MAHA OYA (River) & RIVER BASIN FROM NATIONAL DRINKING WATER & SANITATION SERVICE PROVIDERS PERSPECTIVE

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OBJECTIVES OF THE PRESENTATION IS TO IDENTIFY,

National Water Supply and Drainage Board

Corporate Goals

Vision

Mission

How Maha Oya could help achieving corporate goals and Objectives of NWSDB

NWSDBS total water production was 367mcm for year 2004
Water supply schemes in Maha oya produced
20 MCM approximately 5% overall production

NWSDB'S VISION

PROVIDE & FACLITATE ACCESS TO SAFE DRINKING WATER AND SANITATION FACILITIES TO ACHIEVE SOCIAL AND ECONOMIC DEVELOPMENT OF SRI LANKA

NWSDB'S MISION

SERVE THE NATION IN PROVISION OF SAFE POTABLE WATER AND SANITATION FACILITIES ENSURING AFFORDABLE PRICES AND ENVIRONMENTAL QUALITY

NWS&DB's Corporate Goals and Objectives

GOAL Provide additional coverage to facilitate achievement of the government's objectives for domestic, commercial, industrial, tourism and other types of customers.

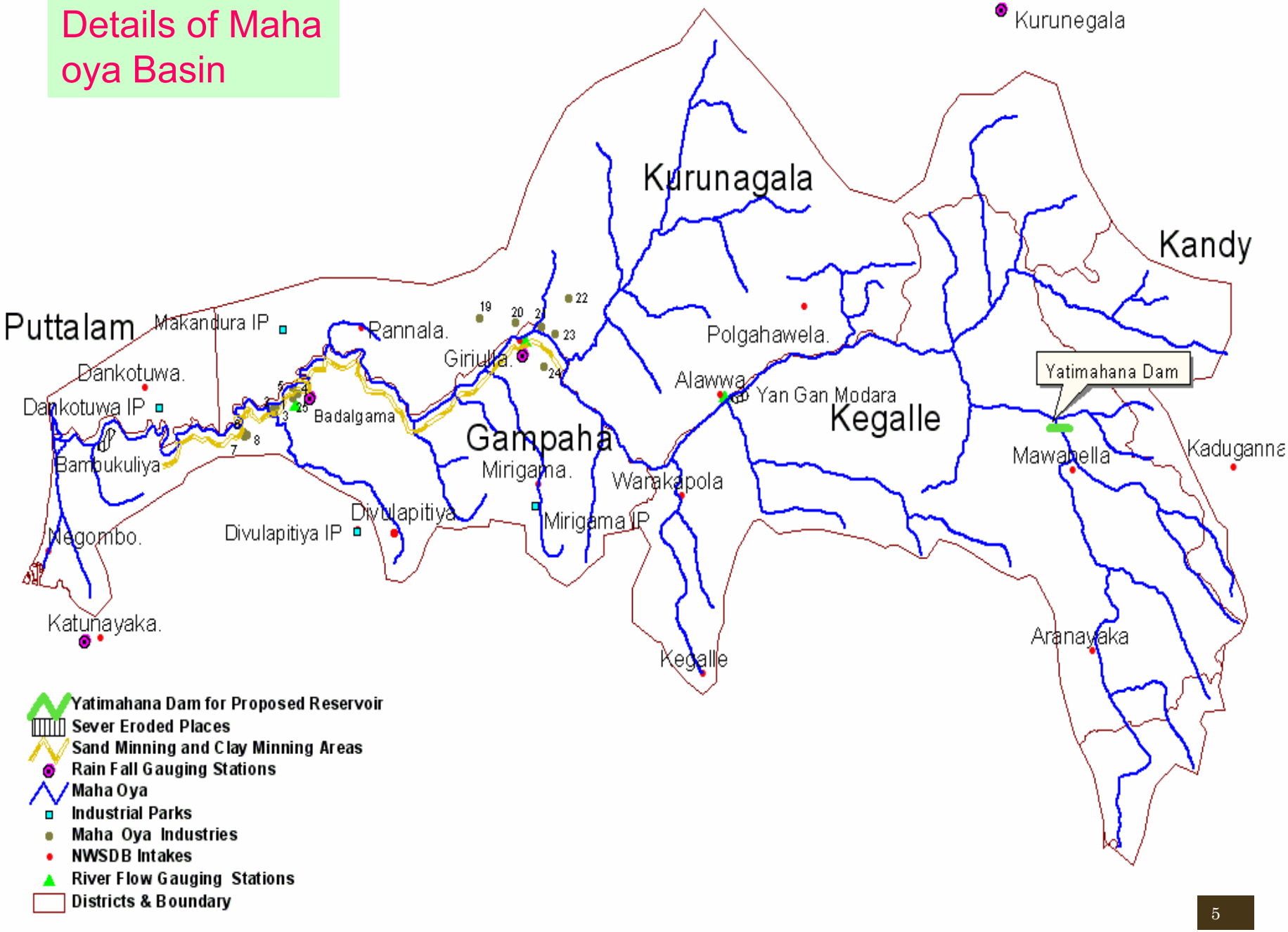
	2005	2006	2007
❑ Urban Piped Schemes Coverage *	86%	90%	94%
❑ Outside UC/ MC Areas piped schemes Coverage (Excluding rural) **	14%	16%	17%
❑ Rural Piped Schemes Coverage ***	8%	9%	10%
❑ Total Piped Schemes Coverage	29%	37%	39%
❑ Rural Tube well Coverage	12%	2.7%	13%

Coverage figures are based on the population.

Note:-

* Urban - MC and UC Areas
** Semi Urban- Areas other than Urban & Rural
*** Rural - Areas where population served is less than 6,000.

Details of Maha oya Basin



GENERAL DATA ON MAHA - OYA

- Mean Annual Rainfall - 2229 mm
- Precipitation Volume - 3817 mcm
- Discharge Volume - 1486 mcm
- Maximum length from source to sea - 130 km

SOCIO ECONOMIC INDICATORS of MAHA OYA BASIN

- Total basin population - 1,057,722
- Population density - 720 persons/km^2
- Agricultural activities - Paddy, Rubber, Tea and Coconut
- 5 Nos. BOI industrial estates including Katunayake and Nearly 25 Non BOI industries

Present Water Extraction and Demand Forecast

Water Users	Demand Present (MCM / annum)	Demand 2005 (MCM /annum)	Demand 2015 (MCM /annum)	Demand 2025 (MCM /annum)
Drinking Water Supply (Served Population – 200,000) **No. of WSS 14 (pipe borne)** Bambukuliya, Divulapitiya, Dankotuwa, Pannala, Giriulla, Alwwa, Polgahawela, Mawanella , Asupiniella (Hemmargagama wss), Hiriwadunna, Asupiniella (Aranayaka / Mawanella proposed), Rambukkana, Aranayaka, Kegalle **Present Service Area** (Negombo MC, KIA, KEPZ, Kegalle UC, Mawanella PS, 04 Industrial Parks (Dankotuwa, Makadura, Meerigama & Divulapitiya)	15.48	25.73	35.15	56.61
Demand for Industrial Estates No. of IP 04 (Dankotuwa, Makadura, Mirigama, Divulapitiya)	2.83	3.11*	3.42*	3.76*
Demand for BOI Industries (outside the Industrial Parks, 22 BOI registered individual industries)	1.91	2.10*	2.31*	2.54*
Demand for Non BOI industries (05 major Non BOI industries & Tile & Bricks Factories)	0.10	0.11*	0.12*	0.13*
Food Production (Paddy cultivation & mixed crops)	15.5	17.05*	18.76*	20.62*
Others	5.0	5.5*	6.05*	6.66*
Total	**40.82**	**53.60**	**65.81**	**90.32**

*Note: Future water demands other than water supply use have been extrapolated on an assumed 10% (provisional) growth rate basis.

SUMMARY OF WATER DEFICIT

- The water balance studies carried out under the Western River Basin Sector Project indicates the following water deficits
  - 2005 - 6.9 MCM
  - 2015 - 7.5 MCM
  - 2025 - 7.5 MCM

RIVER WATER QUALITY

Analysis of long-term water quality data & record of incidents have revealed that:

- ✓ High variation of COD,
- ✓ Major pollutants are of industrial origin,
- ✓ Accidental increase of colour and Albuminoidal nitrogen,
- ✓ Black layer on the surface of water filters,
- ✓ Oil and Grease in water samples,
- ✓ Occurrences of fish kills.

IMPACT ON DRINKING WATER SUPPLY

- ✓ Interruption of water supply,
- ✓ Bad Taste, smell, color etc,
- ✓ Short-Term and Long-Term health hazards,
- ✓ Few polluting industries can cause the closure of entire industries in Katunayake EPZ,
- ✓ Consumers not willing to pay for low quality water,
- ✓ Adverse effect on sustainability of NWSDB

POLLUTION OF DRINKING WATER

Aggravated due to:

- ✓ Low flow condition during dry weather,
- ✓ Contamination with sewer / drainage water from polluted town centers,
- ✓ Significant volume of industrial effluent discharges relative to dry weather flow,

Priority Issues, Caused & Recommended Mitigatary Measures

	Priority Issued & Recommended Remedial Actions (A)	***Causes (B)***	***Remedial Actions (C)***
1	Pollution and contamination of waterways constitute the most important issue: affecting health, interruption of drinking water supply, fish kill, etc and causing washing, swimming and bathing impossible.	(i) Siting of industries in unregulated manner. (ii) Lack of proper monitoring mechanism. (iii) Inadequacy of legal frame work to abate pollution timely which encourages further pollution.	(i) Industrial survey and proper inventory of industries of Point and Non Point pollution Sources. (ii) Carefully planned monitoring mechanism (iii) Enforce necessary amendments to NWSDB and CEA Act.
2	Unregulated extraction of water, especially during low flows impacted adversely on humans, agriculture and environment.	(I) Absence of a central organization for practicing Integrated Water Resources Management (IWRM)	Urgent need to establish an authority to exercise and manage the river using IWRM principles
3	Issues of water for domestic use (drinking) have very high priority	(i) No mechanism to recognize the importance of water supply, (ii) Lack of timely co-ordination between agencies involved in river basin management and water supply.	Urgent need to establish an authority to exercise and manage the river using IWRM principles

Priority Issues, Caused & Recommended Mitigatary Measures

	Priority Issued & Recommended Remedial Actions (A)	***Causes (B)***	***Remedial Actions (C)***
4	Issue of unregulated Clay and Sand mining affected plantation, agriculture and domestic needs by lowering of water tables.	(i) Political commitment is low at National & Local level to mitigate the environmental damage, (ii) Lack of understanding about future Implications of such environmental damages, (iii) Significant political priority for self employment of youths to maintain rural economies, (iv) Also refer comments in 1(B) (ii) & (iii)	(i) Organize Public Awareness and campaigns through mass media, (ii) Improve rural economies through promotion sustainable Industrial Promotion Policies, (iii) Find alternative sources of Clay and sand mines by scientific exploration coordinated by Geological Science Bureau
5	Unfilled clay & sand pits cause severe environmental problems	(i) Unregulated sand / clay mining. The law is inadequate for rectification, (ii) Also refer comments in 1(B) (ii), (iii) & 4(B) (i).	(i) Strengthen the law. (ii) Delegate full power to Regional authorities without political interferences.
6	Disposal of urban waste including by Local Authorities direct into the river system had severe health implications especially for downstream users	(i) Lack of regard, Lack of awareness, and No concern for obligations to National problems, (ii) Also refer to comments in 3(B) (i)	Identify such pollution locations and inventoried through Local Authorities and develop monitoring mechanism

Priority Issues, Caused & Recommended Mitigatary Measures

	Priority Issued & Recommended Remedial Actions (A)	***Causes (B)***	***Remedial Actions (C)***
7	Upper water shed catchment degradation and degradation of riverbanks and reservations due to encroachments	(i) Lack of Impact Assessment	Urgent need to establish an authority to exercise and manage the river using IWRM principles
8	Need for an institutional arrangement for integrating local efforts and streaming of issues to Provincial / National levels as required was essential	(i) Lack of resources (ii) Also refer comments in 2(B) (i)	Find resources, implement as early as possible
9	Need to mobilize resources to link up pollution abatement and conservation activities with awareness programs to sustain awareness and interest.	(i) Lack of resources	Find resources, implement as early as possible
10	Need to mobilize youth including school children, religious and community leaders, private sector and even those pursuing negative impacts led to major improvements with regard to pollution and contamination.	(i) No proper forum and program (ii) Programs are prepared in an ad-hoc manner	Develop well thought sustainable realistic Programs and find resources to implement
11	Consensus building and partnership development to tackle common issues had beneficial outcomes	(i) No proper forum and program	Create and Maintain a regular forum to include all stakeholders

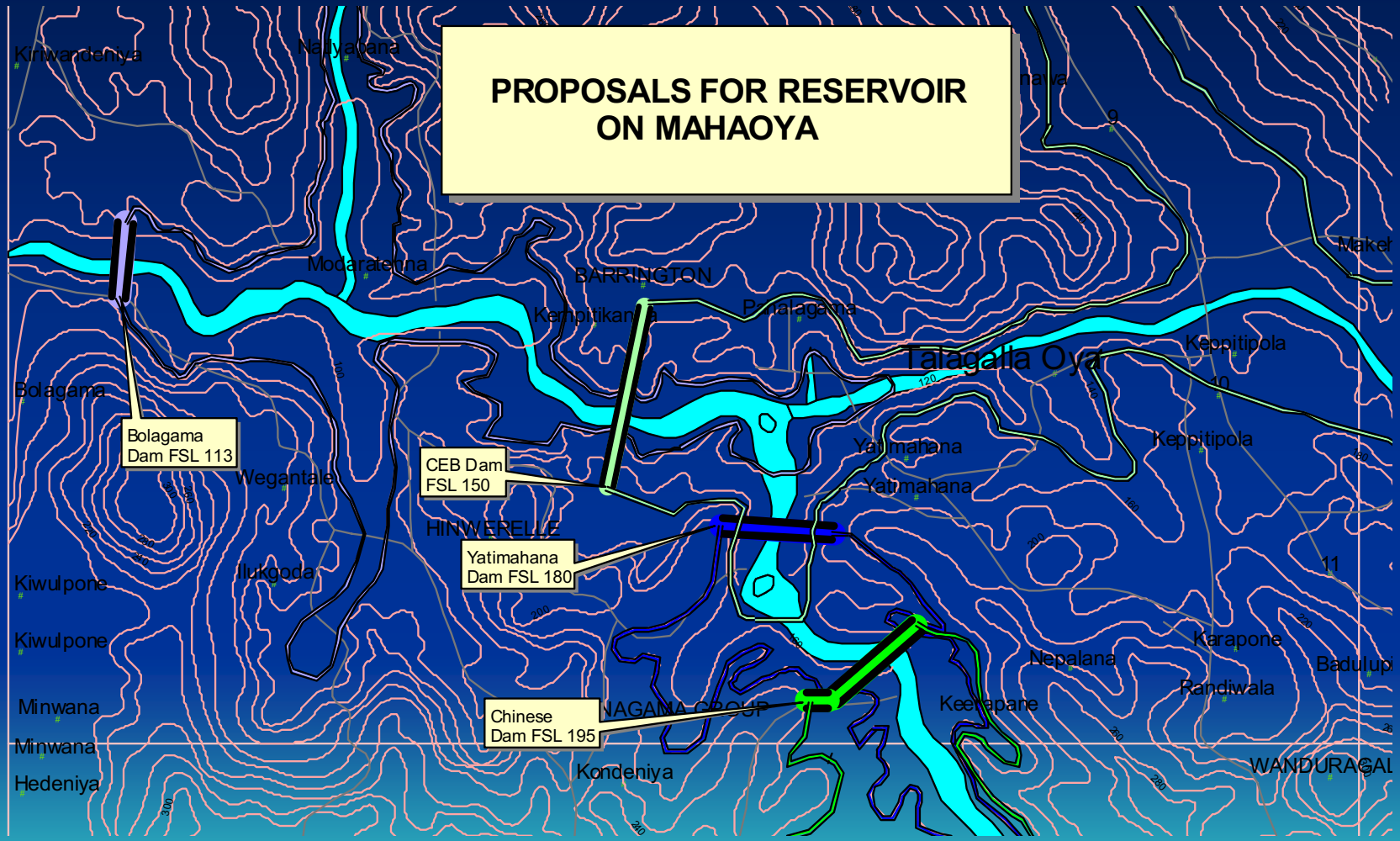
Priority Issues, Caused & Recommended Mitigatary Measures

	Priority Issued & Recommended Remedial Actions (A)	***Causes (B)***	***Remedial Actions (C)***
12	Need to integrate efforts not only among local authorities and CBO/NGO at basin, sub basin and village levels were noted	(i) No proper forum and program	Create and Maintain a regular forum to include all stakeholders
13	Support of religious and political leadership necessary	(i) No proper forum and program (ii) Also refer comments in 4(B) (I)	Create and Maintain a regular forum to include all stakeholders
14	Awareness campaigns need to be linked to programs supporting health sanitation and environment regulation and control and conservation measures for degraded downstream and source areas.	(i) No proper forum and program (ii) Programs are initiated in an isolated manner	Create and Maintain a regular forum to include all stakeholders
15	Need for networking at local and AWP level for sharing information and co-ordination	(i) No identification of the necessity of central agency for co-ordination and information sharing	Institute an agency or ownership to be delegated to a pivotal key stakeholder
16	Identification of best practices for propagation.	(i) No proper forum and program	Create and Maintain a regular forum to include all stakeholders

Priority Issues, Caused & Recommended Mitigatary Measures

	Priority Issued & Recommended Remedial Actions (A)	***Causes (B)***	***Remedial Actions (C)***
17	Establishing river banks and bed survey of the Maha Oya	(i) Destroying of banks due to uncontrolled sand and clay mining, cutting down trees & flooding (ii) Also refer comments in 4(B) (i)	(i) Survey the river bends and banks. (ii) Zone out the areas suitable for sand mining & clay mining with the support of Geological mining Bureau.
18	Establish hydrological water quality monitoring model for identifying long term & short term measures.	(i) Lack of proper monitoring mechanism (ii) Lack of resources	(i) Need to establish authority to manage the river in an integrated manner. (ii) Find resources, implement as early as possible (iii) Establish scientific water quality modeling techniques
19	Preservation of upper catchment and buildup storage capacity of the river reaches.	(i) Lack of impact assessment	(i) Initiate properly orchestrated upper catchments preservation program (ii) Study and Promote building-up storage capacity along the river basin.

Location of Options



Kahagolla site (on Kegalu Oya) is not shown

Details of Proposed Yatimahana Reservoir

- Catchment area – 236.67 sq. km
- Mean annual yield – 211.0 MCM
- Capacity – 12.7 MCM
- Water spread – 85.7 ha
- Full supply depth – 43 m
- Max. height of dam – 48 m
- Effective head for power generation – 46.2 m
- Hydropower potential – 2.12 MW, 18.59 Gwh
- Installed capacity – 4.0 MW
- Number of houses submerged - 92
- 32 ha rubber & 15 ha paddy land submerged
- Part of a minor road affected (about 50m). No bridges affected

Maha-Oya Flow Data & Water Deficits

Water Deficits with a Reservoir/s - Table 5.1

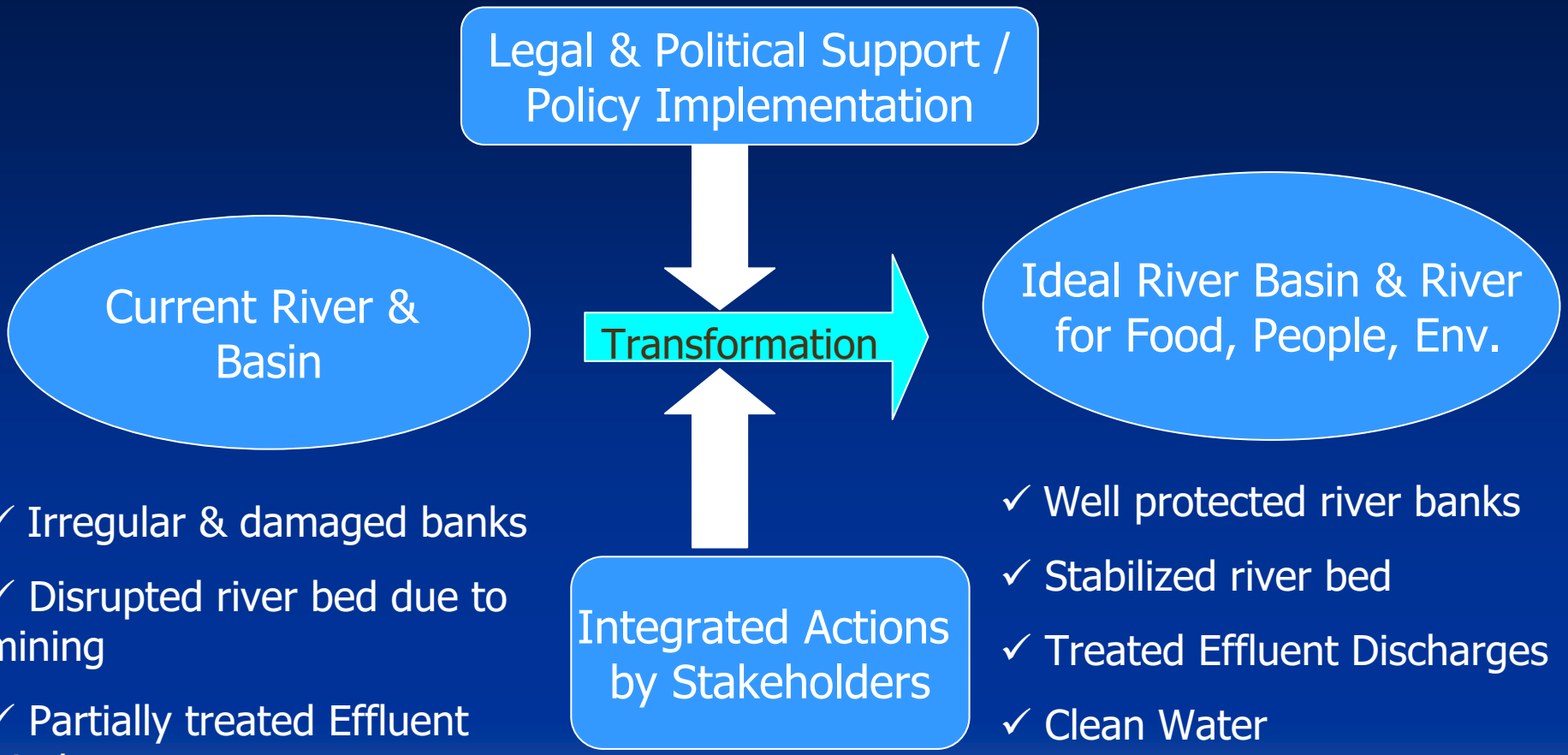
Water Supply Scheme	With Yatimahana			With Yatimahana & Bolagama		
	Environmental Flow 0 m3/sec –Yatimahana Only	Environmental Flow 1 m3/sec –Yatimahana Only	Environmental Flow 2 m3/sec –Yatimahana Only	Environmental Flow 0 m3/sec –Yatimahana & Bolagama	Environmental Flow 1 m3/sec –Yatimahana Bolagama	Environmental Flow 2 m3/sec –Yatimahana Bolagama
	Water Supply Deficits m3/day					
Kegalla Rambukkana	86	1037	864	43	778	1037
Polgahawela	86	432	346	69	346	518
Kaboollanka	173	605	259	147	432	605
Mirigama Industrial	86	173	86	52	86	173
Giriulla	259	691	173	225	432	605
Divulapitiya	173	259	86	0	0	9
Pannala	173	518	259	0	0	9
Badalgama Industrial	346	605	259	0	0	0
Dankotuwa	1814	2506	1123	0	0	26
Bambukuliya*	4752	259	0	0	0	0

Bambukuliya being close to the outfall the environmental flow released downstream is assumed as zero for all cases. Bambukuliya is therefore benefited from the environmental flows released upstream.

Comparison of Case I Yatimahana reservoir with high dam and Case II Yatimahana reservoir with lower dam and Bolagama reservoir are given in Table below: **Table 5.2**

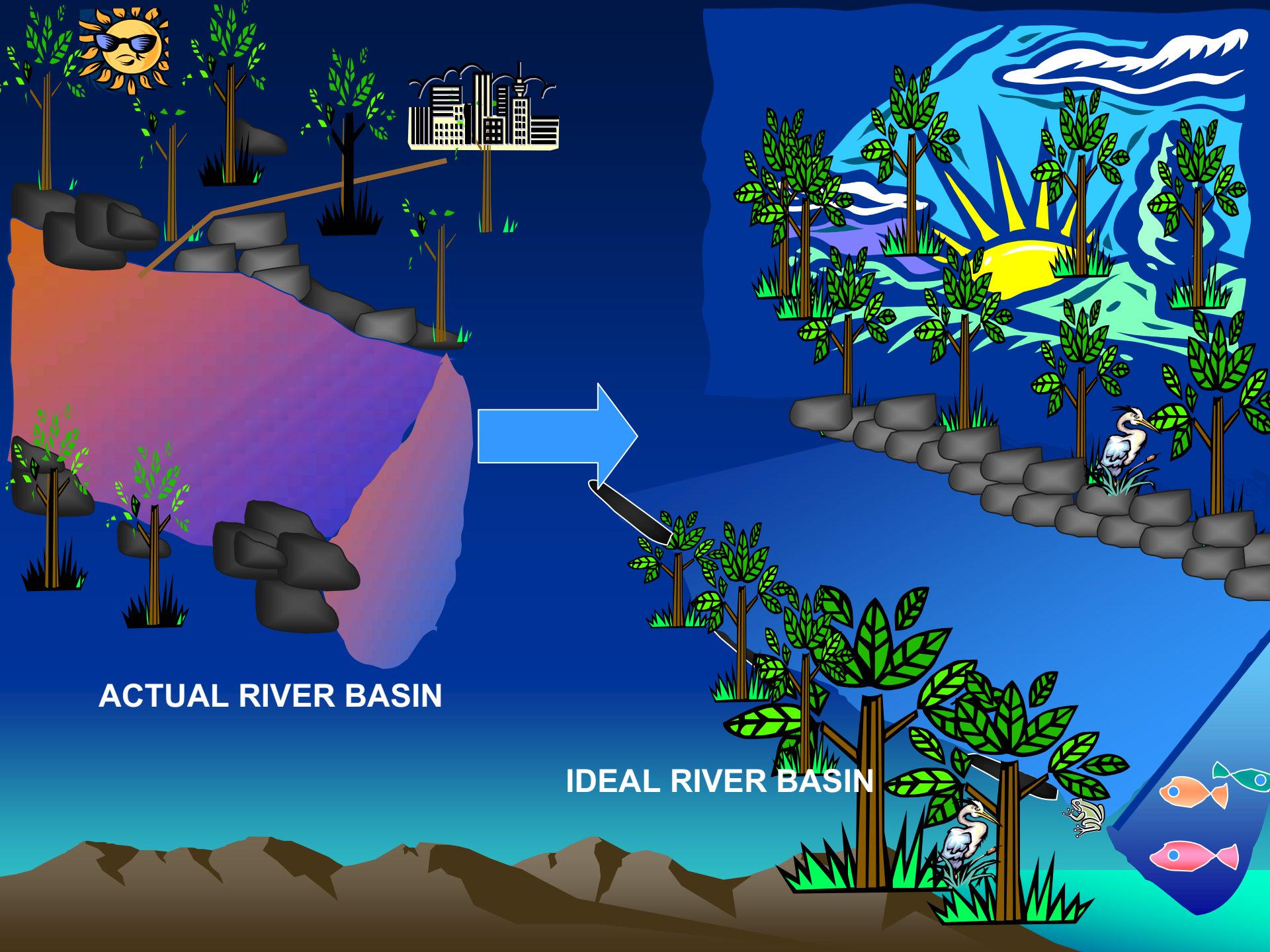
Parameters	Case I	Case II		
	Yatimahana Reservoir	Yatimahana Reservoir	Bolagama Reservoir	Both Reservoirs
FSL	183.0 m	173.0 m	110.0 m	
HFL	185.0 m	175.0 m	112.0 m	
DTL	188.0 m	178.0 m	113.5 m	
Height of Dam	53 m	43 m	33.5 m	
Capacity	12.7 MCM	7.36 MCM	7.3 MCM	14.66 MCM
Power	3.285 MW	2.654 MW	1.673 MW	4.327 MW
	29.94 Gwh	23.26 Gwh	14.69 Gwh	37.95 Gwh
Environmental				
Submergence at HFL contour				
Houses	92	40	n.a.	40
Rubber	32	21	12	33
Paddy	15	10	28	38
Coconut	-	-	10	10
Roads	-	-	3 km	3 km
Bridges	-	-	-	
Cost Rs. Mill.	**2,880**	**2,052**	**1,700**	**3,752**

CONCEPT



- ✓ Irregular & damaged banks
- ✓ Disrupted river bed due to mining
- ✓ Partially treated Effluent Discharges
- ✓ Direct contamination with sewer/ street drainage from townships
- ✓ Unregulated industrial siting

- ✓ Well protected river banks
- ✓ Stabilized river bed
- ✓ Treated Effluent Discharges
- ✓ Clean Water
- ✓ Well defined industrial areas
- ✓Scientifically explored Clay/ Sand mining sites
- ✓Improved upper catchment and Impounding Capacity


ACTUAL RIVER BASIN
IDEAL RIVER BASIN


Thank you

STAKEHOLDERS & STAKES

Stakeholder	Stakes	Remarks
CEA, Prov. CEA	Protect environment	Close monitoring and secure more resources
Irrigation Department	Water for Flood production	Uninterrupted Water supply to meet demand
NWSDB	Water Supply for drinking & wastewater disposal	Emphasis on water quality / impounding storage for uninterrupted WS
BOI, My/ Indus. & Inv. Promotion.	Siting of Industries for Investment promotion	Interrupted WS & Wastewater disposal and sites for industries
Provincial Councils, Local Authorities	Local control of the basin to protect Env. & Social Economy	Appropriate sites for industries, clay / sand mining. Resources for monitoring
Geological Mining Bureau	Scientific exploration to identify clay / sand deposits	To be involved as a key stakeholder

Reports Available

1. Maha Oya Multi Purpose Project, Pre feasibility study (May 1999)
2. Low Flow Study at Maha Oya (June/Sept 1998)
3. Maha Oya Basin - Detailed Basin Assessment (June 1999)
4. Water Resources Issues & Urgent Priority Actions - Maha Oya Basin
5. Maha Oya, Kalu Gange & Deduru Oya Water Resource Assessment
6. Sector Planning Report - Kegalle District, NWSDB
7. Sector Planning Report - Putlam District, NWSDB
8. Sector Planning Report - Kurunegala District, NWSDB
9. Western River Basin Sector Project, 1998
10. Flow Measurements - Asupiniella
11. Materplan for Electricity Supply of Sri Lanka - Supplement to Volume A-1 - Canadian Hydro Project Maha 096, February 1988
12. Improvement of Water Availability for Water Supply Schemes from Maha Oya - Inception Report & Preliminary Report
13. Improvement of Water Availability for Water Supply Schemes from Maha Oya – Draft Final Report (Vol. I : Main Report)
14. Improvement of Water Availability for Water Supply Schemes from Maha Oya – Draft Final Report (Vol. I I : Appendices)

WATER SUPPLY TECHNOLOGICAL ISSUES

- ✓ Industries, especially textile industries, use a wide variety of dyes, detergents and chemicals,
- ✓ Many such substances (micro pollutants) harmful to human health,
- ✓ CEA standards do not cover micro pollutants,
- ✓ Most micro pollutants not removed in conventional water treatment and waste water treatment plants,
- ✓ Serious health risks in the medium and long term,

NATURAL RESOURCE MANAGEMENT ISSUES IN MAHA OYA

- ✓ No proper record and assessment of industries,
- ✓ Poor and inadequate data,
- ✓ Low flows to meet water demand and waste assimilation,
- ✓ Ambient water quality management,
- ✓ No scientific approach to explore clay / sand deposits,
- ✓ Soil erosion, unregulated over -mining of sand and clay,
- ✓ Fragmented institutional responsibilities,
- ✓ Lack of proper guiding policy for industrial siting.

SUMMARY OF ACTIONS

1. Study by NWSDB to improve the impounding Storage Capacity up-steam of Maha-Oya in 2004 by NWSDB/ SWECO GRONER Consultant,
2. Low Flow analysis in Maha Oya,
3. Implementing Low Flow Weir construction in Maha Oya river,
4. Several Workshops and Seminars by Lanka Jalani and NGO Maha-Oya Mithuro to build awareness among the stakeholders,
5. Appointment of Task Force for Pollution Mitigatory Measures,
6. Building up Dialogue on Water for food, People and Envi.
7. Stopping and control of sand mining in the river

ACTION ITEMS

Short Term Measures on River Basin:

Prepare a TOR for action required (see next page),

- ✓ Appoint an Ad-hoc committee for the ownership of the basin if NWRA or AWP not established soon,
- ✓ Collect the outcomes of all studies done in the basin,
- ✓ Basin survey including river banks, river bed,
- ✓ Geological survey for clay / sand deposits in the basin,
- ✓ Industrial survey for point and non point pollution sources,
  - ➢ Map out polluting industries
  - ➢ Data on chemicals used, treatment processes

Long Term Measures on River:

- ✓ Gazette Notification for sensitive area declaration,
- ✓ Streamline project approval procedure,
- ✓ Policy development for siting of industries,
- ✓ River / effluent quality monitoring program,
- ✓ Identify the stakeholders and need of resources,
- ✓ Establish and strengthen the legal procedures in abating the pollutions threat.

1. National Water Resources Authority or institutional framework and legislation are expected to address these issues,
2. Co-ordination committees at basin level could be formed on these issues and co-ordinate actions relating to water resource management,
3. Ownership of the River and Committee should be established comprising members from all stakeholders,
4. Scientific exploration of natural resources, clay and sand must be used to meet the raw material requirements in industry,
5. Storage capacity of the river and protection upper catchment should be done immediately,
6. Building up of a comprehensive data base,
7. Conduct an awareness campaign including the active participation of school children.

PROJECTED WATER DEMAND FOR PIPED SCHEMES m^3/day

Name	Population	2005	2015	2025
1.Aranayaka/ Mawanella Integr.	126,000	13,000	18,000	24,000
2.Kegalle/Rambukkana	115,000	10,000	15,000	23,000
3.Polgahawela Alawwa	90,000	5000	9000	15,000
4.Kabool Lanka	-	4500	5000	18,000
5.Giriulla/ Dambadeniya	75,000	4000	10,000	18,000
6.Pannala/ Kuliyapitiya	115,000	6000	15,000	23,000
7.Dankotuwa	175,000	30,000	21,000	54,000
8.Negambo	286,000	18,000	36,000	44,000
9.Seeduwa/ Katunayaka				
10.Air force/ Airport	4500	4500	8000	10,000

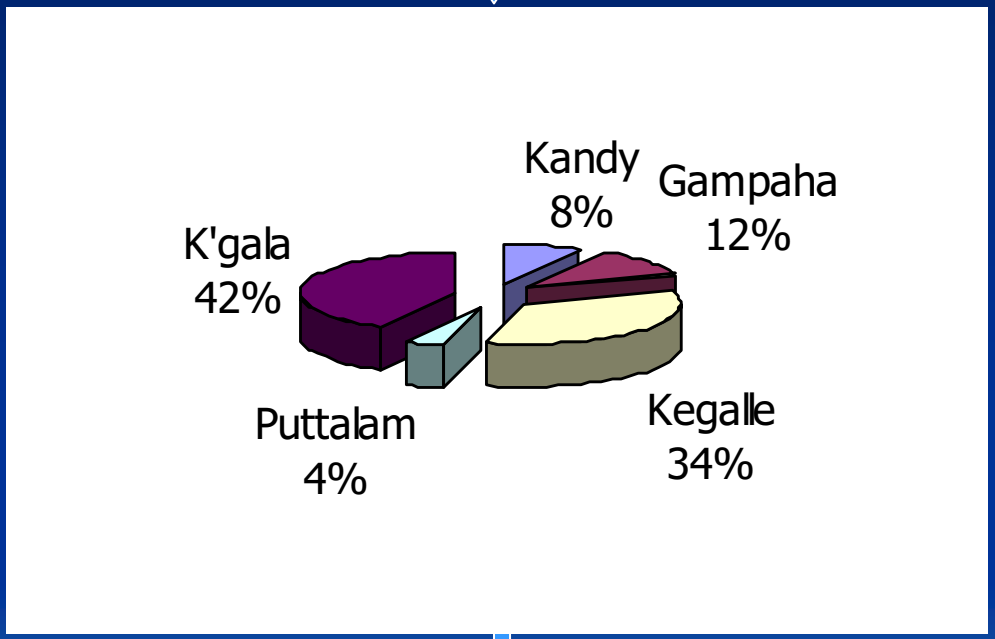
EXPECTED ACTIVITIES

- Study relevant reports available and carryout water resource assessment and water balance studies

1.0 Maha Oya Multi Purpose project – Pre-feasibility study- May 1999
2.0 Low flow study at Maha Oya – June/Sept 1998
3.0 Maha Oya river basin assessment
4.0 Water resource issues and urgent priority actions – Maha Oya basin
5.0 Maha Oya, Kalu Ganga & Deduru Oya Water Resource Assessment
6.0 Sector Planning Report – Kegalle District, NWS&DB
7.0 Sector Planning Report – Putlam District, NWS&DB
8.0 Sector Planning Report – Kurunegala District, NWS&DB
9.0 Western River Basin Sector Project, 1998

ADMINSTRATIVE SET UP

4 Provinces (Central, Sabaragamuwa, N-Western, Western)



(Basin area coverage by districts)

24 Divisional Secretariats