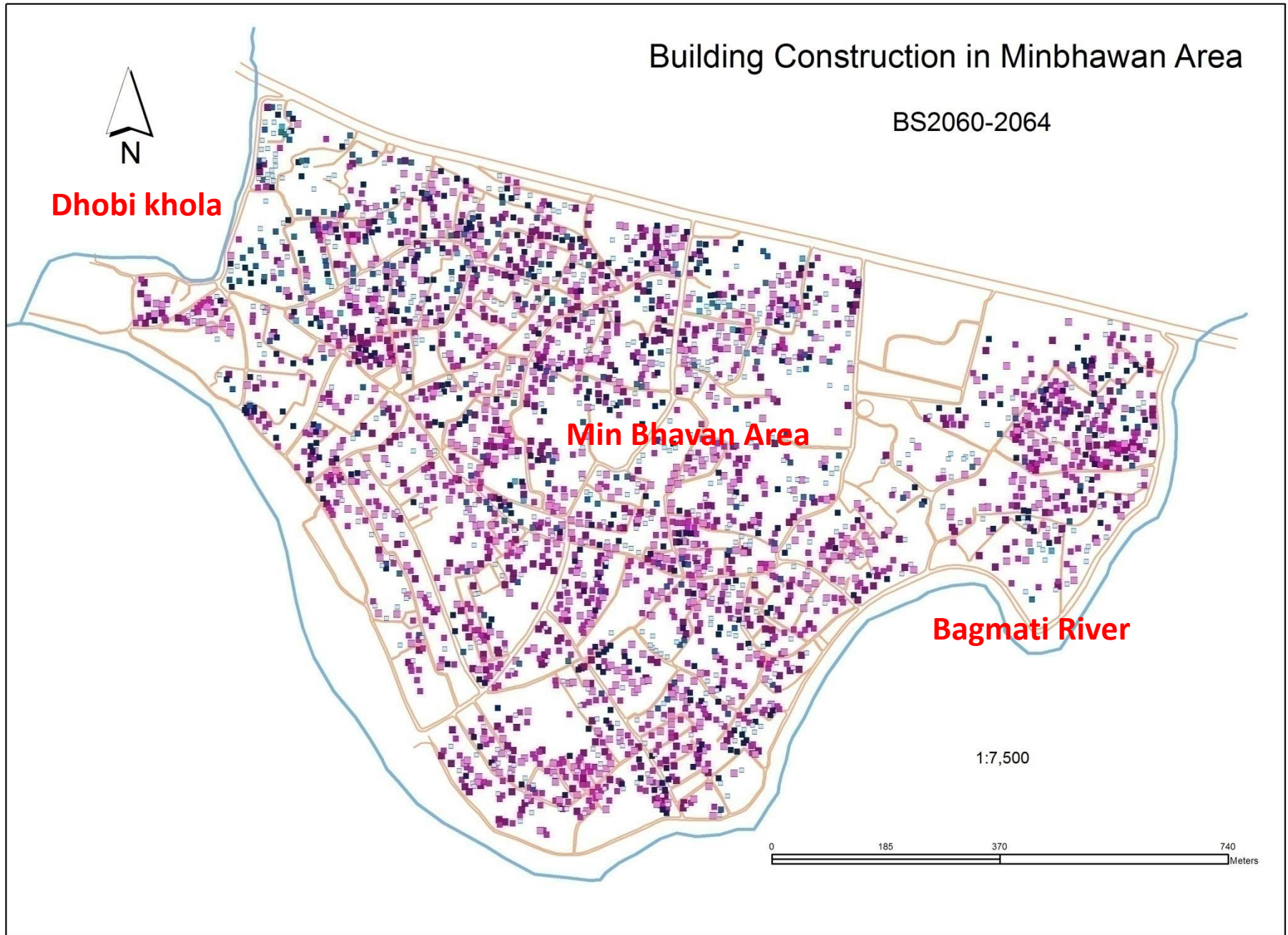
According to the Census 2011

Average growth rate for Kathmandu Valley is 4.2 % and for Country 1.4 %

1973-2007

Building Construction in Minbhawan Area

BS2060-2064



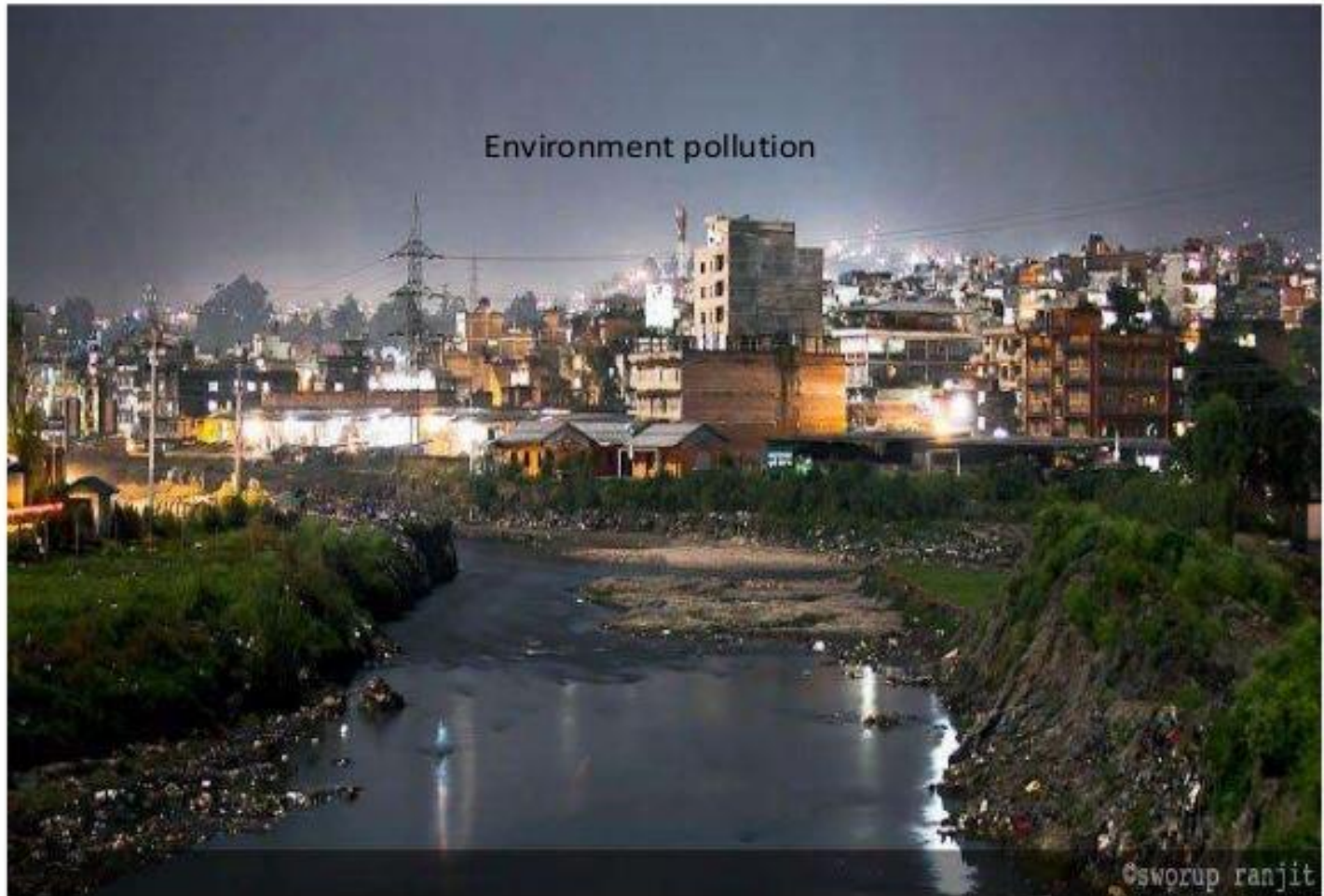
Challenges of Urbanization

- Environmental impacts : Water, air, noise, nature etc
- Unemployment
- Urban poverty (poor living condition)
- Criminal activities
- Original fabric of building will be lost due to physical changes
- Directly effect on conservation of nature as well as heritage.
- Urban congestion
- Rise in market price of service utilities relating to daily life activities

Traffic Problems



Environmental Pollution



Concrete Jungle

Kathmandu

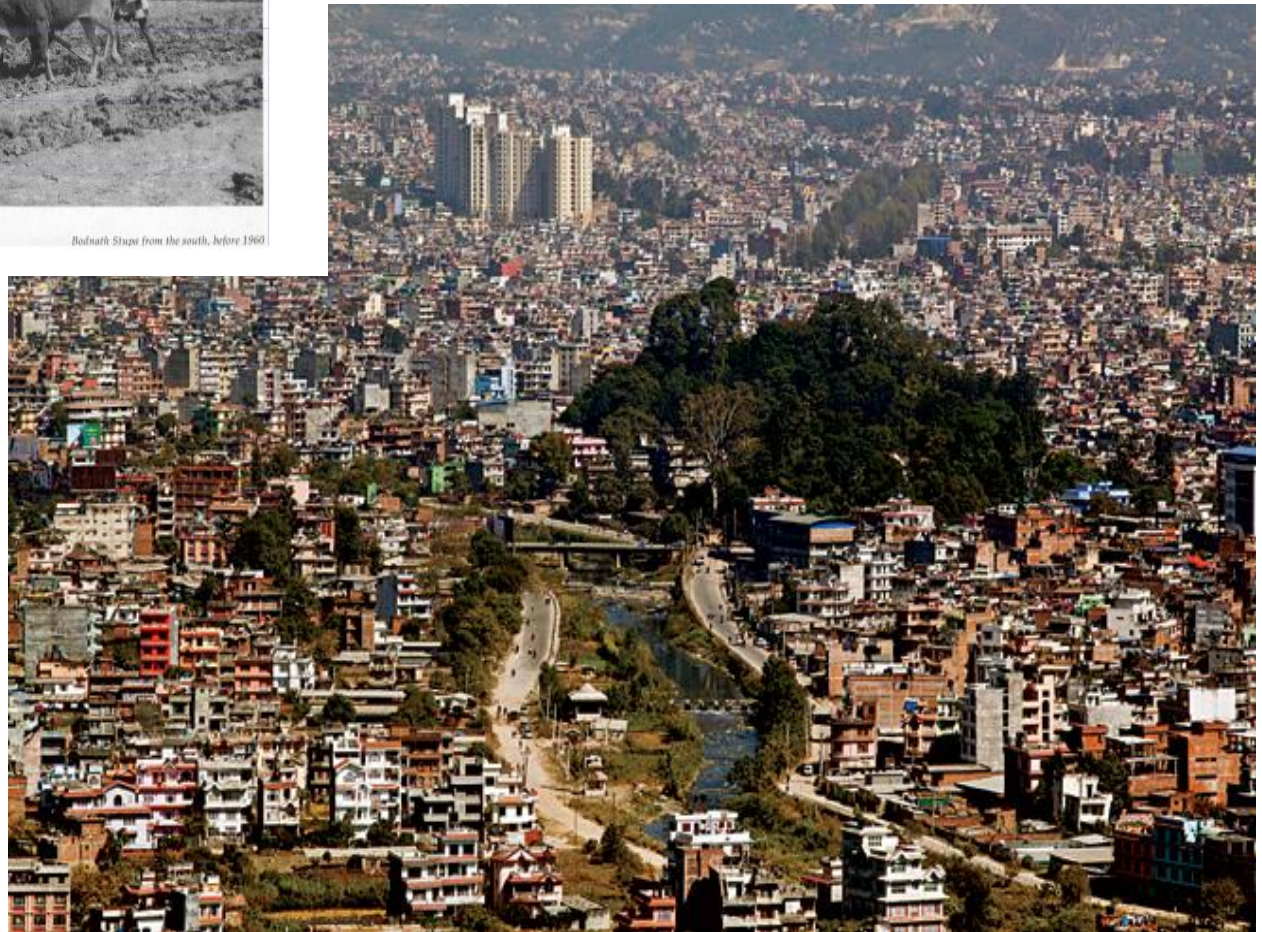


1960



Bodhi Stupa from the south, before 1960

2017

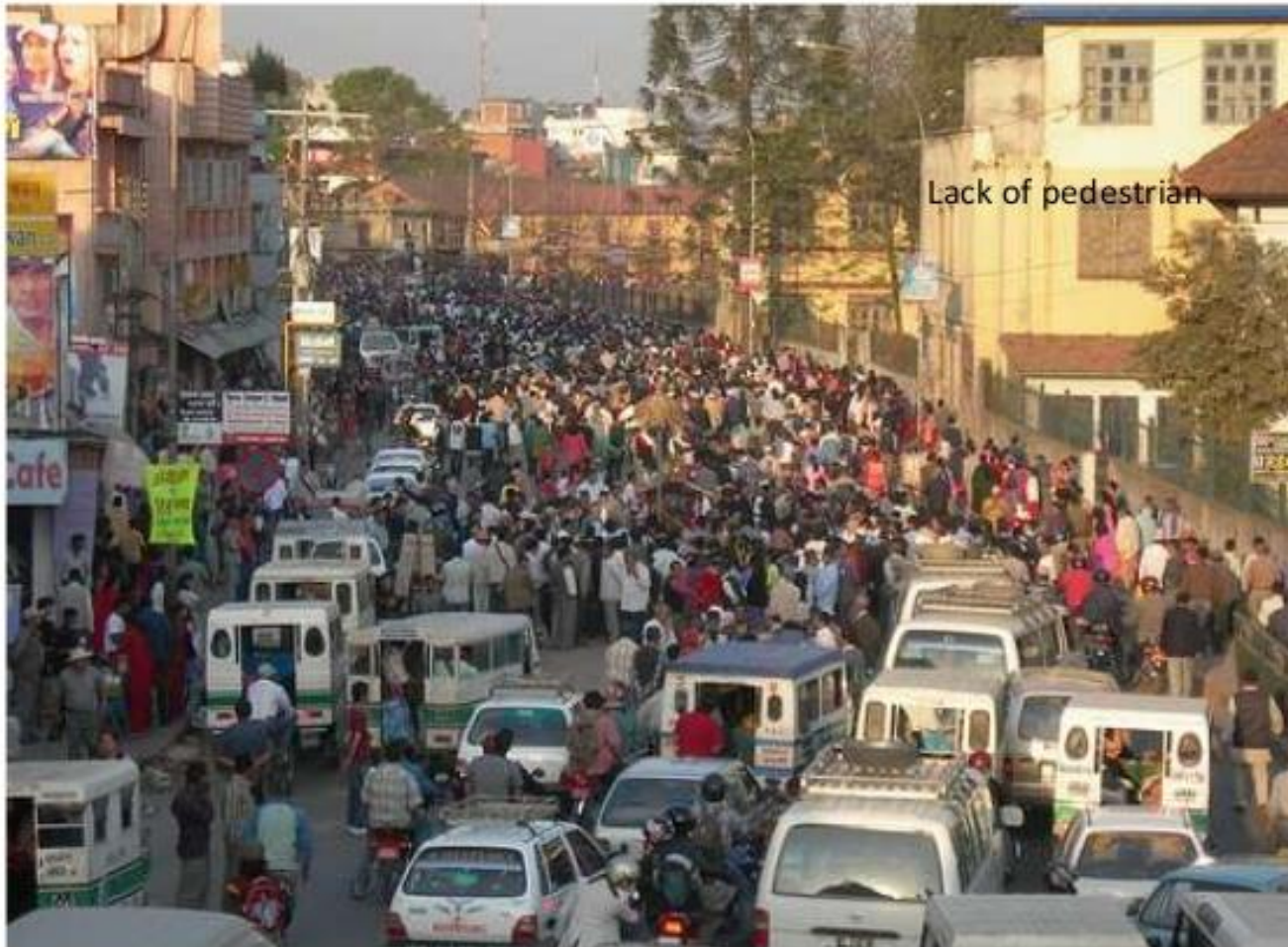




Congestion

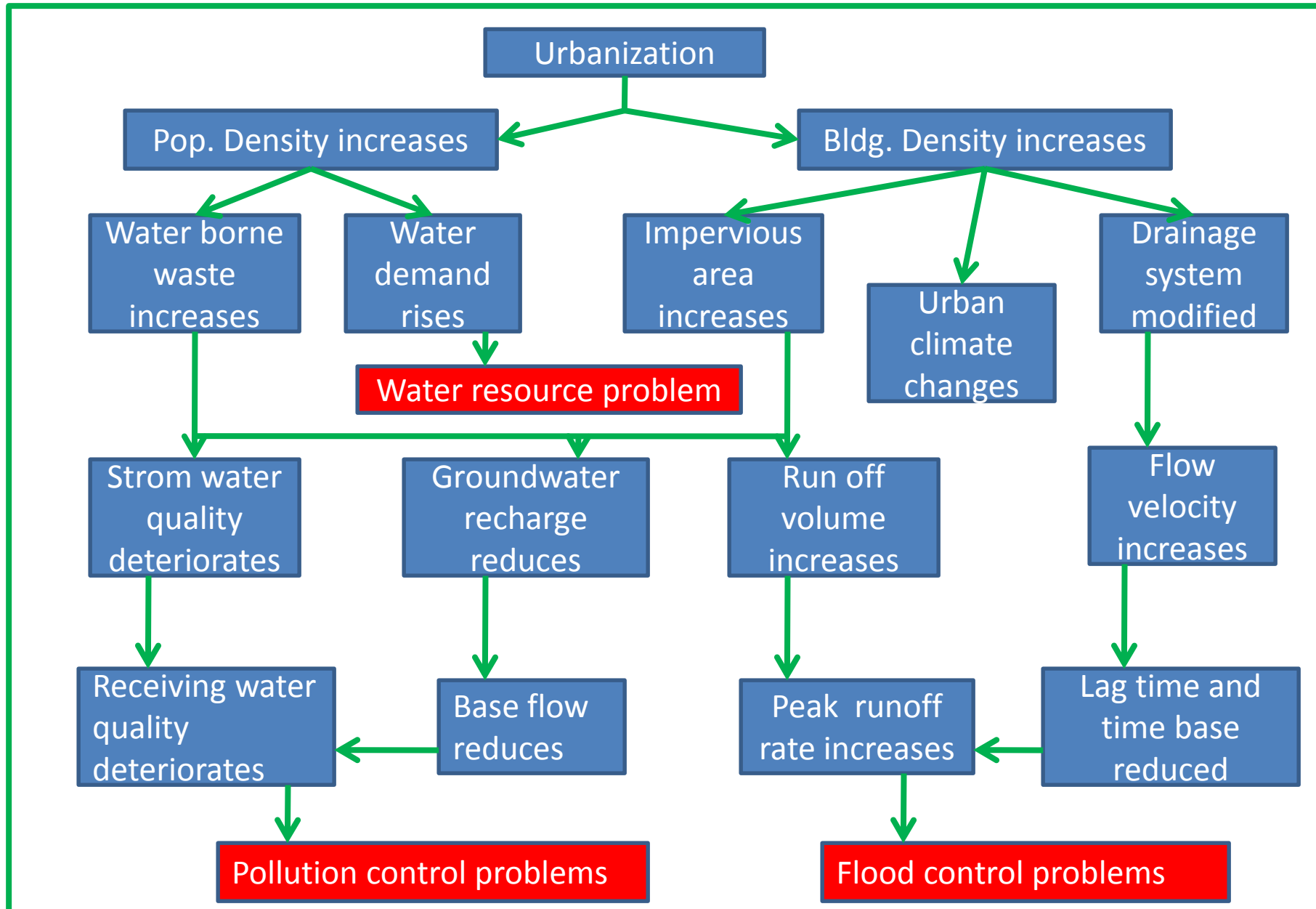


Lack of Footpath



Lack of pedestrian

The Effects of Urbanization on Hydrological Processes (Hall,1984)



BIR WATER WORKS
Constructed during regime
of
HIS HIGHNESS THE MAHARAJ ADHIRAJ PRITHVI
BIR BIKRAM JUNG BAHADUR SHAH BAHADUR SHAM
SHER JUNG-King of Nepal
AT THE EXPENSES OF
HIS EXCELLENCY THE MAHARAJAH SIR BIR SHAM
SHER JUNG RANA BAHADUR G.C.S.I THONG LING PIM-
MA KO-KANG-WANG SIAN-PREE A.U.GO.THA.BA.PREE
AU.GO.PRAU.PAU Prime Minister and commander-in-chief of
Nepal
The works were carried out
by
THE HON^{BLE} L.M.S^r.CLAIR.A.M.I.C.E-Exe Engineer
1891 बीरवाटर बाक्स 1893

Municipalities in the Kathmandu Valley

10 September 2012

27

Data sources:
Digital Landuse Map of Municipalities
(municipalities, rivers), Bagmati River basin
Improvement Project (rivers, Kathmandu
Valley, Wards, roads), CWWMP/PPTA 7936
(watersheds).

Datum : Everest Adjusted 1937
Projection : Transverse Mercator

Kathmandu Municipality

Kirtipur Municipality

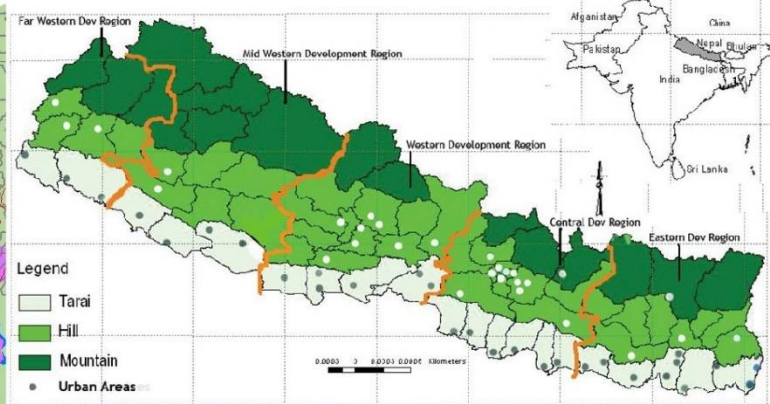
Thimi Municipality

Bhaktapur Municipality

Lalitpur Municipality

SERVICE AREA
5 MC + 39/9/6

Scale 1:125,000
When printed in A4 size
0 1 2 4 km



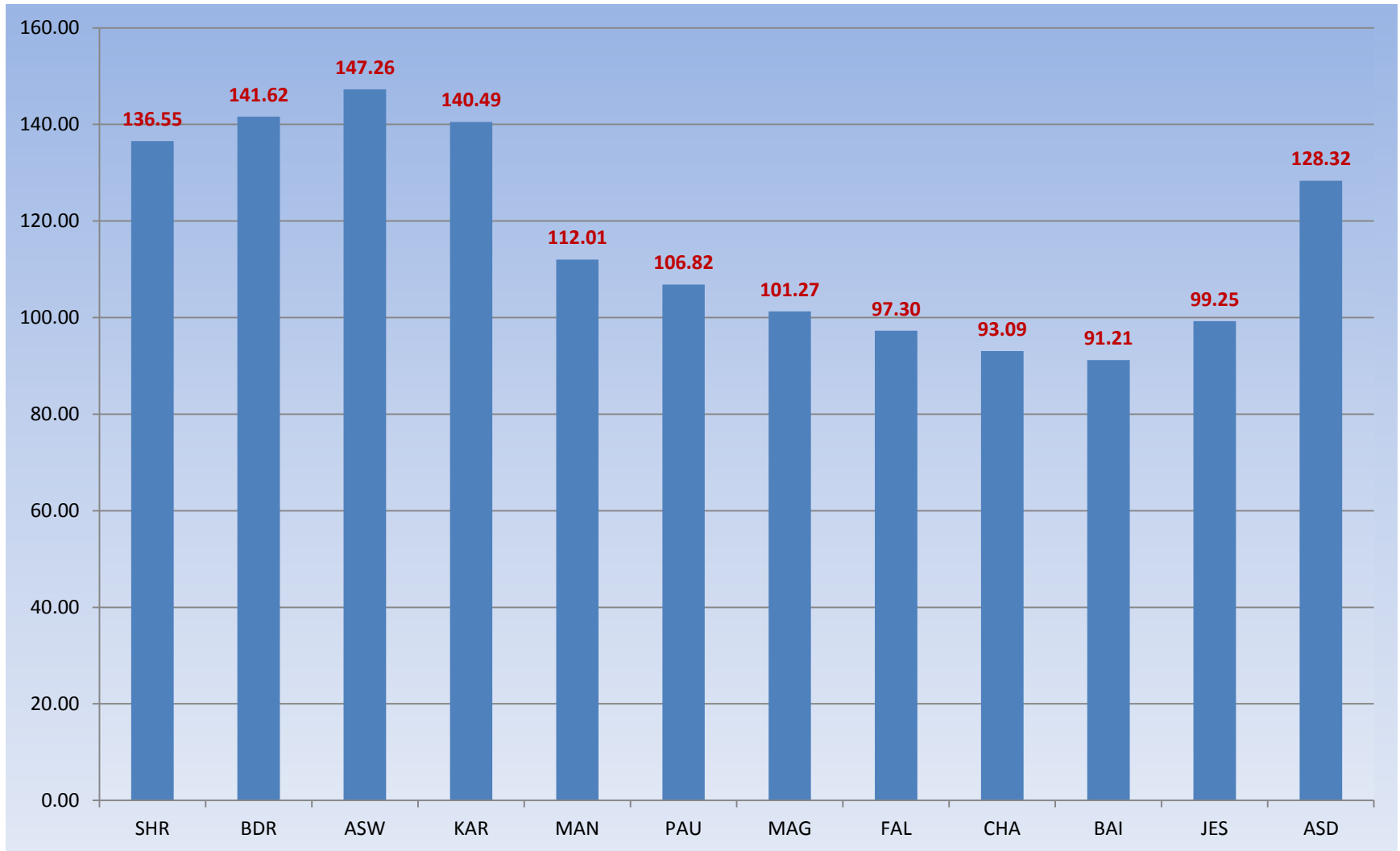
- Kathmandu Valley
- Rivers
- KUKL Service Areas Outside Municipalities
- Municipalities**
- Bhaktapur
- Kathmandu
- Kirtipur
- Lalitpur
- Thimi
- 100 m Elevation Contours
- Highways
- Main roads

Demand -Supply trends



Average Monthly Production

Mld



Months

System Components



35

Surface
Sources



78

Total
Tube
wells

69

In
Operation



Treatment
Plants

21

117Mld



47

Ground
Reservoirs

41000 m3

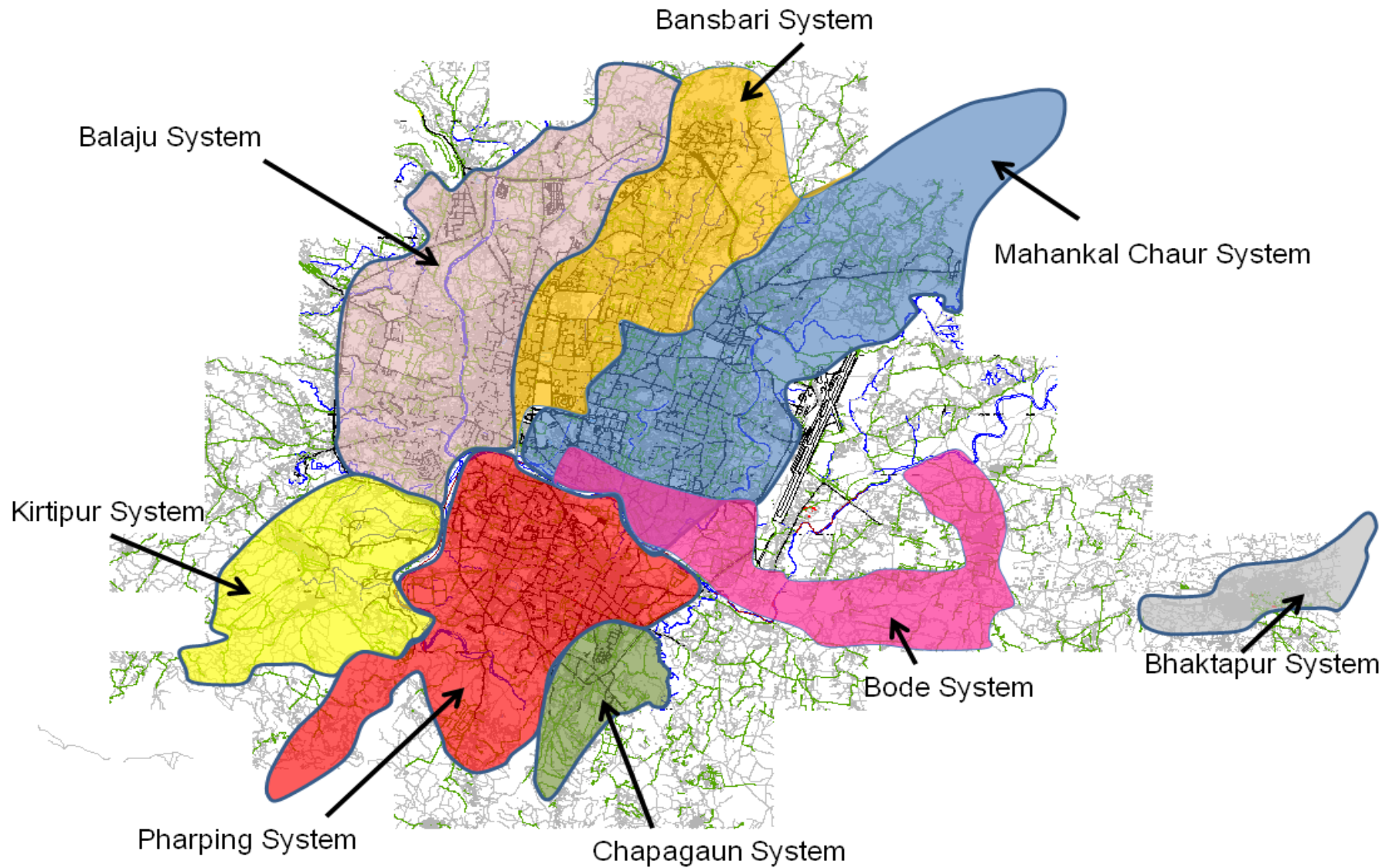


39

Pumping
Stations

> 1400 Km Pipe Lines

Major 8 systems



Water distribution schedule from the system

System	Alternate days	
	Wet season	dry season
Mahankalchaur system	3	7
Bansbari	3	9
Balaju	9	9
Minbhawan	3	5
Sundarighat	3	5
Sipradi	3	8
Sundarijal	every day	5
Lalitpur	3	5
Madhyapur	Every day	5
Bhaktapur	alternate day	5
Tanker Service		

Manohara River in Wet Season



DRY Vs WET SEASONS?

Manohara River in Dry Season



DRY Vs WET SEASONS?

Sundarijal during wet season

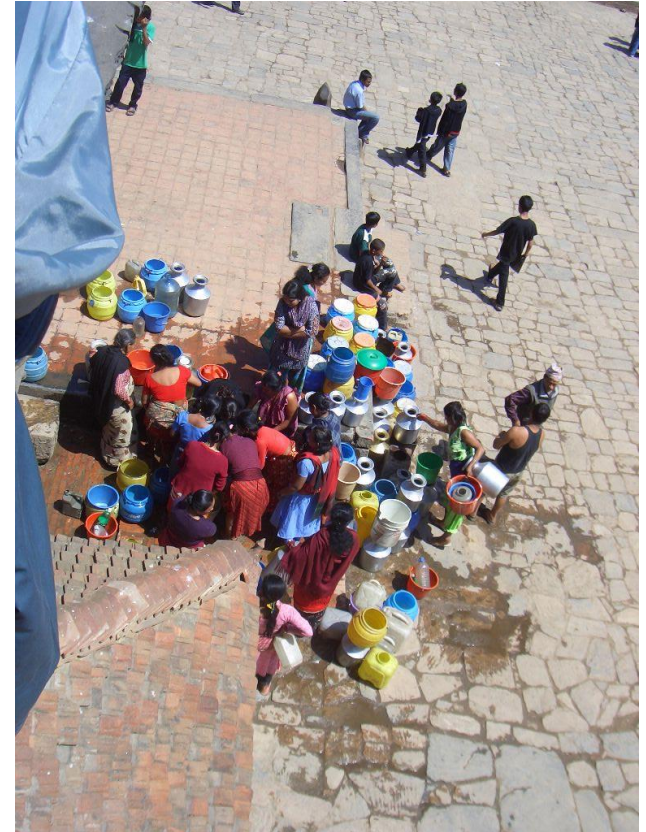


Sundarijal during dry season



Everyday fight for the right of water

Intermittent supply / Inequitable distribution



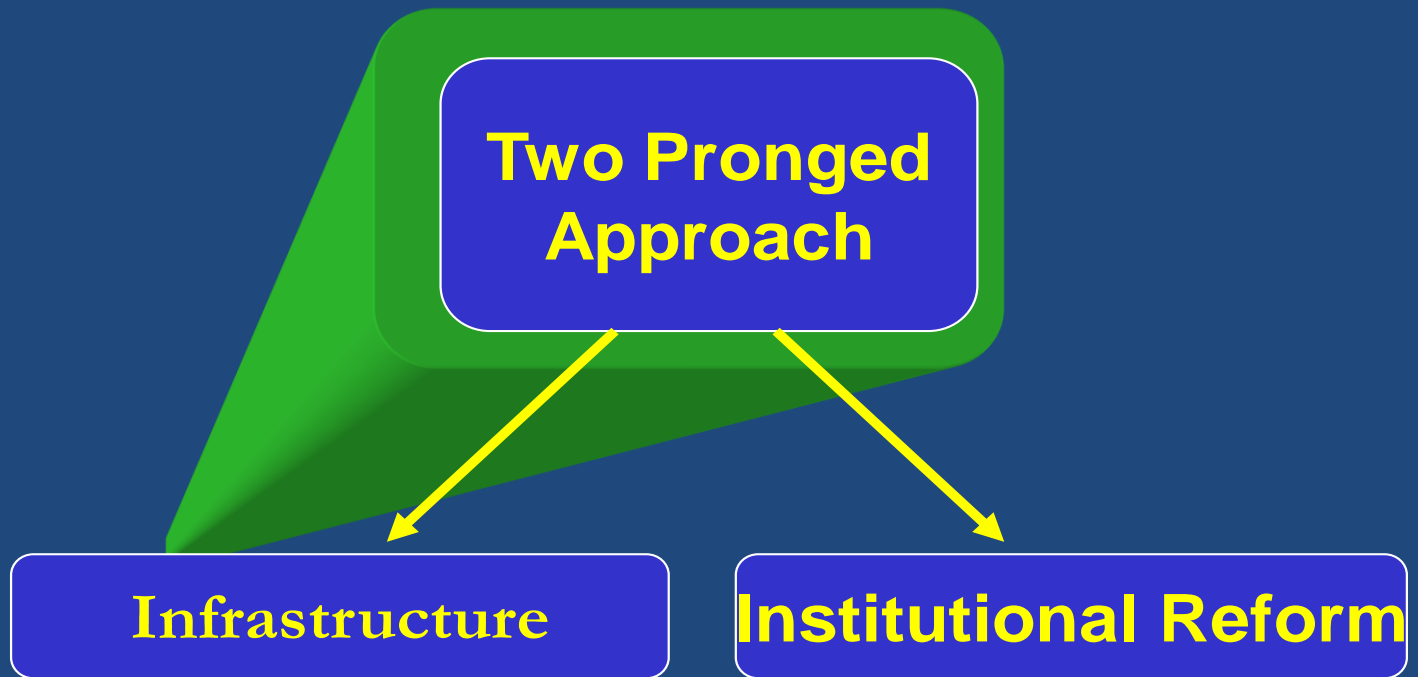
Delegation visiting one of the branches of KUKL and the final results



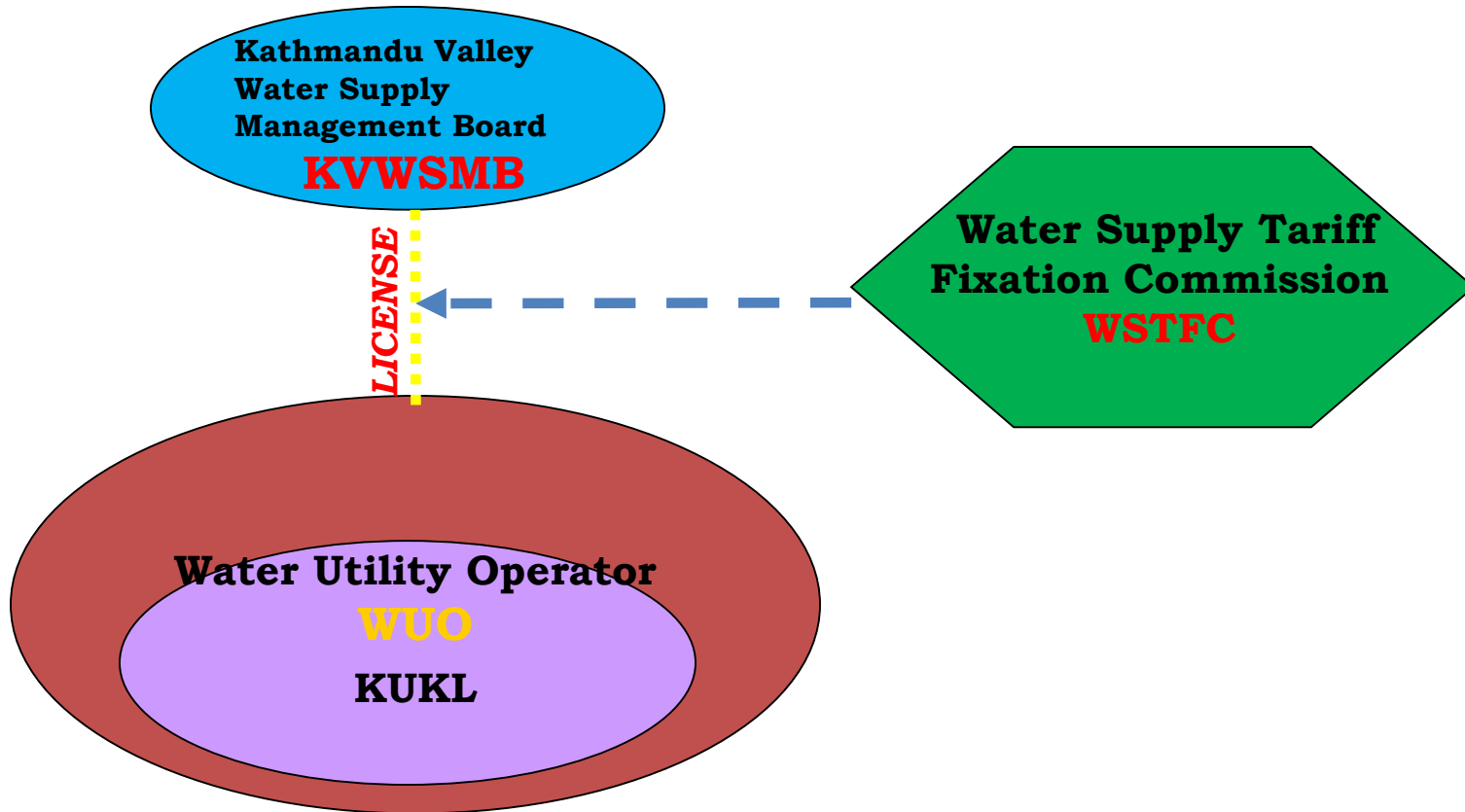
Misbehavior – a broken glass at Branch



Way forward....



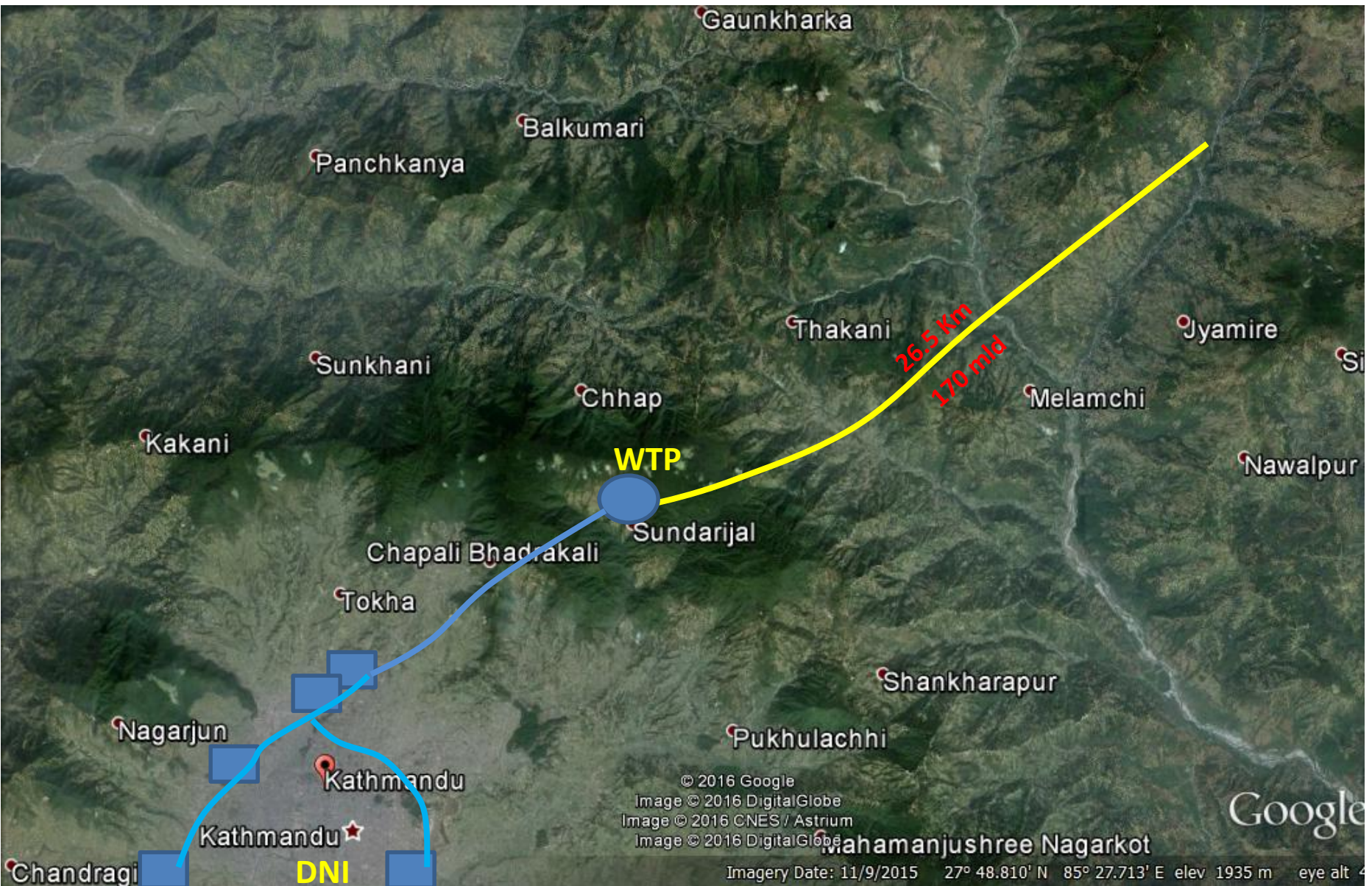
New Institutional Arrangement



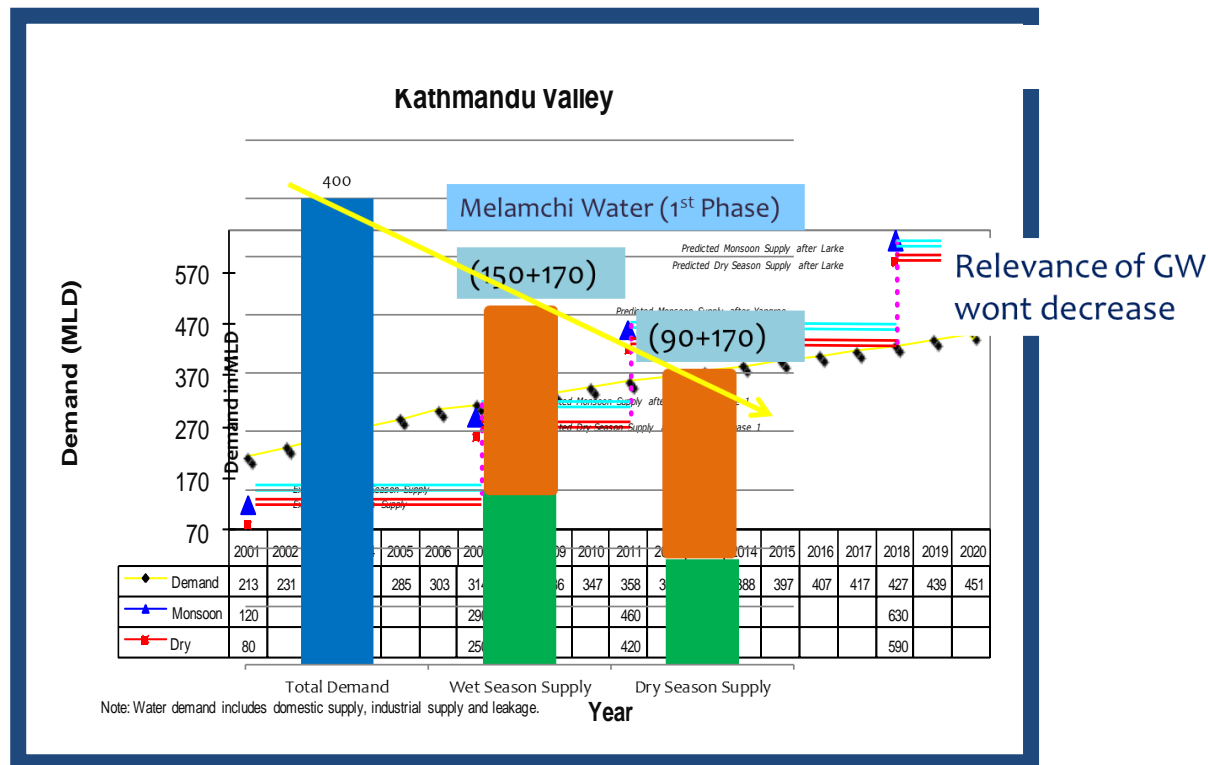
KVWSMB : Asset owner and responsible for developing and overseeing service policies & planning

KUKL : Responsible for operating water supply and wastewater system in Kathmandu Valley

WSTFC : Tariff regulation and safeguarding consumer interests



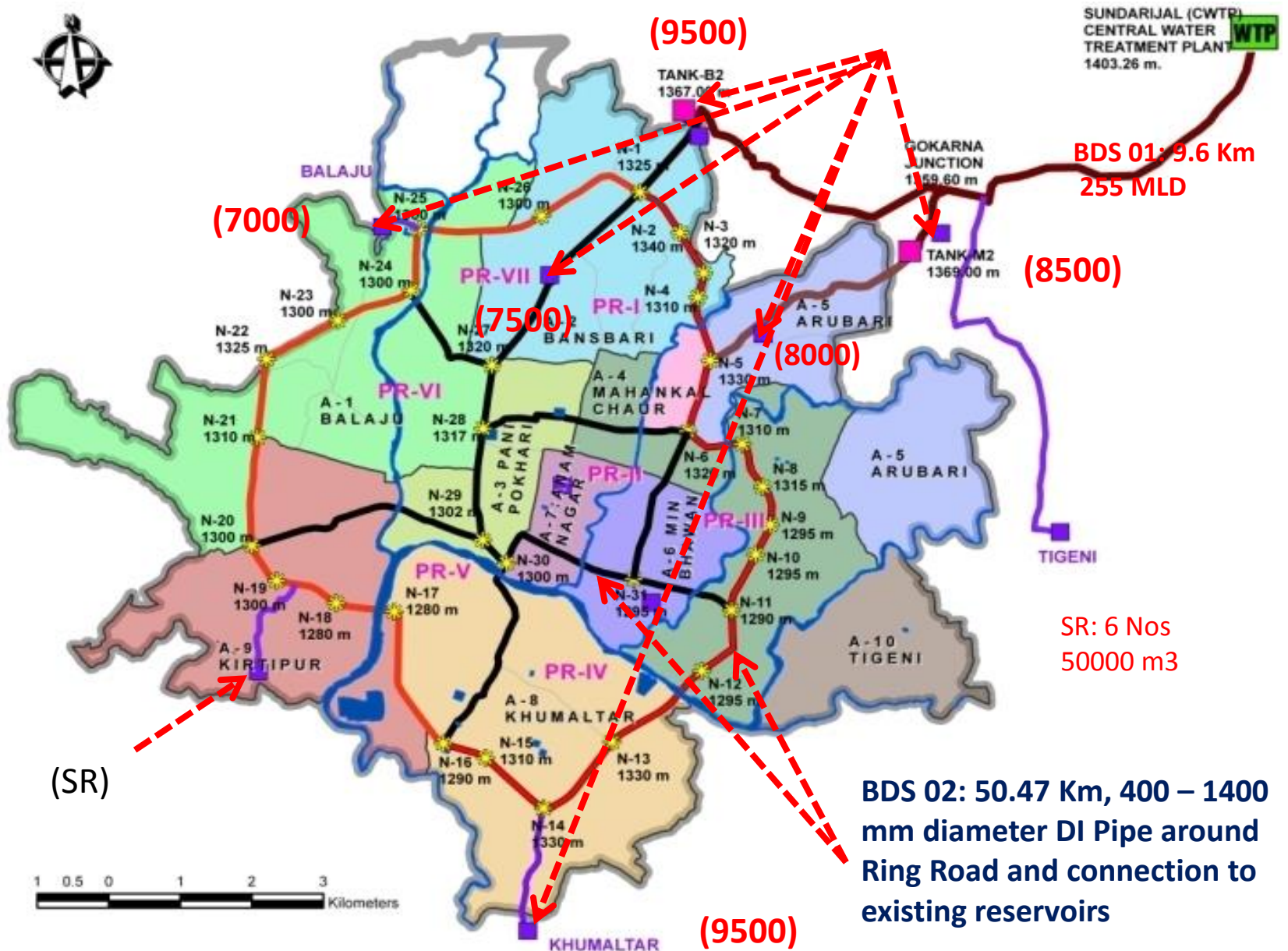
- Melamchi 1st phase wont give us 24*7 water supply.



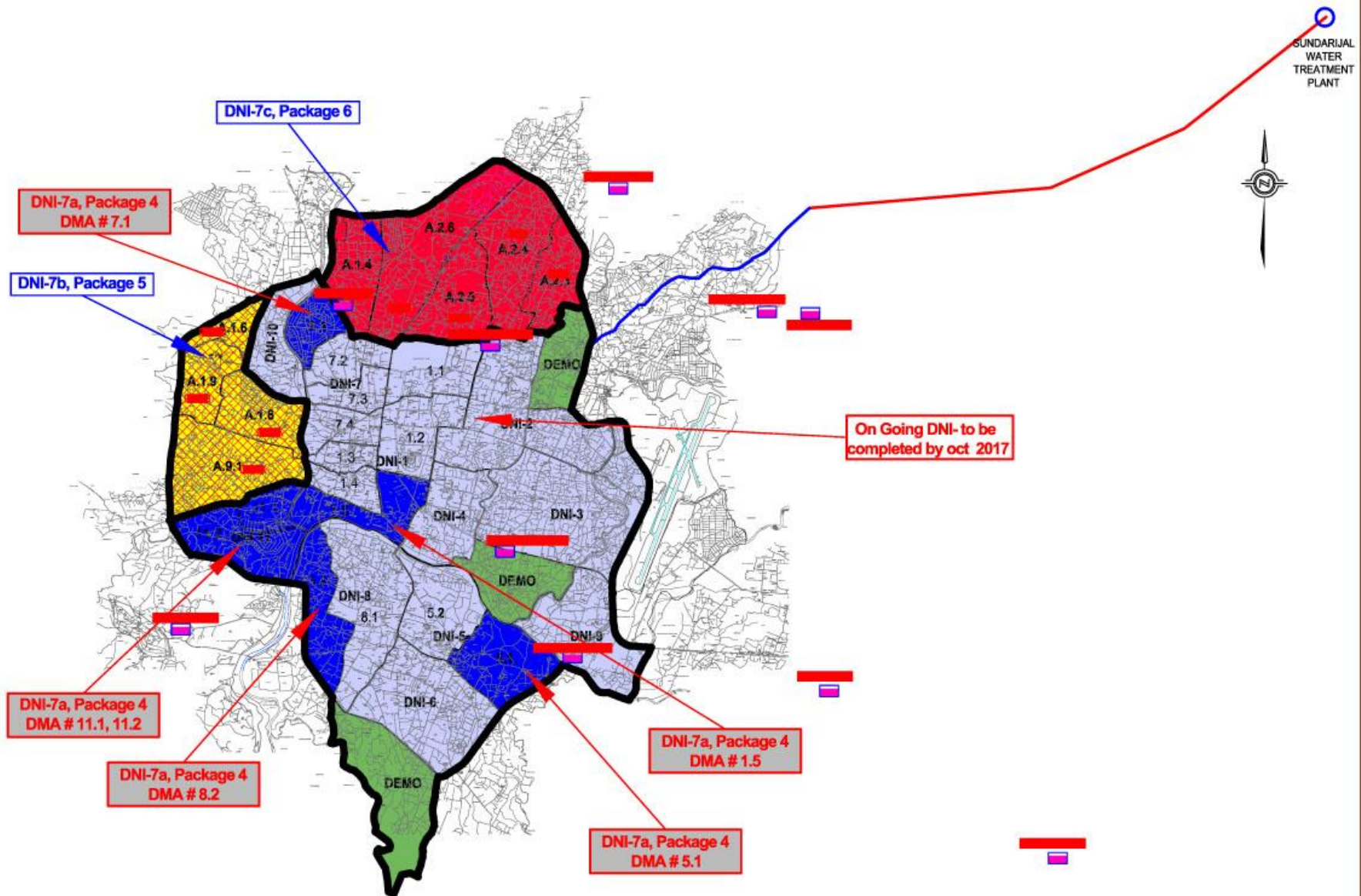
Project Location



BDS-SR: Infrastructure & Equitable Distribution



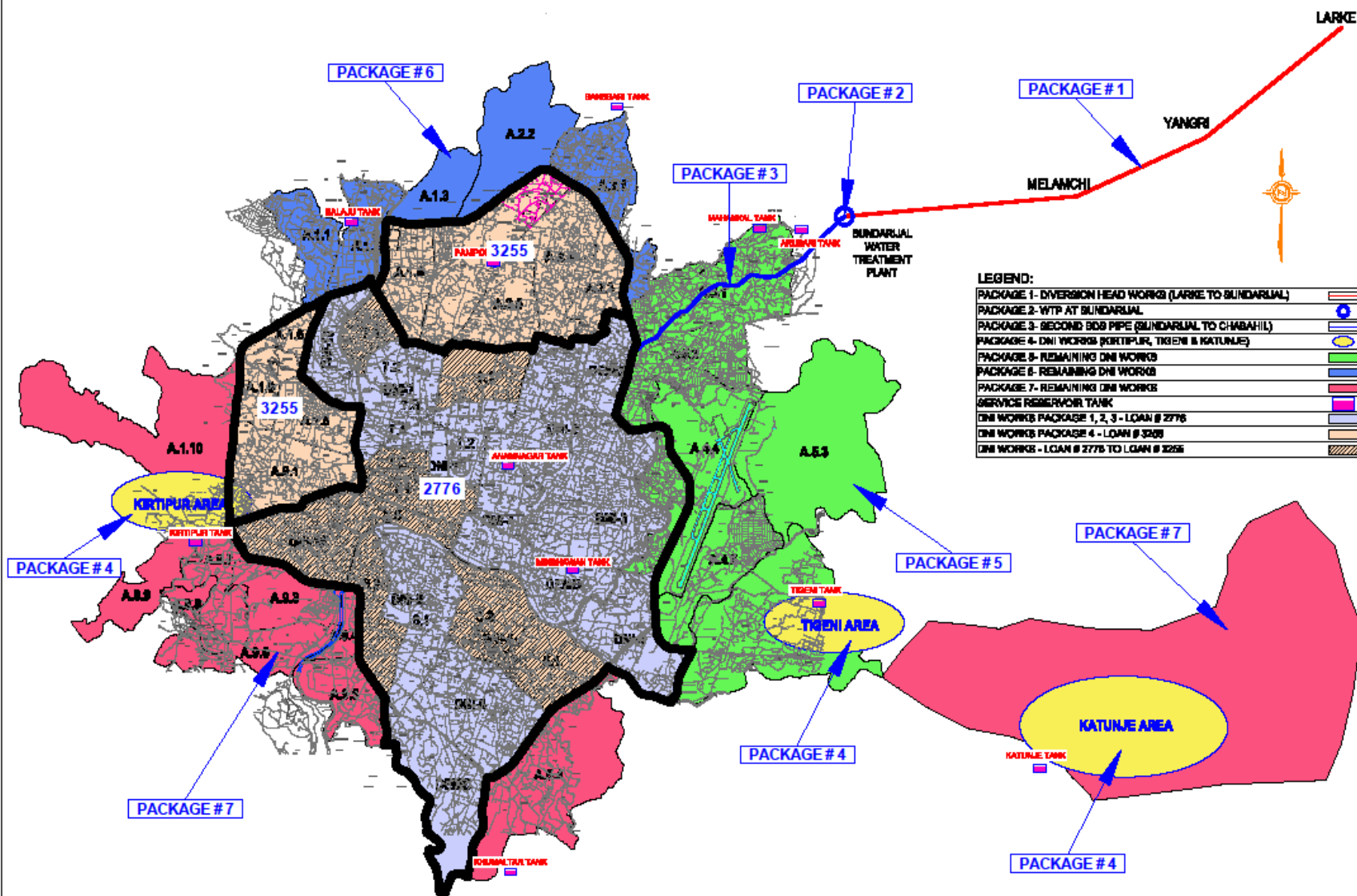
Distribution Network Improvement Works



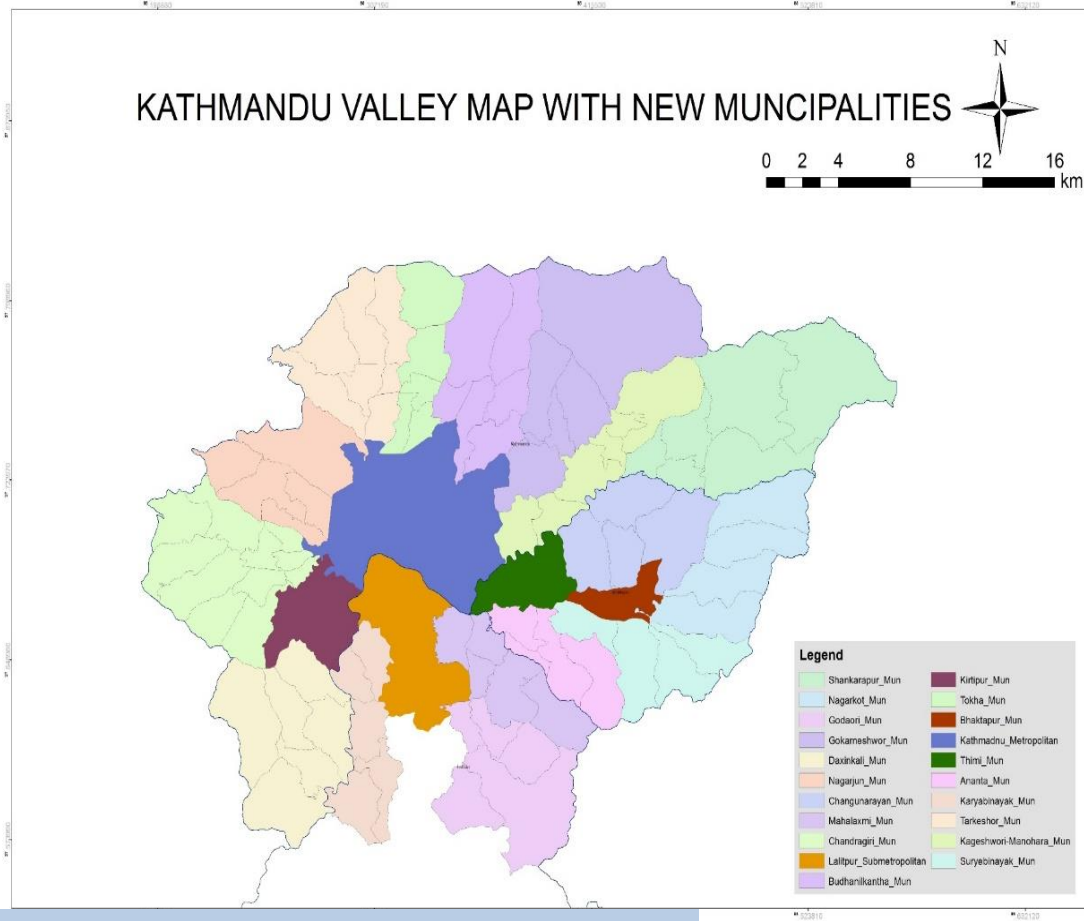
Investment Program

Future Water Supply and Sanitation Development in Kathmandu Valley

For the Period Year 2018 - 2022 and 2020 - 2025



Each Municipalities : Case by case



Access the sources

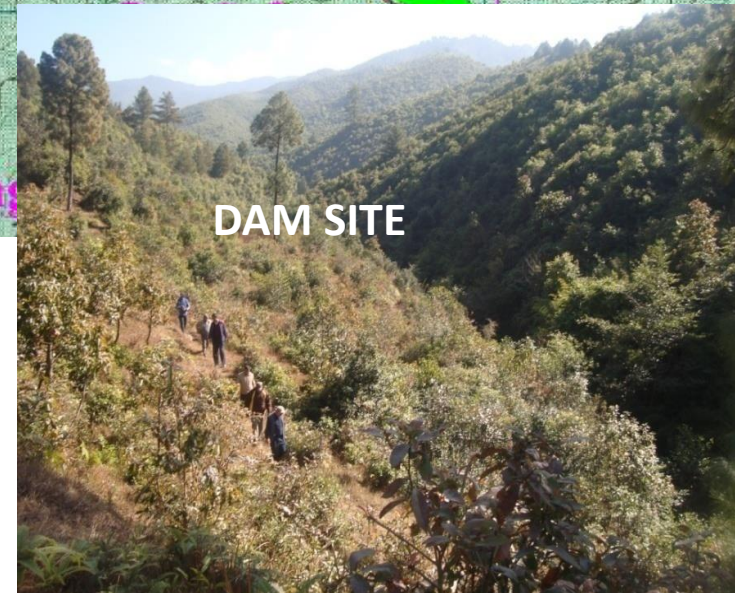
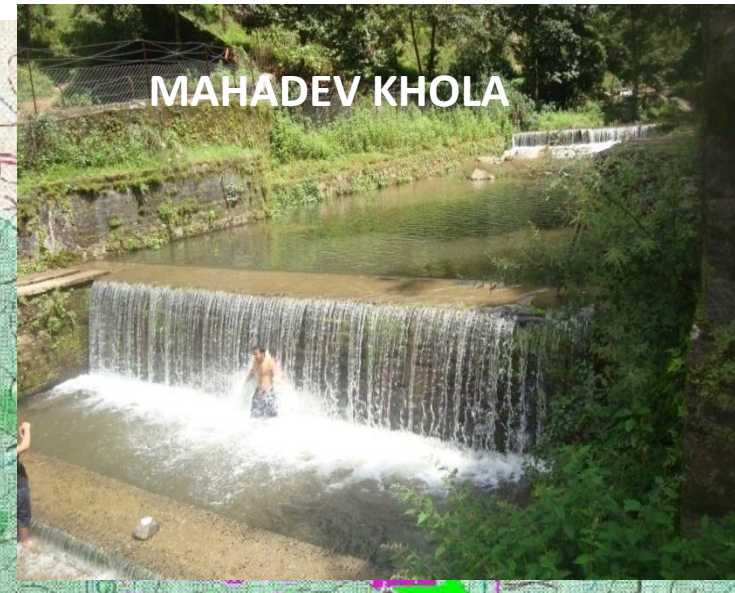
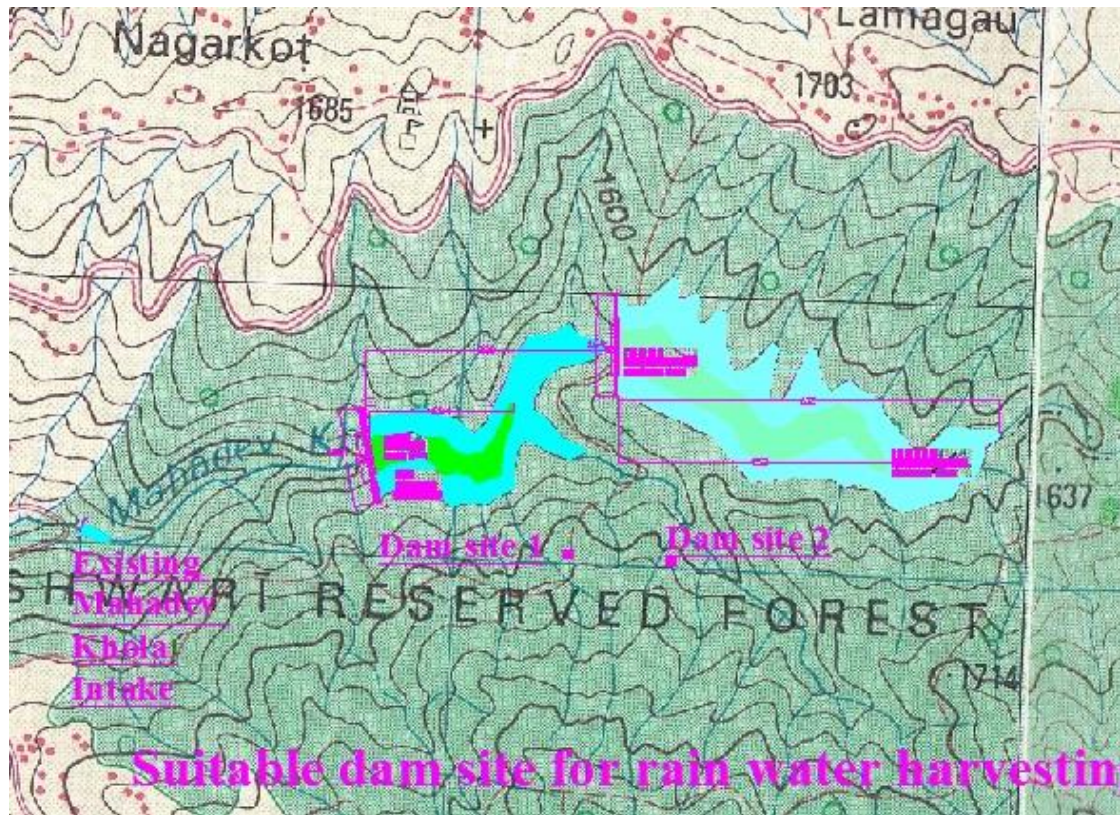
If the demand is greater than the local sources

Bulk supply from Melamchi (Till 2030)

Reservoir wise water systems (dam) – as an emergency, contingency, regular & climate resilient plans

INTEGRATED MASTER PLAN UPTO 2050

Rain water harvesting in Mahadev Khola by constructing dam



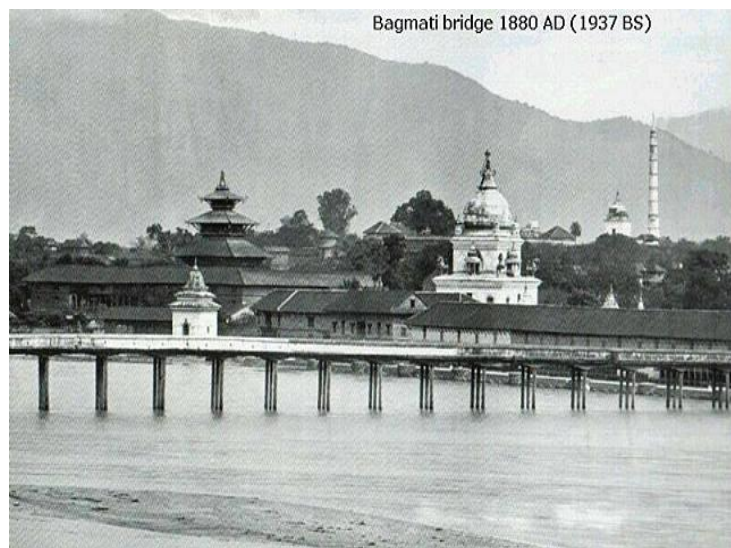
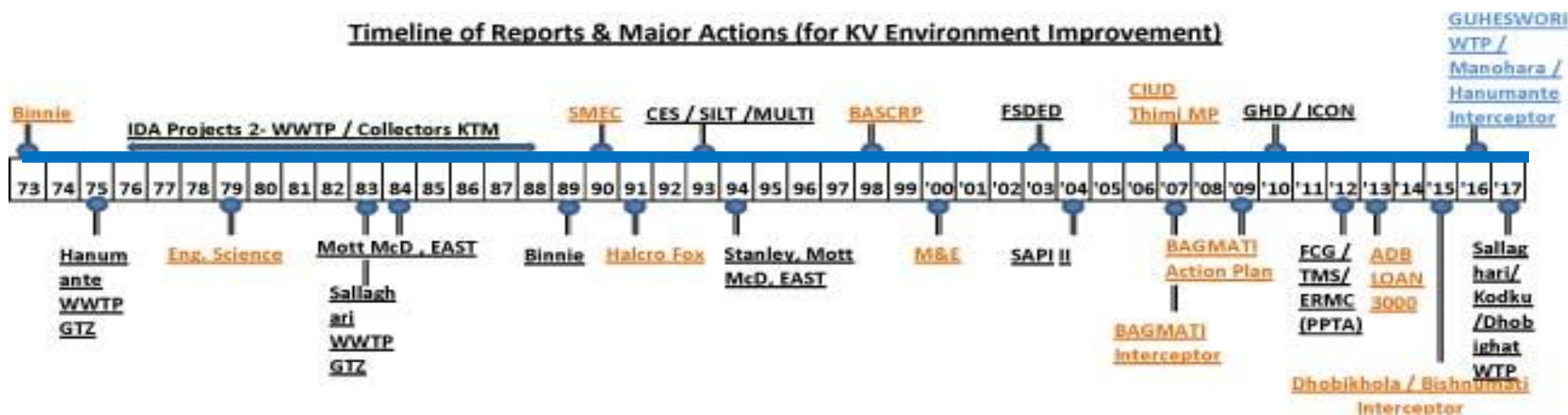
Catchment area Upstream of Dam site2: 5.5 sq.km

Rainfall: >1600 mm

Height of Dam = 20- m

Discharge = 10 Mld

Timeline of Reports & Major Actions (for KV Environment Improvement)



Bagmati bridge 1880 AD (1937 BS)



Present Situation:



A typical outfall letting raw sewage in the river



Present Situation:

List of Main Sewage Treatment Plants in Kathmandu Valley

Name of Sewage Treatment Plant	Capacity	Type	Remarks
Dhobighat Sewage Treatment Plant	15.4 Mld	Stabilization Pond	Not functioning
Kodku Sewage Treatment Plant	11.1 Mld	Stabilization Pond	Not functioning
Guheswori Sewage Treatment Plant	16.4 Mld	Oxidation Ditch /Extended Aeration	Partially functioning
Hanumanghat Sewage Treatment Plant	0.5 Mld	Stabilization Pond/Extended Aeration	Not functioning
Sallaghari Sewage Treatment Plant	2.0 Mld	Stabilization Pond/Extended Aeration	Not functioning

Present Situation:



View of Dhobighat WWTP/ Cows are grazing in the dry ponds

Present Situation:

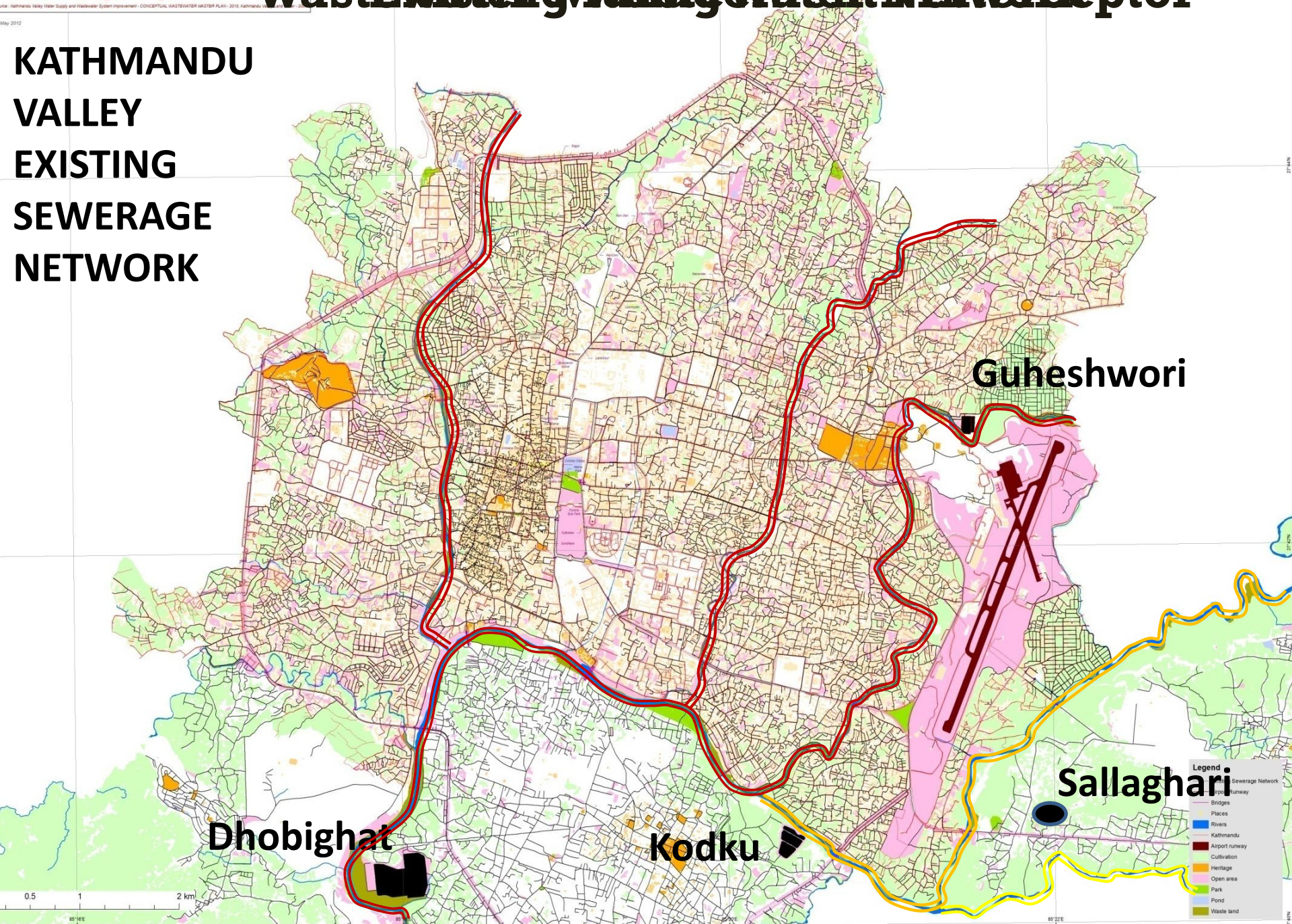


View of Kodku WWTP /covered by vegetation growth

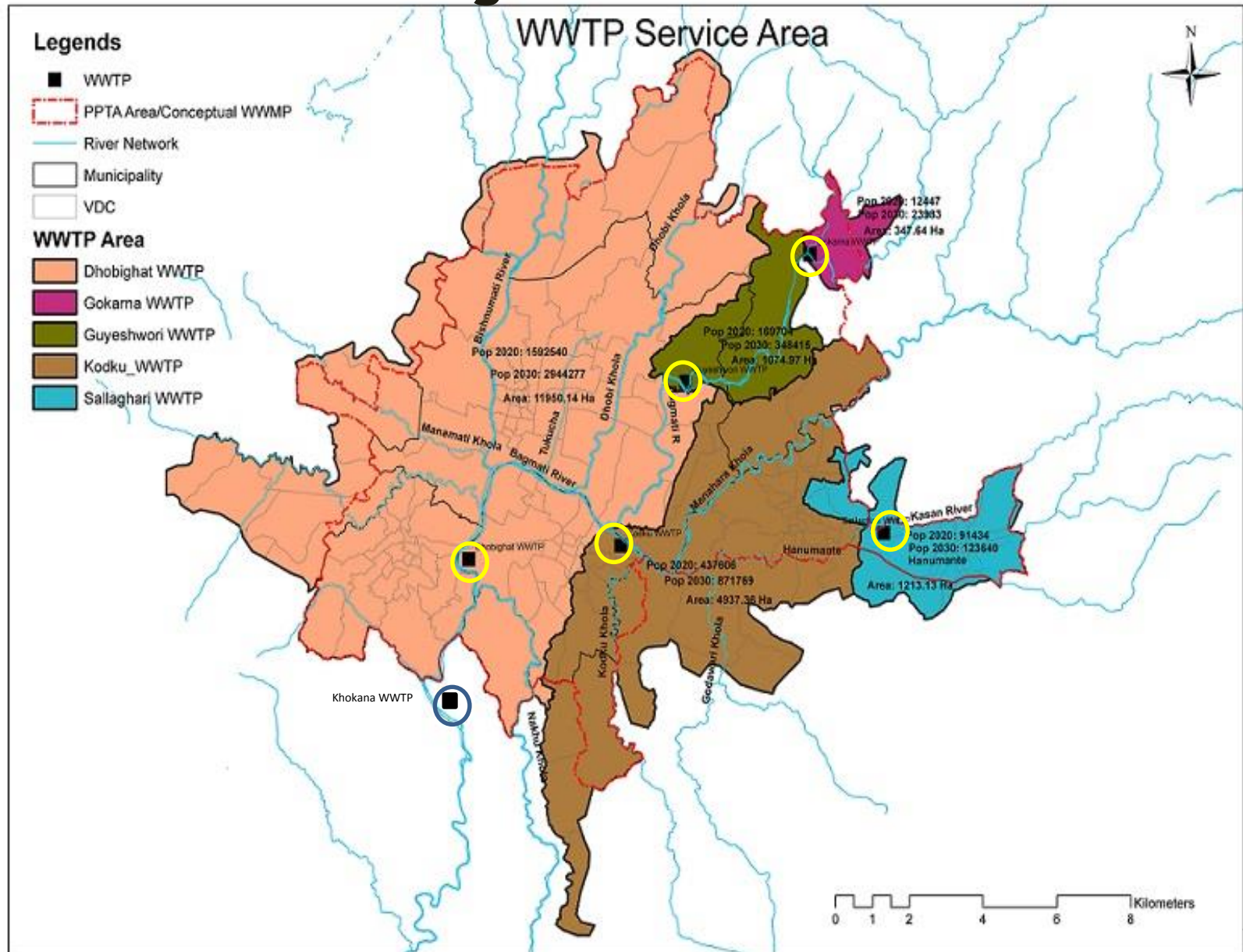
Way Forward....

- Rehabilitation of existing sewer network system
- Interceptor & collectors – to prevent the raw sewer direct discharge into river
- 5 Major WWTPs (New, Upgrade): Gokarna, Guheswori, Sallaghari, Kodku & Dhobighat
- Major WWTP (Under land acquisition process)- Khokana, Chalnakhel.

KATHMANDU VALLEY EXISTING SEWERAGE NETWORK



Wastewater Management : Treatment Plants



Existing Upgrade



Future 2025

Chalnakhel

Bagmati River

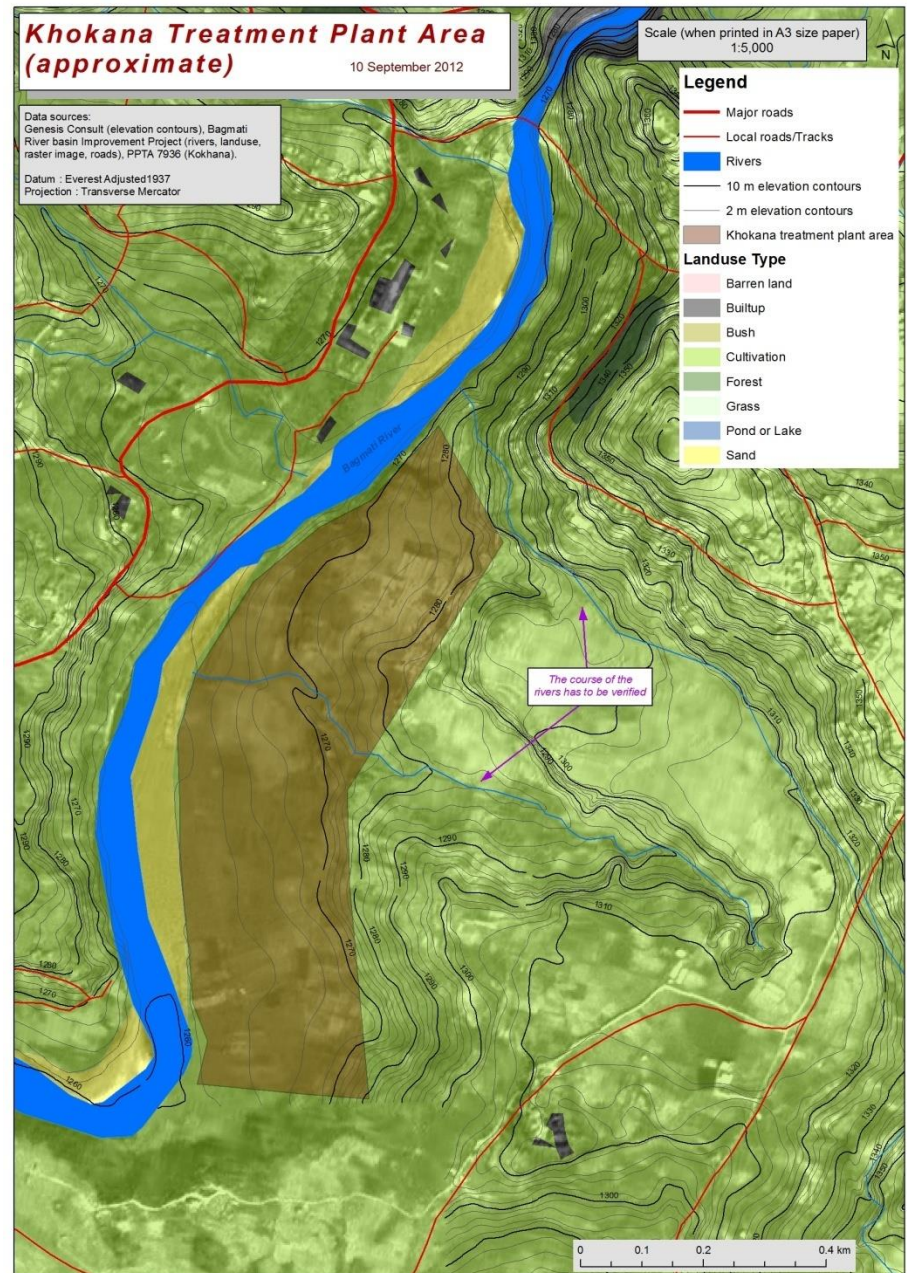


KHOKANA (CHALNAKHEL)

WWTP APPROX. 300 MLD

- 40 hectares land is need for future wastewater treatment plant

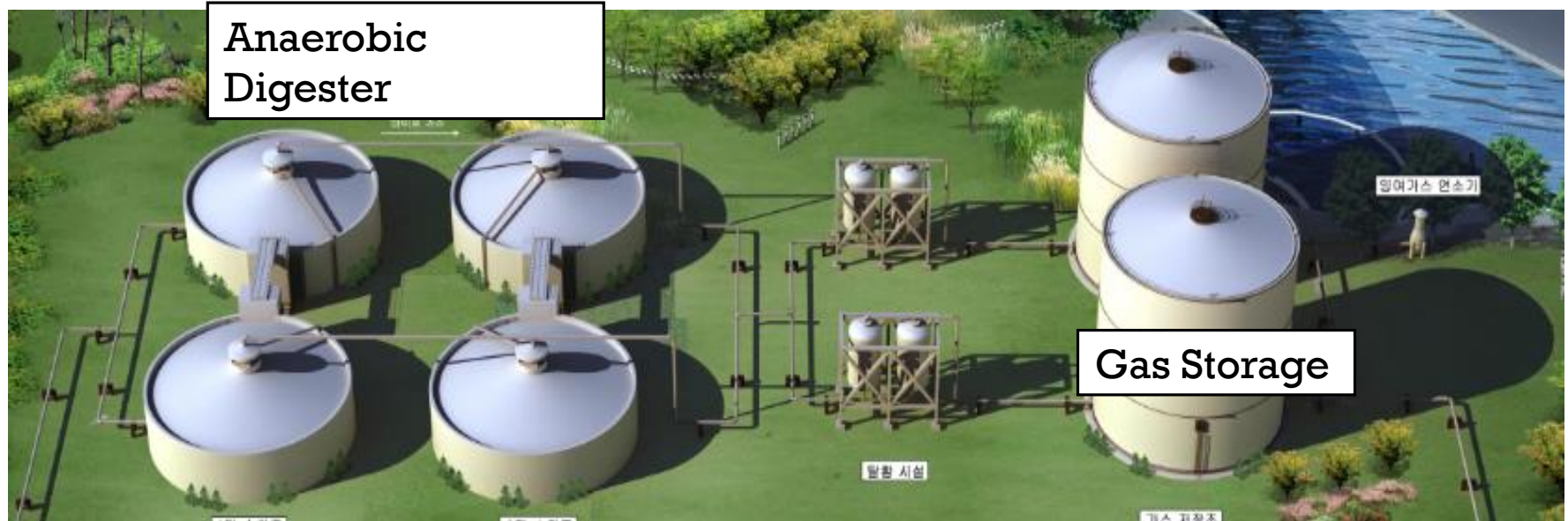
- Land acquisition under process



Concepts for Design of WWTPs

Recover Energy

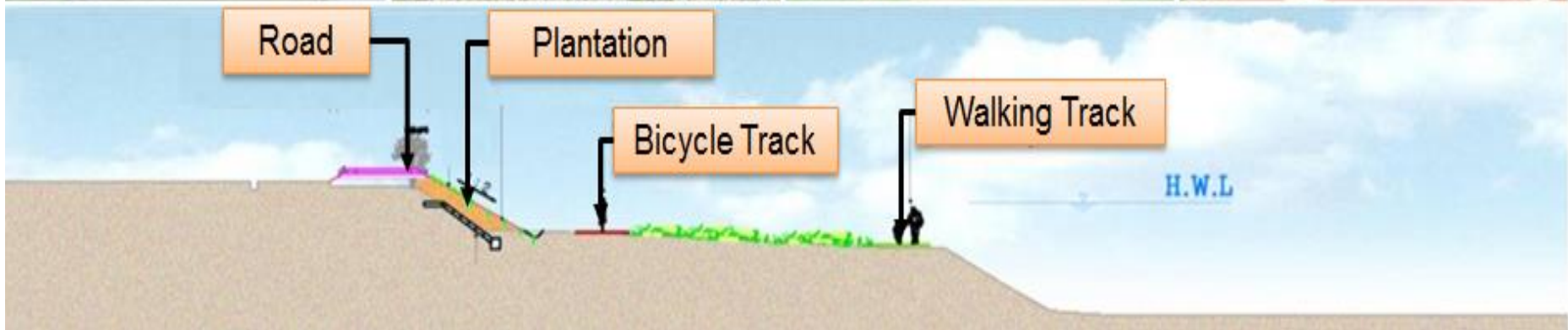
Generate Electricity by Methane Gas from Anaerobic Digester



Concepts for Design of WWTPs

Be Harmony with Surrounding Area

- ❖ Provide Recreational area and public park for population on reserved area in WWTP or water front
- ❖ WWTPs not only treat wastewater but also provide site for relaxation and recreation



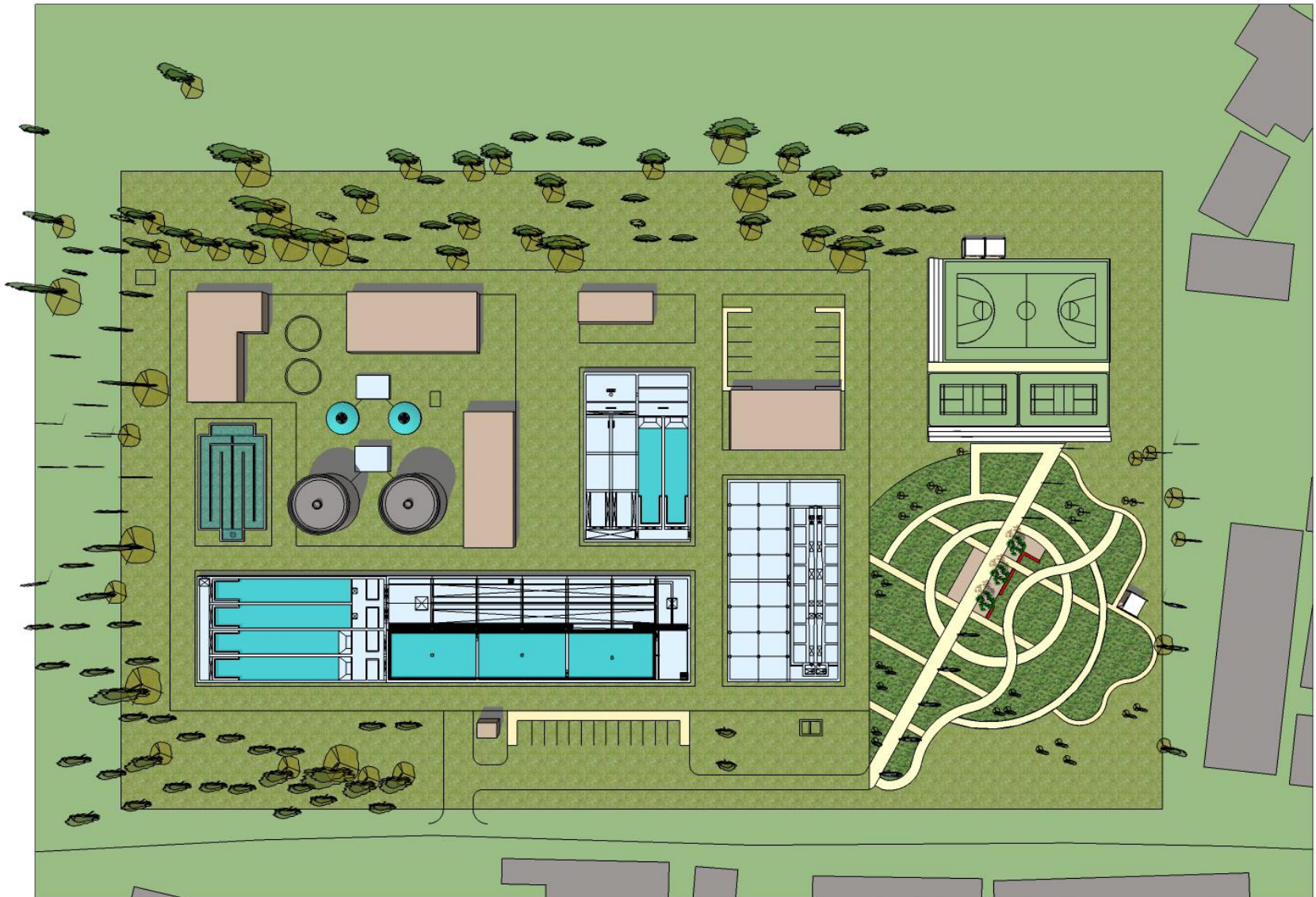
Guheswori WWTP (Layout) 34.2 Mld



Sallaghari WWTP



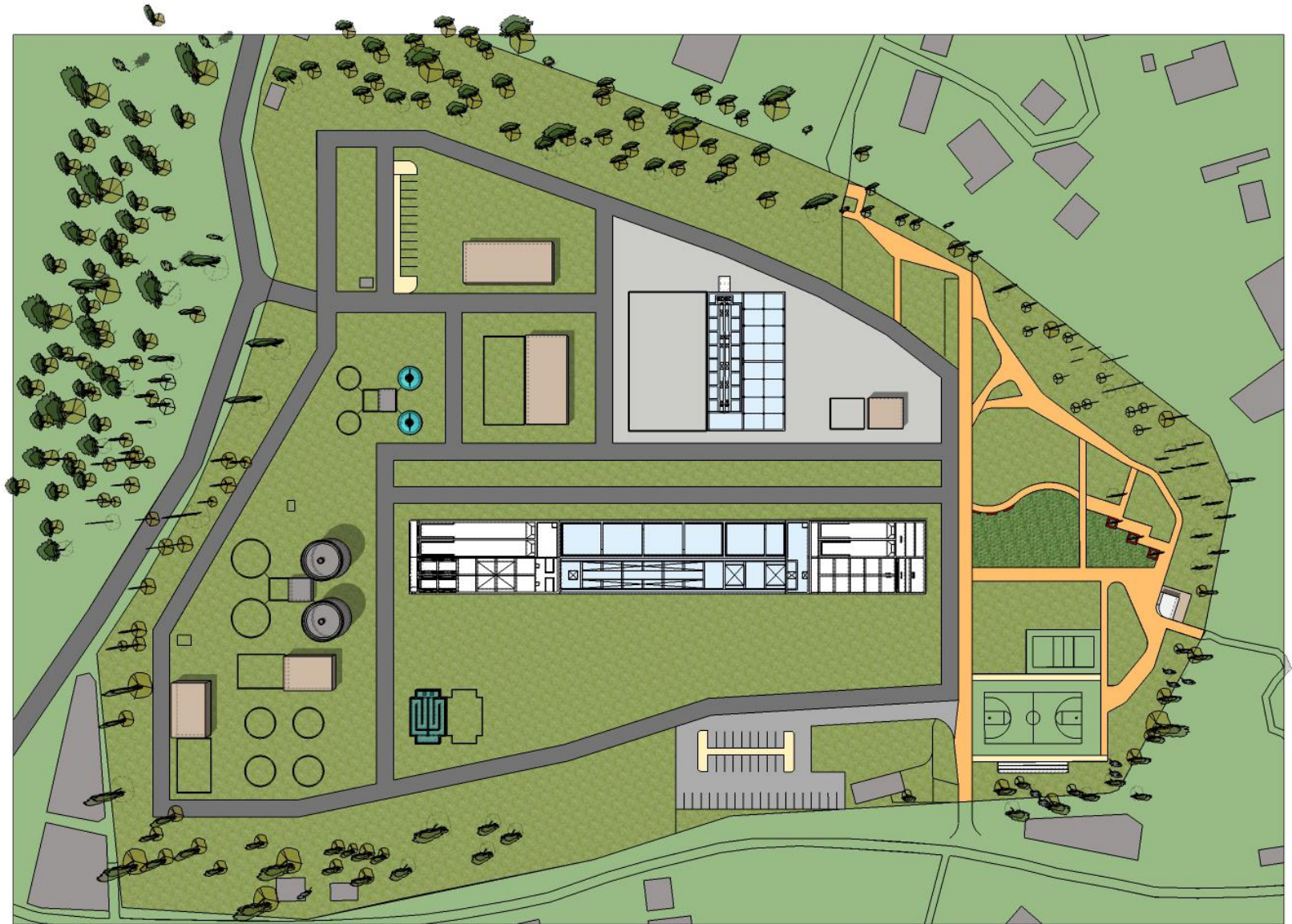
Sallaghari WWTP (Layout) 14.2 Mld



Kodku WWTP Present Situation



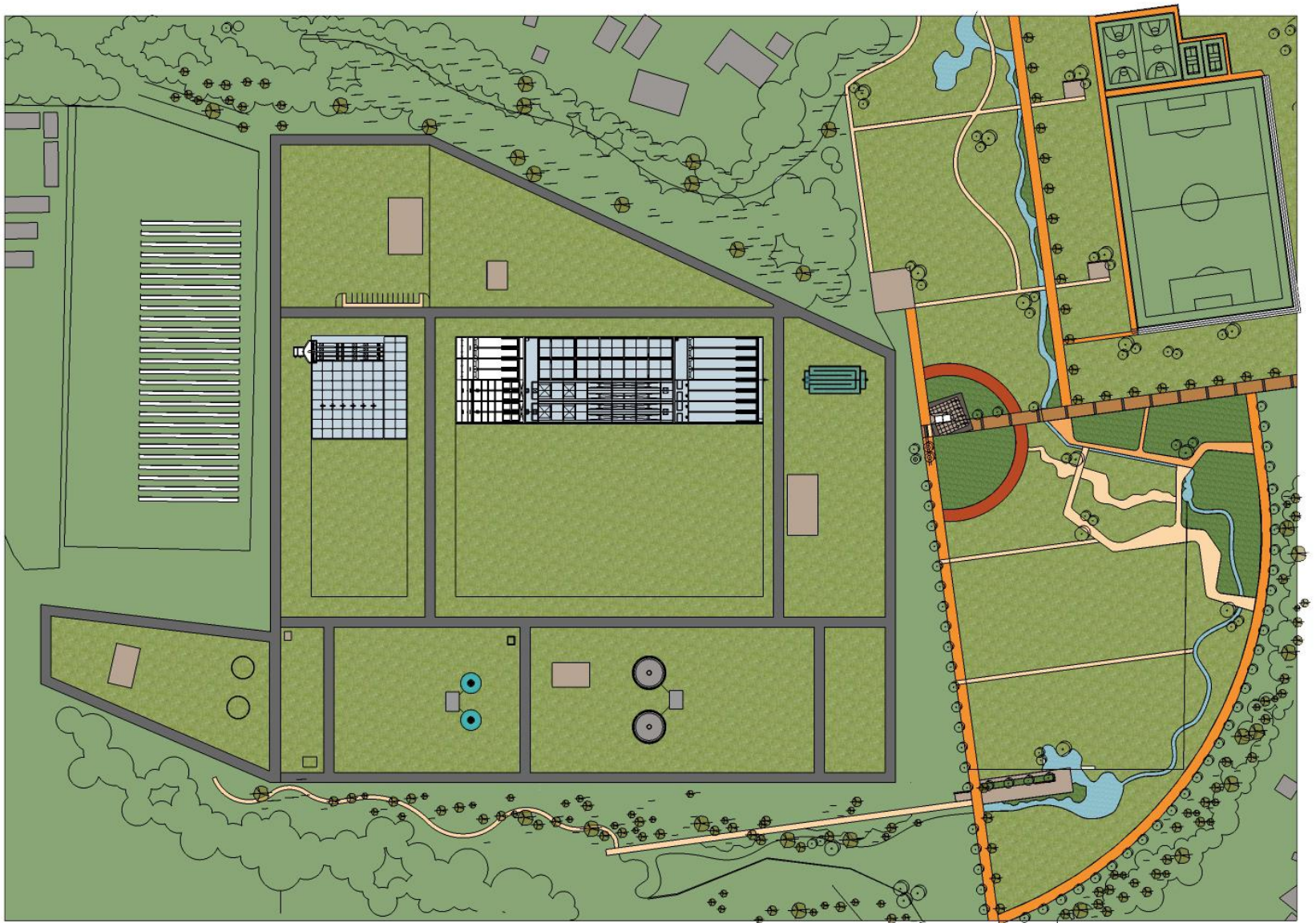
Kodku WWTP (Layout) 35 Mld



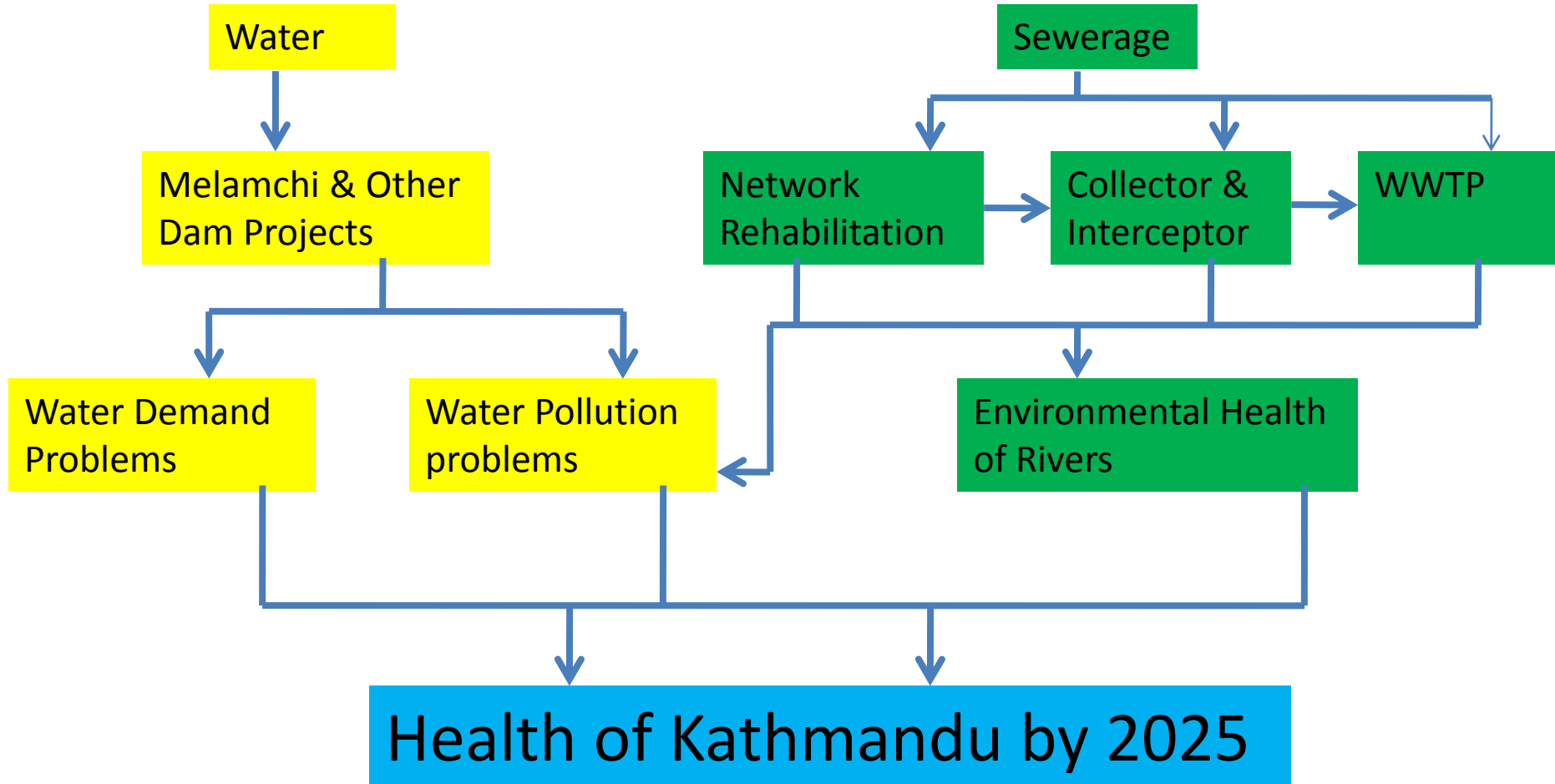
Dhobighat WWTP Present Situation



Dhobighat WWTP (Layout) 110 Mld

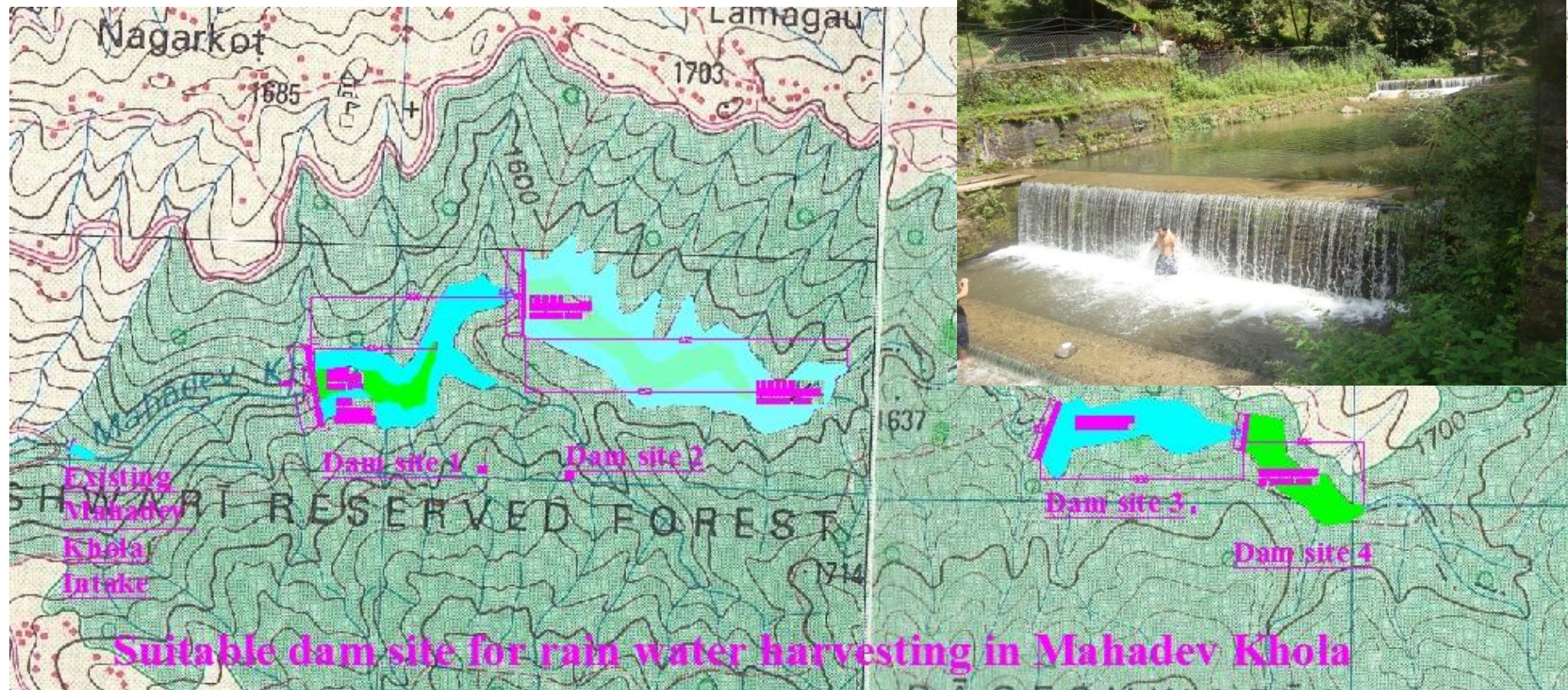


Conclusion:



THANKS

Rain water harvesting in Mahadev Khola by constructing dam



Catchment area Upstream of Dam site2: 5.5 sq.km

Rainfall: >1600 mm

Mahadev Khola Dam Project : One of the Rain Water Harvesting Project



Existing water production
Wet season: 4.0 mld
Dry season: 2.0 mld

Water production with
Dam (NRs 1430 million)
Wet season: 7.0 mld
Dry season: 6.0 mld

Mahadev Khola Intake

Overall Issues:

- Equitable distribution
- Early completion of Melamchi
- NRW
- Source protection

Solutions:

- DNI (100% replacement)
- 170 Mld within 1.0 – 2.0 years, Consultant selection work has been started.
- New DNIs with DMAs
- < 15 % NRW criteria associated with the payment of the contractors
- Illegal connections
- Disputes
- Local and KVWSMB Act
- Stakeholders (e.g. Bagmati, Shivapuri Conservation , KVWSMB, KUKL)

Overall Issues:

➤ Underground water

Solutions:

- Licensing (414/ 1000)
- This year 700
- Study is needed: Yamanashi + Short term study will be started within 6 months
- Recharge: Mandatory for license holders
- Unpaved area for new construction
- Artificial recharging (shallow + deep)

➤ RWH

- Recharge: Mandatory for license holders
- New construction: Technical support
- HH level + Large scale
- Impounding reservoirs (Mahadev Khola, Thosne, Godavari, Sisnery etc)

➤ Contingency plan and other sources

- Melamchi repair
- Incase of disaster
- Mahadev Khola, Thosne, Godavari, Sisnery etc

Overall Issues:

- Protection of local water sources: Stone taps, ponds

- Sharing the benefits (levy)

- Budget

Solutions:

- KVWSMB/ local government
- Not much priority given at present

- Mealmchi
- GoN should decide

- No grant from GoN
- Loan: even @ 9 %, land acquisition

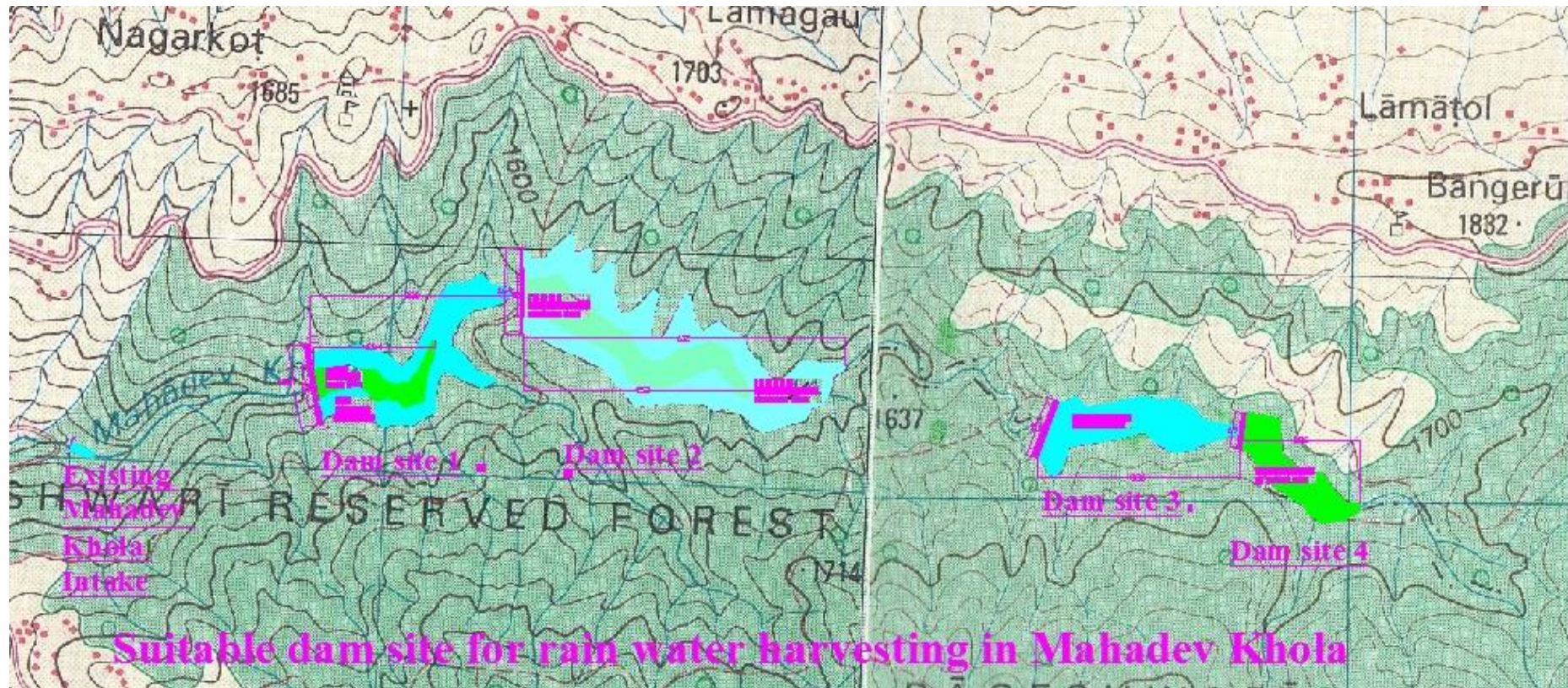
Recommendations:

- ❖ Service area of KVWSMB : Kathmandu Valley
- ❖ Sources: Responsibility of KVWSMB (for Valley)
- ❖ Grant not loan for the development of water infrastructure
- ❖ No combined sewer in newly developed municipalities (wherever possible)
- ❖ New houses: RWH, certain % of unpaved areas.

Post Melamchi:

- DD & SS???
 - Melamchi repair?????
 - Disaster Management????
- 
- Contingency Plan????

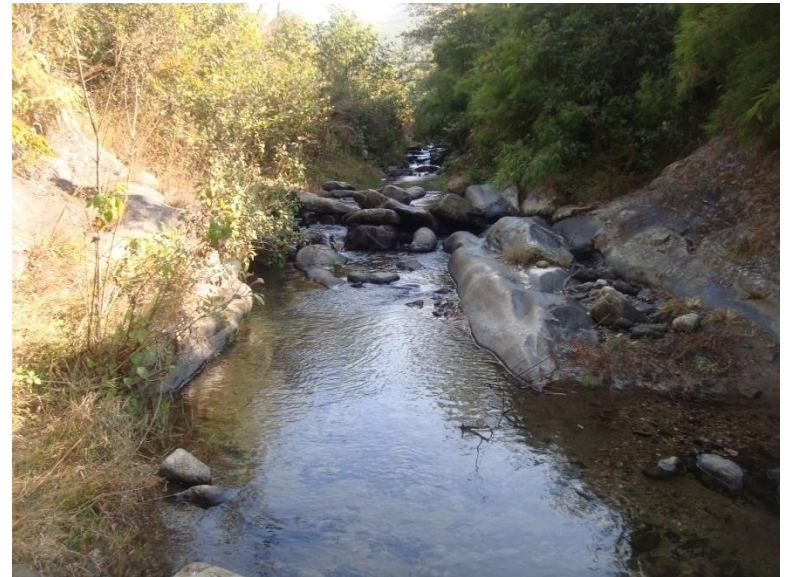
Rain water harvesting in Mahadev Khola by constructing dam



Catchment area Upstream of Dam site2: 5.5 sq.km

Rainfall: >1600 mm

Dam site at Bageswori (Upstream of Exining Mahadev Khola Intake)

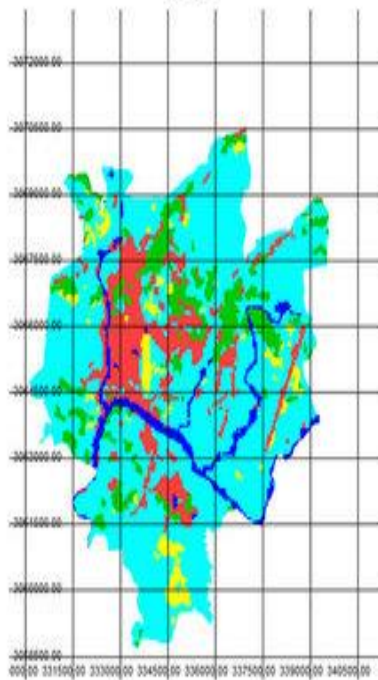




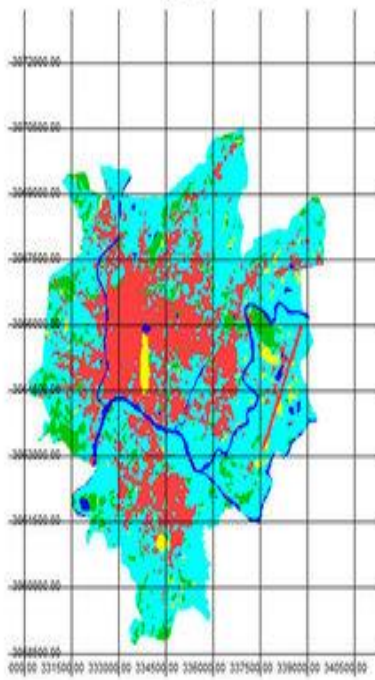
DNI pipe to be laid at Asan (DNI-2)

LAND USE MAP OF KATHMANDU

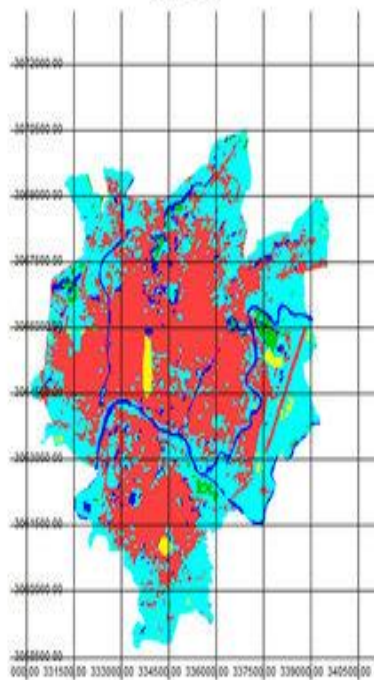
1976



1989



2001



2009

