

APPENDICES

Appendix 1 Income and Expenditure Accounts for Local Governments

City Name COLOMBO MUNICIPAL COUNCIL
Province Western
District Colombo

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates and Taxes	1,951.47	2,096.55	2,081.36	2,148.93	2,226.96	2,445.30	2,158.43
Rent	119.21	157.37	134.15	154.43	175.69	187.46	154.72
License Fees							
Charges for Services	219.92	253.05	302.04	214.19	225.27	292.75	251.20
Warrant Cost/Fine							
Stamp Duty	1,073.86	243.52	749.83	1,495.54	175.61	396.45	689.14
Court Fines							
Other Revenue	100.90	131.34	175.40	160.57	155.53	126.40	141.69
Total Revenue	3,465.36	2,881.83	3,442.78	4,173.66	2,959.06	3,448.36	3,395.18
Expenditure							
Personal Emoluments	2,040.69	2,354.23	2,449.35	2,518.91	2,529.90	2,709.17	2,433.71
Travelling Expenses							
Supplies & Equipments	436.47	449.60	538.12	581.61	622.18	657.80	547.63
Repairs to Capital Assets	368.19	389.78	430.95	480.76	547.83	838.10	509.27
Transport							
Interest & Dividends	11.58	35.11	85.51	5.55	6.12	5.65	24.92
Grants and Contribution	121.68	96.26	89.83	96.58	113.23	143.31	110.15
Pensions Gratuity							
Establishment and Miscellaneous	662.86	744.32	696.58	599.65	647.11	661.85	668.73
Allocations							
Total	3,641.47	4,069.30	4,290.34	4,283.06	4,466.37	5,015.88	4,294.40
Actual revenue over							
Recurrent Expenditure	(176.11)	(1,187.47)	(847.56)	(109.40)	(1,507.31)	(1,567.52)	(899.23)
Government Grants/ Reimbursemer	973.36	1,062.44	1,292.59	1,244.40	1,557.47	1,802.13	1,322.07
Capital receipt / Grants	10.77	7.37	1.39	6.31	122.82	48.31	32.83
Total Capital Expenditure	(448.02)	(496.37)	(609.31)	(323.16)	(643.28)	(395.39)	(485.92)
Total Surplus / (Deficits)	360.00	(614.03)	(162.89)	818.15	(470.30)	(112.47)	(30.26)

City Name Dehiwala Mt.Lavainia MC
Province Western
District Colombo

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	142.82	154.03	147.65	146.29	156.1	159.98	151.15
Rent	10.93	11.53	12.96	12.15	15.04	15.96	13.10
License Fees	14.43	12.59	13.12	14.9	11.97	16.79	13.97
Charges for Services	30.99	25	26.62	27.64	28.02	30.3	28.10
Warrant Cost/Fine	0.27	0.21	0.25	0.35	0.34	15.06	2.75
Stamp Duty							
Court Fines							
Other Revenue	250.77	223.97	244.46	348.94	176.95	175.16	236.71
Total	450.21	427.33	445.06	550.27	388.42	413.25	445.75667
Expenditure							
Personal Emoluments	328.9	376.24	393.61	435.93	447.72	458.91	406.89
Travelling Expenses	8.33	4.23	3.74	3.83	3.91	4.23	4.71
Supplies & Equipments	75.82	95.58	93.06	105.66	93.64	105.25	94.84
Repairs to Capital Assets	27.87	26.16	35.75	33.94	36.04	42.61	33.73
Transport	88.27	92.11	98.19	107	113.06	122.45	103.51
Interest & Dividends	0.99	0.9	4.22	3.64	4.23	4.82	3.13
Grants	4.1	4.86	8.16	7.09	7.72	11.24	7.20
Pensions Gratuity	15.36	7.92	3.78	8.76	8.63	9.04	8.92
Total	549.64	608.00	640.51	705.85	714.95	758.55	662.92
Actual Revenue over Recurrent Expenditure	-99.43	-180.67	-195.45	-155.58	-326.53	-345.3	-217.16
Revenue Grants & reimbursements	188.1	222.06	236.95	382.25	363.5	380.58	295.57
Capital Receipts and Grants			7.24	45.67	11.69	0.84	10.91
Capital Expenditure	-31.99	-56.61	-42.15	-67.05	-23.14	-18.77	-39.95
Total Surplus / Deficit	56.68	-15.22	6.59	205.29	25.52	17.35	49.37

City Name Kaduwela MC
Province Western
District Colombo

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates		47.74	48.23	62.12	74.61	78.56	62.25
Rent		4.57	4.16	5.61	6.37	6.77	5.50
License Fees		8.41	9.92	8.46	5.29	5.24	7.46
Charges for Services		13.81	10.69	7.05	11.92	13.65	11.42
Warrant Cost/Fine		5.62	6.92	4.06	6.27	6.95	5.96
Stamp Duty							0.00
Court Fines							0.00
Other Revenue		198.22	273.18	365.05	435.39	277.72	309.91
Total		278.37	353.1	452.35	539.85	388.89	402.51
Expenditure							
Personal Emoluments		54.56	59.11	66.11	67.74	71	63.70
Travelling Expenses		0.37	0.67	0.44	0.79	0.97	0.65
Supplies & Equipments		16.98	18.04	30.21	23.09	27.77	23.22
Repairs to Capital Assets		7.26	5.88	7.24	14.88	9.81	9.01
Transport		27.69	34.91	42.88	51.07	51.54	41.62
Interest & Dividends		0.42	0.41	0.32	0.64	0.46	0.45
Grants		2.77	0.79	3.28	5.15	4.15	3.23
Pensions Gratuity		1.53	2.49	1.7	1.52	1.76	1.80
Total		111.58	122.3	152.18	164.88	167.46	143.68
Actual revenue over Recurrent							
Expenditure		166.79	230.8	300.17	374.97	221.43	258.832
Revenue Grant & Reimbursement		33.52	36.92	37.48	38.33	48.75	39.00
Capital Receipts & Grants		19.24	66.63	37.7	18.61	38.77	36.19
Capital Expenditure		-231.58	-324.63	-395.22	-217.94	-112.24	-256.32
Total Surplus / Deficits		-12.03	9.72	-19.87	213.97	196.71	77.70

City Name Kolonnawa Urban Council
Province Western
District Colombo

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates		30.36	35.85	32.59	30.00	31.34	32.028
Rent		2.69	2.96	2.9	3.53	4.50	3.316
License Fees		1.66	2.49	1.5	1.66	0.52	1.566
Charges for Services		0.8	2.38	3.97	5.66	7.59	4.08
Warrant Cost/Fine		3.48	3.6	2.87	2.20	2.69	2.968
Stamp Duty							
Court Fines							
Other Revenue		8.25	11.1	12.33	12.23	9.61	10.704
Total Revenue		47.24	58.38	56.16	55.28	56.25	54.662
Expenditure							
Personal Emoluments		58.32	59.34	72.19	80.27	84.10	70.844
Travelling Expenses		0.53	0.48	1.53	4.17	0.63	1.468
Supplies & Equipments		5.31	5.79	5.39	7.50	8.23	6.444
Repairs to Capital Assets		4.52	6.01	9.3	13.01	12.85	9.138
Transport		16.47	8.47	8.56	6.56	8.57	9.726
Interest & Dividends		0.01	1.14	0.47	2.13	1.78	1.106
Grants		1.14	0.23	0.52	0.52	0.89	0.66
Pensions Gratuity		0.61	0.6	0.67	1.22	1.19	0.858
Total		86.91	82.06	98.63	115.38	118.24	100.244
Actual Revenue over Recurrent Expenditure		(39.67)	(23.68)	(42.47)	(60.10)	-61.99	-45.582
Revenue Grants & Reimbursement		35.2	45.18	69.06	75.15	71.71	59.26
Capital Receipts & Grants		3.94	5.63	3.91	1.10	8.42	4.6
Capital Expenditure		-16.94	-15.73	-8.56	(7.66)	-13.91	-12.56
Total Surplus / Deficits		(17.47)	11.40	21.94	8.49	4.23	5.72

City Name Kelaniya Pradeshiya Sabha
Province Western
District Gampaha

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	14.11	15.18	16.94	44.21	44.58	47.750	30.46
Rent	8.4	6.72	7.94	6.96	7.61	8.900	7.76
License Fees	0.81	1.96	2.27	2.63	1.21	1.670	1.76
Charges for Services	24.19	23.36	26.22	27.12	56.01	37.110	32.34
Warrant Cost/Fine	1.87	10.36	2.34	5.53	5.08	5.620	5.13
Stamp Duty							
Court Fines							
Other Revenue	2.15	2.12	2.16	2.56	1.47	1.61	2.01
Total	51.530	59.700	57.870	89.010	115.960	102.660	79.46
Expenditure							
Personal Emoluments	38.21	44.51	48.35	55.01	57.98	63.36	51.24
Travelling Expenses	0.39	0.56	0.41	0.46	0.43	0.40	0.44
Supplies & Equipments	5.72	7.61	8.63	10.57	10.42	14.04	9.50
Repairs to Capital Assets	12.46	7.8	83.98	56.52	35.38	36.62	38.79
Transport	14.51	9.32	5.84	10.57	13.58	14.66	11.41
Interest & Dividends	0.12	0.48	0.73	0.92	2.86	3.21	1.39
Grants Payments	0.6	0.67	0.65	1.52	1.24	2.16	1.14
Pensions Gratuity	1.41	1.36	1.29	1.19	1.27	0.99	1.25
Total	73.42	72.31	149.88	136.76	123.16	135.44	115.16
Actual Revenue over Recurrent Expenditure	(21.89)	(12.61)	(92.01)	(47.75)	(7.20)	(32.78)	-35.71
Revenue Grants and Reimbursements	20.03	24.58	98.07	58.56	44.03	40.08	47.56
Capital Grants / Receipts	3.12	7.22	3.61	12.48	78.48	54.10	26.50
Capital Expenditure	-16.07	-10.66	-3.76	-52.19	-134.57	(65.72)	-47.16
Total Surplus / (Deficit)	(14.81)	8.53	5.91	(28.90)	(19.26)	(4.32)	(8.81)

City Name Peliyagoda Urban Council
Province Western
District Gampaha

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs:m	Rs:m	Rs:m	Rs:m	Rs:m	Rs:m	Rs:m
Revenue							
Assessment Rates	23.1	26	26.8	27.1	27.5	28.21	26.45
Rent	1.2	1.4	1.56	1.7	2	2.05	1.65
License Fees	2.1	1.65	1.06	1.21	1.03	1.51	1.43
Charges for Services	0.8	1.47	1.74	1.21	1.33	2.67	1.54
Warrant Cost/Fine	1.7	1.83	1.24	2.86	1.48	1.71	1.80
Stamp Duty							
Court Fines							
Other Revenue	1.5	19.9	28.5	13.2	21.3	1.02	14.24
Total	30.4	52.25	60.9	47.28	54.64	37.17	47.11
Expenditure							
Personal Emoluments	26	28.1	31.8	35.8	36.7	37.3	32.62
Travelling Expenses	0.14	0.32	0.45	0.23	0.23	0.2	0.26
Supplies & Equipments	2.9	3.3	4.4	3.5	3.7	3.66	3.58
Repairs to Capital Assets	7.1	29.6	26.67	15.3	6.5	13.58	16.46
Transport	8.5	8.4	9.5	11.2	13.4	14.32	10.89
Interest & Dividends	0.94	1.5	0.82	1.54	1.49	1.73	1.34
Grants	0.15	0.2	0.29	0.3	0.23	0.25	0.24
Pensions Gratuity	0.55	0.44	0.51	0.51	0.37	0.38	0.46
Total	46.28	71.86	74.44	68.38	62.62	71.42	65.83
Actual revenue over Recurrent							
Expenditure	-15.88	-19.61	-13.54	-21.1	-7.98	-34.25	-18.73
Revenue Grants and reimbursement	13.6	15.7	20.9	27.13	27.03	28.7	22.18
Capital Receipt & Grants	2.9	5.11	7.14	7.53	3.04	18.69	7.40
Capital Expenditure	-4.2	-6.6	-8.4	-21.7	-18.3	-19.1	-13.05
Total Surplus / (Deficits)	-3.58	-5.4	6.1	-8.14	3.79	-5.96	-2.20

City Name Kalutara Urban Council
Province Western
District Kalutara

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs:m	Rs:m	Rs:m	Rs:m	Rs:m	Rs:m	Rs:m
Revenue							
Assessment Rates	10.80	11.90	15.30	38.70	28.50	27.00	22.03
Rent	5.90	8.50	6.30	6.00	8.40	11.90	7.83
License Fees	0.90	0.40	0.30	0.40	0.40	0.40	0.47
Charges for Services	17.30	4.00	4.70	5.80	5.70	13.00	8.42
Warrant Court/Fine	0.20	0.30	0.40	0.30		3.00	0.70
Stamp Duty	3.80	0.40	15.70	31.70	8.30	7.60	11.25
Other Revenue	1.60	4.90	2.30	2.60	2.80	2.80	2.83
Total	40.50	30.40	45.00	85.50	54.10	65.70	53.53
Expenditure							
Personal Emoluments	47.80	53.40	57.00	63.00	67.30	75.30	60.63
Travelling Expenses	0.30	0.50	0.60	0.40	1.50	0.59	0.65
Supplies & Equipments	5.00	6.20	8.00	8.80	8.50	9.47	7.66
Repairs to Capital Assets	9.60	12.10	14.30	18.70	12.80	19.15	14.44
Transport	7.40	11.70	11.80	9.80	12.00	14.82	11.25
Interest & Dividends	0.20	0.20	0.30	0.20	0.60	0.44	0.32
Grants	3.00	0.20	0.60	1.20	1.60	1.72	1.39
Pensions Gratuity	1.70	1.00	1.00	1.10	2.00	2.38	1.53
Total	75.00	85.30	93.60	103.20	106.30	123.87	97.88
Actual Revenue over Recurrent Expenditure	-34.50	-54.90	-48.60	-17.70	-52.20	-58.17	-44.35
Revenue Grants & Reimbursement	29.20	37.50	46.90	53.90	54.10	62.10	47.28
Capital Receipts & Grants	9.60	8.30	10.70	11.10	5.90	6.91	8.75
Capital Expenditure	(0.40)	(7.30)	(12.70)	(11.80)	(12.00)	(1.74)	-7.66
Total Surplus/ Deficit	3.90	(16.40)	(3.70)	35.50	(4.20)	9.10	4.03

City Name Matale M C
Province Central
District Matale

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	15.88	15.58	16.04	16.4	16.85	20.78	16.92
Rent	6.81	10.68	9.67	13.02	13.91	15.00	11.52
License Fees	3.14	3.14	3.83	4.07	3.79	4.65	3.77
Charges for Services	6.93	9.35	10.18	10.71	12.64	13.97	10.63
Warrant Cost/Fine	2.64	3.83	4.66	4.67	5.61	6.33	4.62
Stamp Duty							
Court Fines							
Other Revenue	9.04	22.69	27.98	27.63	22.39	33.19	23.82
Total	44.44	65.27	72.36	76.50	75.19	93.92	71.28
Expenditure							
Personal Emoluments	81.61	99.56	106.99	111.4	112.02	120.88	105.41
Travelling Expenses	0.96	0.59	1.06	0.7	0.82	1.16	0.88
Supplies & Equipments	18	20.07	25.46	25.51	25.76	31.04	24.31
Repairs to Capital Assets	2.54	2.49	5.54	2.8	3.47	4.84	3.61
Transport	8.24	8.8	9.63	7.21	6.83	7.21	7.99
Interest & Dividends	3.73	7.87	6.55	15.58	14.99	5.87	9.10
Grants	2.17	1.89	1.89	2.3	5.67	5.13	3.18
Pensions Gratuity	3.2	2.4	2.49	3.51	3.47	3.71	3.13
Total	120.45	143.67	159.61	169.01	173.03	179.84	157.60
Actual revenue over Recurrent							
Expenditure	(76.01)	(78.40)	(87.25)	(92.51)	(97.84)	(85.92)	-86.32
Revenue Grant & Reimbursement	53.09	62.41	89.83	105.01	100.61	99.72	85.11
Capital Receipts & Grants	0.5	2.91	1.32	5.8	1.17	0.19	1.98
Capital Expenditure	-7.58	-4.73	-7.75	-4.24	-7.16	(5.48)	-6.16
Total Surplus / Deficits	(30.00)	(17.81)	(3.85)	14.06	(3.22)	8.51	-5.39

City Name Nuwara Eliya M C
Province Central
District Nuwara Eliya

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	39.47	55.8		106.21	75.27	71.27	69.604
Rent	18.35	22.42		17.5	23.86	30.82	22.59
License Fees	4.8	6.74		4.92	10.16	9.85	7.294
Charges for Services	3.72	5.48		5.44	4.73	7.00	5.274
Warrant Cost/Fine	0.35	0.25		0.1	4.4	3.85	1.79
Stamp Duty				1.61	1.36	10.99	2.792
Court Fines		0.18		0.4	0.21	0.16	0.19
Other Revenue	10.14	12.89		35.97	24.94	30.58	22.904
Total	76.83	103.76	-	172.15	144.93	164.52	132.438
Expenditure							
Personal Emoluments	65.37	73.04		80.19	79.59	86.27	76.892
Travelling Expenses	0.5	0.65		0.89	1.5	0.65	0.838
Supplies & Equipments	17.6	17.04		24.4	34.86	47.95	28.37
Repairs to Capital Assets	5.16	4.46		10.27	10.99	14.13	9.002
Transport	7.47	7.45		9.57	11.74	11.59	9.564
Interest & Dividends	0.52	0.52		2.24	2.39	1.89	1.512
Grants	2.14	1.41		4.08	14.36	2.33	4.864
Pensions Gratuity	2.03	2.82		1.52	3.38	2.94	2.538
Total	100.79	107.39	-	133.16	158.81	167.75	133.58
Actual revenue over Recurrent Expenditure	(23.96)	(3.63)	-	38.99	(13.88)	(3.23)	-1.142
Revenue Grant & Reimbursement	42.27	38.6		73.5	75.57	68.66	59.72
Capital Receipts & Grants	0.41	5.43		0.4	5.38	36.82	9.688
Capital Expenditure	-24.18	-36.58		-44.58	-63.43	(146.22)	-62.998
Total Surplus / Deficits	(5.46)	3.82	-	68.31	3.64	(43.97)	5.268

City Name Badulla MC
Province Uva
District Badulla

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	17.10	17.74	16.57	17.95	26.14	19.61	19.19
Rent	12.77	1.45	12.49	16.80	19.80	21.04	14.06
License Fees	2.60	3.93	7.27	7.33	1.99	8.95	5.35
Charges for Services	2.89	2.20	2.57	2.23	3.42	3.60	2.82
Warrant Cost/Fine	0.51	0.60	21.23	7.17	1.95	1.00	5.41
Stamp Duty					4.13	12.19	8.16
Court Fines					3.70	3.10	3.40
Other Revenue	9.57	9.41	6.41	9.56	11.07	4.89	8.49
Total	45.44	35.33	66.54	61.04	72.20	74.38	59.16
Expenditure							
Personal Emoluments	53.14	62.24	63.74	75.44	83.29	86.40	70.71
Travelling Expenses	0.48	0.73	0.58	0.60	0.44	0.42	0.54
Supplies & Equipments	9.99	16.05	12.74	8.95	8.70	9.70	11.02
Repairs to Capital Assets	2.38	4.73	7.16	16.56	27.92	18.69	12.91
Transport	6.98	4.73	3.88	5.87	5.24	5.81	5.42
Interest & dividends	9.79	10.30	8.58	8.12	7.51	8.19	8.75
Grants	3.77	3.92	4.05	4.81	1.58	1.64	3.30
Pensions Gratuity	1.36	1.23	0.62	1.44	1.34	1.24	1.21
Total	87.89	103.93	101.35	121.79	136.02	132.09	113.85
Actual revenue over Recurrent							
Expenditure	(42.45)	(68.60)	(34.81)	(60.75)	(63.82)	(57.71)	(54.69)
Revenue Grant & Reimbursement	30.36	38.19	44.86	60.27	68.76	71.72	52.36
Capital Receipts & Grants	5.24	11.25	3.44	7.21	3.24	3.13	5.59
Capital Expenditure	-1.76	-1.14	-9.81	-15.1	-17.45	-15.7	(10.16)
Total Surplus/ (deficits)	(8.61)	(20.30)	3.68	(8.37)	(9.27)	1.44	(6.91)

City Name Batticaloa MC
Province Eastern
District Batticaloa

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	15.02	15.73	16.89	18.86	17.72	7.07	15.22
Rent	8.74	13.86	12.50	15.56	18.58	23.61	15.48
License Fees	2.72	3.83	4.14	5.07	4.90	5.20	4.31
Charges for Services	3.60	3.55	3.79	4.87	6.83	6.73	4.90
Warrant Cost/Fine	3.83	4.06	4.05	0.88	6.35	0.20	3.23
Stamp Duty	-	-	-	-	2.48	-	0.41
Court Fines	3.62	3.35	3.19	3.17	3.71	2.71	3.29
Revenue Grants							
Other Revenue	8.13	9.23	14.45	19.96	18.00	12.91	13.78
Capital Receipts							
Total	45.66	53.61	59.01	68.37	78.57	58.43	60.61
Expenditure							
Personal Emoluments	73.32	84.62	94.14	104.00	102.56	110.65	94.88
Travelling Expenses	0.30	0.48	0.31	3.63	0.23	0.15	0.85
Supplies & Equipment	5.49	7.75	1.78	9.19	8.75	11.56	7.42
Repairs to Capital Assets	4.81	3.22	5.39	6.10	8.35	11.05	6.49
Transport	2.31	2.17	3.21	4.17	4.26	4.63	3.46
Interest & Dividends	0.05	0.31	0.61	0.64	-	-	0.27
Grants	0.19	0.22	0.36	3.16	0.45	0.48	0.81
Pensions Gratuity	2.28	5.02	2.74	26.16	2.78	1.47	6.74
Capital Expenditure							
Total	88.75	103.79	108.54	157.05	127.38	139.99	120.92
Actual revenue over Recurrent Expenditure	(43.09)	(50.18)	(49.53)	(88.68)	(48.81)	(81.56)	(60.31)
Revenue Grant & Reimbursements	56.23	86.54	79.83	90.91	90.02	95.30	83.14
Capital Receipts & Grants	13.06	32.31	25.76	20.14	76.09	16.41	30.63
Capital Expenditure	(24.57)	(27.15)	(25.60)	(26.12)	(48.30)	(16.70)	(28.07)
Total Surplus/ (deficits)	1.63	41.52	30.46	(3.75)	69.00	13.45	25.39

City Name Kalmunai MC
Province Eastern
District Ampara

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates		2.36	2.71	2.71	9.95	10.22	5.59
Rent		10.82	9.66	9.93	10.5	11.51	10.484
License Fees		1.42	1.41	1.29	1.85	1.82	1.558
Charges for Services		0.63	0.66	0.84	0.92	1.07	0.824
Warrant Cost/Fine		2.31	2.8	3.34	1.95	7.03	3.486
Stamp Duty							
Court Fines							
Other Revenue		1.12	1.35	1.16	6.1	25.14	6.974
Total		18.66	18.59	19.27	31.27	56.79	28.916
Expenditure							
Personal Emoluments		41.14	45.89	49.65	51.57	63.90	50.43
Travelling Expenses		0.47	0.26	0.19	0.31	0.48	0.342
Supplies & Equipments		6.24	7.46	7.45	7.85	11.35	8.07
Repairs to Capital Assets		8.62	3.51	6.03	4.65	9.96	6.554
Transport		1.52	1.33	3.4	4.46	8.87	3.916
Interest & Dividends					0.18	0.03	0.105
Grants		0.89	0.13	0.24	0.35	0.32	0.386
Pensions Gratuity		1.15	1.23	1.66	2.41	1.54	1.598
Total		60.03	59.81	68.62	71.78	96.45	71.338
Actual revenue over Recurrent Expenditure		(41.37)	(41.22)	(49.35)	(40.51)	(39.66)	-42.422
Revenue Grant & Reimbursement		41.25	40.47	40.32	44.06	47.73	42.766
Capital Receipts & Grants		13.37	2.55	5.18	11.27	7.08	7.89
Capital Expenditure		-9.39	-1.22	-1.52	-5.62	(4.26)	-4.402
Total Surplus / Deficits		3.86	0.58	(5.37)	9.20	10.89	3.832

City Name Matara Municipal Council
Province Western
District Matara

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	9.79	16.78	18.05	18.23	17.93	17.76	16.42
Rent	9.8	10.79	11.09	10.48	10.1	10.71	10.50
License Fees	5.98	8.97	5.33	5.34	3.38	6.76	5.96
Charges for Services	13.37	15.23	18.23	21.56	20.83	26.93	19.36
Warrant Cost/Fine	2.6	3.14	2.91	2.92	2.94	2.9	2.90
Stamp Duty							0.00
Court Fines							0.00
Other Revenue	23.85	28.05	39.66	29.09	31.82	48.87	33.56
Total	65.39	82.96	95.27	87.62	87	113.93	88.70
Expenditure							
Personal Emoluments	79.97	93.51	101.34	108.14	112.42	123.13	103.09
Travelling Expenses	0.42	0.59	0.82	0.75	0.33	0.34	0.54
Supplies & Equipments	6.22	7.96	11.61	10.74	10.92	14.48	10.32
Repairs to Capital Assets	7.95	9.72	18.97	22.14	17.95	14.87	15.27
Transport	10.88	7.74	9.53	7.92	8.06	13.58	9.62
Interest & Dividends	0.05	6.45	8.02	2.87	6.5	6.03	4.99
Grants	0.58	0.32	0.22	0.61	0.45	0.37	0.43
Pensions Gratuity	4.31	4.57	4.8	4.88	4.67	5.15	4.73
Total	110.38	130.86	155.31	158.05	161.3	177.95	148.98
Actual revenue over Recurrent Expenditure	-44.99	-47.9	-60.04	-70.43	-74.3	-64.02	-60.28
Revenue Grants & Reimbursements	45.47	60	69.03	74.63	79.13	82.28	68.42
Capital Receipts & Grants	6.51	14.6	34.9	45.64	25.97	42.27	28.32
Capital Expenditure	-7.38	-16.13	-45.57	-46.8	-30.08	-21.14	-27.85
Total Surplus / Deficits	-0.39	10.57	-1.68	3.04	0.72	39.39	8.61

City Name Trincomalee U C
Province Eastern
District Trincomalee

Income and Expenditure Accounts

	2006	2007	2008	2009	2010	2011	Average
	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m	Rs: m
Revenue							
Assessment Rates	12.69	15.47	15.44	14.97	22.94	Final	16.30
Rent	3.62	4.92	6.67	8.84	11.25	Accounts	7.06
License Fees	1.93	1.99	3.46	2.86	2.95	not	2.64
Charges for Services	0.78	6.60	1.03	3.36	3.73	Finalized	3.10
Warrant Cost/Fine	2.59	1.64	6.72	6.83	2.12		3.98
Stamp Duty							-
Court Fines							-
Other Revenue			12.21	4.50	17.18		6.78
Total	21.61	30.61	45.53	41.36	60.17		39.86
Expenditure							-
Personal Emoluments	47.18	55.95	60.32	68.37	73.68		61.10
Travelling Expenses	0.17	0.68	0.32	0.19	0.30		0.33
Supplies & Equipments	3.46	9.40	9.88	8.41	7.20		7.67
Repairs to Capital Assets	2.12	5.20	13.71	10.03	5.42		7.30
Transport	2.27	3.35	3.54	3.90	3.08		3.23
Interest & Dividends	0.02	0.00	0.00	0.01	0.02		0.01
Grants	0.15	0.25	0.19	0.26	0.36		0.24
Pensions Gratuity	4.22	4.93	4.28	2.68	2.03		3.63
Total	59.59	79.77	92.24	93.85	92.09		83.51
							-
Actual revenue over Recurrent							-
Expenditure	(37.98)	(49.15)	(46.71)	(52.48)	(31.92)		(43.65)
Revenue Grant & Reimbursements	36.61	51.52	47.57	53.71	52.56		48.40
Capital Receipts & Grants							-
Capital Expenditure	(5.55)	(6.88)	(4.72)	(0.62)	(19.57)		(7.47)
Total Surplus / (Deficits)	(6.92)	(4.51)	(3.86)	0.61	1.07		(2.72)

Appendix 2 Legal Framework, Finance and Institutional Arrangement of Japan's Sewerage System

Legal Framework, Finance and Institutional Arrangement of Japan's Sewerage System

February 22, 2007

**Japan Bank for International Cooperation
(JBIC)**

**Legal Framework, Finance and Institutional Arrangement
Of
Japan's Sewerage System**

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Legal Framework, Finance and Institutional Arrangement of Japan's Sewerage System

I. Brief History of Japan's Sewerage System Development

—Sewerage Implementation in the High Growth Age in Japan—

1.1. Sewerage before World War II (1945)

The pre-war history of the Japanese sewerage system dates back to the Edo Period (1600-1867). The Tokyo (formerly Edo) drainage system, which had been a state-of-the-art drainage system in those days, was built with the main intention of keeping the city clean.

A western sewerage system was introduced in the late 19th century in Yokohama and Tokyo in 1881 and 1885 respectively. Although the western sewerage system had been developed more than 120 years before, it was as late as 1922 that the operation of the first full-scale modern sewage treatment plant started in Japan. Moreover, the development of a comprehensive sewerage system started only after World War II.

1.2 Industrialization, Urbanization Accompanied by Pollution in 1950s and 1960s

In the process of reconstruction and economic recovery after World War II, the Japanese economy recorded high growth after the mid-1950s and became the world's second largest industrial economy in 1968. The high economic growth caused rapid urbanization, which in turn demanded the urgent development of urban infrastructure. In 1958, the new Sewerage Law replaced the old sewerage law promulgated in 1900. The new Sewerage Law defined the purpose of the sewerage system as “to contribute to the sound urban development and enhancement of the public sanitation, by improving the urban environment” and priorities were given to the prevention of inundation and the environmental improvement of urban areas. In 1963, the 1st Five-year Sewerage Development Program was started under the framework of the nationwide infrastructures development program. In 1968, the Urban Planning Law, in which the sewerage system was defined as one of the infrastructures to be developed under the Law, was enacted. Although the legal framework for the development of the sewerage system was set up in the late 1950s and 1960s, Japan's sewerage population remained as low as 8 million or only 8% of total population in 1965.

The rapid industrialization and urbanization of the 1950s and 1960s caused serious environmental pollution in the 1960s. Accumulation of solid waste in urban areas, air pollution and the pollution of public water bodies were among the major causes of serious health hazards, which were occasionally fatal. The destruction of the precious natural environment was also experienced during this era. To cope with this problem, the Basic Law for Environment Pollution Control was enacted in 1967.

1.3 Comprehensive Restructuring of Japan's Environment Policy, Regulation and Finance in 1970

Environmental pollution had become a political issue in 1970. A comprehensive restructuring of Japan's environmental policy and legal as well as financial frameworks were debated in the Diet (Pollution Diet). A total of 14 laws relating to pollution control were newly enacted or amended in 1970, including the Water Pollution Control Law and amendment of the Sewerage Law, in which the protection of the water quality of the public water bodies was added as a purpose of the sewerage system. The Environment Agency was established in 1971 (in 2001, it was upgraded as the Ministry of Environment).

Under the Sewerage Law amended in 1970, the Japanese Government had reinforced the budget system to subsidize the local government, based on the recognition that the environmental preservation through sewerage systems development should be the duty of the central government. Under this policy, the ratio of subsidy for sewage work was also increased to more than 50% in 1974 from 40% in 1967, and 25-33.3% in 1957.

Together with the amendment of the Sewerage Law and setting of new objectives, the 3rd 5-year Sewerage Development Program starting from 1971 was approved by the cabinet with the total budget of 2,600 billion yen or 2.8 times of that of the former 2nd Five-year program, in order to accelerate the development of the sewerage system. The Japanese government had set into action intensively and systematically for the construction of the sewerage system through consecutive "Five-year Sewerage Development Programs" and recently "Infrastructure Intensive Development Plan."

Besides these policy changes, technical support has been provided through the Japan Sewage Works Center (predecessor of Japan Sewage Works Agency (JS) in 1975) which was established in 1972 as a public corporation composed of funds and human resources of the central government, prefectures and big cities. The local municipalities which lack technical ability but intend to develop sewerage facilities can obtain technical support by contracting the project management with JS, especially for sewage treatment plants. Through this arrangement, the local municipalities can maintain the required technical level for the sewerage systems. JS has also conducted technical support on operation and maintenance of sewage treatment plants for municipalities, training of local government staff involved in sewerage, and research and technology development on sewage work in order to ensure the continuation of a high technical level.

1.4 Introduction of Water Quality Aggregate Regulations in 1978

In the mid-1970s, it had become evident that effective reduction of the total pollution load flowing into the water bodies was indispensable to improve the water quality of closed water areas such as Tokyo Bay, Ise Bay and Seto Inland Sea, where eutrophication had advanced. For this purpose, by revising the Water Pollution Control Law in 1978, the water quality aggregate regulations were enacted to reduce the total pollution load in the applicable water bodies where achieving and maintaining environmental standards would be difficult with existing discharge standards. Under this regulation, the Prefecture Governor determines, in the total pollution load reduction plan, the targeted reduction quantity for each source of pollution load.

1.5 Achievement and Remaining Issues of Japan's Sewerage Systems

Investment in sewage works through 5-year programs has been intensified and accelerated. The sewered population ratio has been increased year by year as presented in the following figure. As of March 2006, the sewered population was counted at 88 million or 69.3% of the total population. Currently, it is targeted to reach 72 % in 2007 in the Infrastructure Intensive Development Plan.

With the progress of sewerage system development, we have gradually been able to accomplish the major objectives of sewerage systems, such as prevention of inundation, improvement of living condition, and preservation of water quality.

However, there is still a regional gap in the sewered population rate between large cities with large populations and small cities or towns with small populations.

Apart from the problems arising from the existence of regional gaps in the sewered population, the issue of rehabilitation and reconstruction of sewerage systems needs to be addressed urgently. Moreover, new tasks for the future upgrading of sewerage systems such as advanced wastewater

treatment, recycling of treated water and sludge, reducing the risk in water bodies etc. need to be addressed as well.

	1965	1970	1975	1980	1985	1990	1995	2000	2001	2002	2003
Total population (million)	98.27	103.72	111.94	117.06	120.72	123.16	124.91	126.29	126.48	123.6	126.8
Sewered population (million)	8.16	16.16	25.51	34.54	43.33	53.97	66.83	78.03	80.32	82.5	84.5
Sewered ratio(%)	8	16	23	30	36	44	54	62	64	65	66

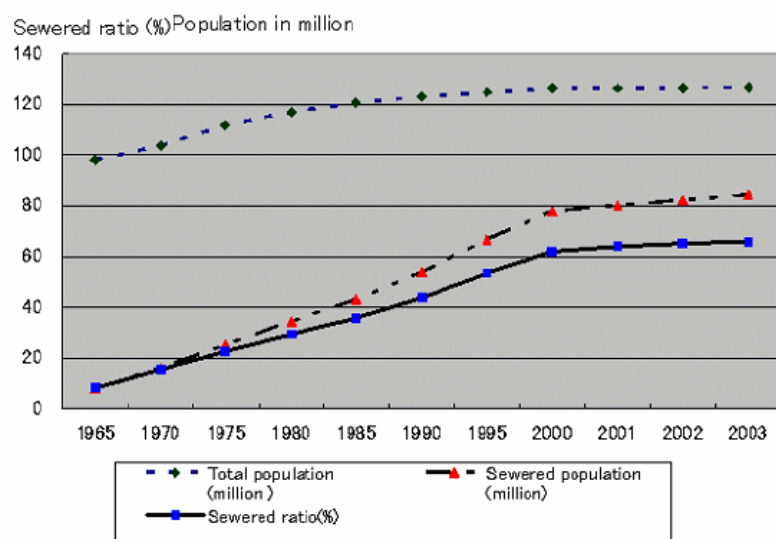


Figure Total Population and Sewered Population Rate

II. Legal Framework of Sewage Works in Japan

The sewerage system has the multiple purposes of improving the urban environment and public sanitation, as well as protecting the water quality of public water bodies. In other words, the sewerage system has dual purposes of achieving the interests of the individual residents as well as achieving public interests. Therefore, in order to develop a proper sewerage system, it is essential to coordinate the rights and obligations of various parties such as the central government, local government, industries and residents. This is achieved through establishing appropriate legal frameworks.

In developing countries, the lack of the appropriate legal frameworks sometimes hampers the development of sewerage systems. Although some developing countries might have relatively well-documented sets of laws and regulations, they are not always enforced. An environmental regulation without enforcement in practice means the absence of any regulation.

In some developing countries, there are many cases where a constructed sewerage system does not produce sufficient environment improvement effects due to the delay of individual connection, which in turn causes the deterioration of the financial situation of the executing agency for the sewerage system.

2.1 Japan's Legal Framework for Sewage Works

In Japan, the Sewerage Law, the Urban Planning Law, the Water Pollution Control Law and the Japan Sewage Works Agency Law make up the legal framework of sewerage system development, which was formulated in the current form in around 1970.

2.1.1 Sewerage Law

In 1958, the new Sewerage Law replaced the old law promulgated in 1900. The new Sewerage Law defined the purpose of the sewerage system as “to contribute to the sound urban development and enhancement of the public sanitation, by improving the urban environment” and priorities were given to the prevention of inundation and the environmental improvement of urban areas. In 1970, the Sewerage Law was amended and the item “conservation of water quality in public water bodies” was added as a role of sewerage systems. This amendment was conducted in response to the establishment of the Basic Law for Environmental Pollution Control and the Water Pollution Control Law. As a result, sewerage systems are considered a key measure for water pollution control.

The Sewerage Law stipulates that the development of sewerage system within a municipality, i.e. city, town and village, is the duty of each municipality. However, if the required sewerage system spans over two or more municipalities, a basin-wide sewerage system shall be developed by the prefecture's government.

Industrial wastewater produced in the sewered area is basically discharged into the sewerage system. However, the Sewerage Law obliges the pre-treatment of industrial wastewater before its discharge. This ensures the quality of the discharged wastewater in order to maintain the biological treatment process in the sewage treatment plant. Industries that have obtained the permission of the administrator of sewerage system for direct discharge to public water bodies and industries which are not located in the sewered area may directly discharge their wastewater into public water bodies. In this case, the quality of discharged wastewater is controlled under the Water Pollution Control Law.

The Sewerage Law (1958) stipulated that the residents living in the area where the sewerage system was developed were obliged to connect to the individual drainpipes, but a penalty was not prescribed against the residents who did not fulfill the obligation. The amendment of the Sewerage Law (1970) obliges residents in newly-sewered areas to convert their toilets to flush toilets within three years of the development of a sewerage system in the area. An ordinance was enacted for setting the penalty.

2.1.2) Urban Planning Law

Since the Urban Planning Law, enacted in 1968, defined the sewerage system as one of the “urban facilities” which is to be included in urban planning, municipalities are requested to include the sewerage facilities in their urban development plan when they make it, in accordance with the law. The Land Acquisition Law is applied in order to acquire the land for the construction of a sewerage system. Once the urban development plan, which includes the sewerage system, is approved in accordance with the Urban Planning Law, some of the required procedures by the Land Acquisition Law can be shortened. With the inclusion of sewerage system in the urban development plan, municipalities can levy urban planning taxes on the assumed beneficiaries of the planned sewerage system.

2.1.3 Basic Law for Environmental Pollution Control (Basic Law for Environment) and Water Pollution Control Law

The Basic Law for Environmental Pollution Control enacted in 1967 (predecessor of the Basic Law for Environment enacted in 1994) determined the responsibilities of the central government, local governments, private enterprises and residents with regard to pollution control, and empowered the central government to determine the environmental standards. The environmental standards on water quality were set up by the national government for major public water bodies based on the Water Pollution Control Law which was enacted in 1970. Although the principle objective of the Water Pollution Control Law is to control the water quality of industrial effluents, municipalities were obliged to fulfill the water quality standard when they built and operated the sewage treatment plants because the sewage treatment plant, a ‘urban facility’ under the Urban Planning Law, is one of the ‘specified facilities’ which was subject to the water quality control of the Law and is the subject of penalties when they failed to fulfill the water quality standard.

The prefectural governor is responsible for monitoring the water quality of public water bodies. The prefectures determine an annual monitoring plan, and based on these plans, the central governmental agencies such as the Ministry of Environment, the Coast Guard and local public organizations are responsible for monitoring the water quality. The prefectural governor issues an improvement order or orders the use of the facility, or temporarily bans the discharge of wastewater in accordance with the Water Pollution Control Law if any specified facilities including sewage treatment plants are found to be discharging water in violation of the effluent standards. If there is an actual violation of the effluent standards, penalties are imposed.

2.1.4 Japan Sewage Works Agency Law

In 1972, the Japan Sewage Works Agency Law was enacted to establish the Japan Sewage Works Agency (JS), whose purpose was to contribute to the improvement of the living environment and protection of water quality of public water bodies through promotion of sewerage system development. This was achieved through, upon the request of local governments, executing the construction and maintenance of the main facilities of sewerage systems on local governments’ behalf, providing technical assistance, educating sewerage engineers and conducting research and development of sewerage technologies. The capital of JS consists of the equity participation of local governments. Equity participation by equity in kind was also permitted. By the establishment of JS, nationwide technical support system for municipalities who were to develop sewerage system was put in place.

Through a consolidation of the legal system conducted in 1970 (as stated above), the method for development of sewerage system, which is the basic facility for water quality conservation of public water bodies, was established.

2.2 How to Prevent Non-Connection to Sewerage Systems

Conversion to flush toilets is mandatory, in accordance with the Sewerage Law, for the residents of sewerage areas within three (3) years of the day when a notice was issued of the commencement of sewerage service. In addition, the administrator responsible for the public sewerage system can order those who are in breach of such obligations to convert vault toilets into flush toilets within a reasonable period, this being decided by the said administrator. Furthermore, those who are in breach of the order shall incur a penalty of up to or equal to 300,000 Japanese yen according to the Sewerage Law.

On the other hand, it is also stipulated that municipalities shall play the part of an agency for reconciliation in cases where disputes arise among the stakeholders concerning the lending of requisite funds or such mediation/reconstruction and other support to those who are to rebuild their toilets. Consequently, many municipalities have been subsidizing a part of the costs and expenses necessary for sewerage connection and reconstruction of drainage plumbing, or assisting residents to have loans for them.

III. Sewerage Finance

The cost of construction as well as operation and maintenance (O&M) of sewerage system is much more (three times more on average) expensive than the costs of the water supply project. On the other hand, people's willingness to pay for the cost of sewage disposal is less than their willingness to pay for the cost of water supply. Therefore, careful consideration is required to establish the funding arrangements for the development of the sewerage system. The issue of funding arrangements for sewerage systems is the other side of the issue of who should pay the costs of sewage disposal. On one hand, the sewerage provides benefits to the individual residents by improving living environment and public sanitation, and, on the other hand, the sewerage aims to achieve public benefit by protecting the water quality of the public water body (which is beyond the interest of individuals). Therefore, it is essential to carefully balance the funding burden of both the private (individual residents) as well as the public sector (central & local government).

In some developing countries, the central government funds the entire investment cost, considering the low ability of residents to afford sewerage services. In other countries, the cost recovery of sewerage service is considered in the same way as the water supply service. In the latter case, in theory, the entire costs of sewerage, including both investment costs and O&M costs, are to be recovered from the sewerage charge, which, however, is not usually set at a level sufficient to recover the entire cost, resulting sometimes in a chronic financial deficit and poor performance of the sewerage executing agencies, and ending up constituting a financial burden on local governments.

In Japan, the principles governing the current funding arrangements and the allocation of the costs of sewerage systems were established around 1970. The basic principles of cost allocation in Japan are the "Public money for rainwater, Private money for polluted water" principle, and the "Polluter pays" principle. In the actual application of these principles, the Sewage Works Finance Committee, which consists of specialists from the central government, local government and the private sector, was created as an advisory body for the central government in order to review the funding arrangements of the sewerage system, taking into consideration the needs of each time. The idea/thoughts which form the basis of the current funding arrangements of Japan's sewage works were described in the Report of the Fifth Sewage Works Finance Committee (1985) as follows:

- ① Regarding the allocation of the operation and maintenance costs of sewerage systems, in principle, the costs for rainwater are to be paid by the public money and the costs for polluted water are to be paid by the private money, taking into consideration the basic nature of the sewerage system and its role as a public good as well as a private good. However, taking into consideration the public nature of sewerage service, it is appropriate to cover a part of the cost for polluted water (i.e., cost for water quality control, a part of cost for advanced treatment, cost for affordable tariff setting) by the public money.
- ② Although the investment cost for polluted water, except those to be covered by the public money, is supposed to be covered by the sewerage charges, it is appropriate to limit the portion to be covered by the sewerage charge, as a transitional measure, in certain circumstance such as when the sewerage charge become too expensive for the residents to afford.

3.1 Funding Arrangements for Development of Sewerage Systems in Japan

Based on the ideas above, the current funding arrangements for sewerage systems in Japan are as follows:

3.1.1 Subsidy from the Central Government

The central government provides subsidies to the local governments responsible for construction of sewerage systems. Facilities eligible for the governmental subsidy, the ratio of subsidy, and the ratio of coverage against investment cost, are set by the central government as follows:

- Eligible Facilities for Subsidy

Sewers : Major sewers and their complementary facilities, including pumping facilities except for gates and fences.

Sewage treatment plant : Sewage treatment plants and their complementary facilities, including pumping facilities, except for gates and fences.

- Non-Eligible Facilities for Subsidy

Minor sewers, gates and fences:

The subsidiary ratio had been revised reflecting the recommendations issued by series of the Committee for Sewerage Financing Study from 1961 to 1985.

The following table shows the history of changes of subsidy ratios for the Public Sewerage System, common sewerage system to be developed by municipalities, since 1957. Subsidy ratios for the basin-wide sewerage system that spans multiple municipalities are a little higher than the figures shown below.

Fiscal Year	Subsidiary Ratios	Facility
1957-1966	1/3	Sewers
	1/4	STP
1967-1973	4/10	Sewers
	4/10	STP
1974-1984	6/10	Sewers
	2/3	STP
1985	5.5/10	Sewers
	6/10	STP
1986	1/2	Sewers
	5.5/10	STP
1987-1990	1/2	Sewers
	5.25/10	STP
1991-2006	1/2	Sewers
	5.5/10	STP

3.1.2 Municipal Bond

Municipalities can issue the municipal bonds for a portion of the construction costs which is not covered by subsidy from the central government. Municipal bonds shall be redeemed by the local governments. However, around 50% of required funds for redemption and interest are eligible for compensation by the national government as a distribution of local allocated tax (except Tokyo to which the local allocated tax is not distributed because of the surplus of its municipal budget).

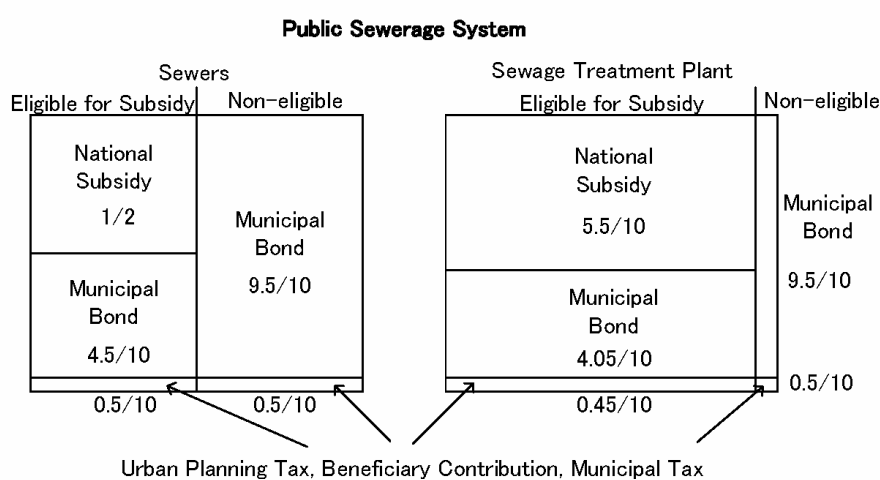
3.1.3 Subsidy from Prefectural Governments

Prefectural governments provide grants to the municipalities responsible for construction of the sewerage system based on the same viewpoints as the one for the subsidy from the central government.

3.1.4 Beneficiary Contribution

With regard to the sewerage projects to be conducted as an urban plan project, the local public entity will collect the beneficiary contribution by setting up the act based on the Urban Planning Law. This contribution is collected prior to the commencement of the development of the sewerage system in addition to the sewerage charge to be paid by residents once they are connected to the sewerage system.

Among the above-mentioned financial sources, national subsidy and municipal bond have the major portion (as illustrated on the figure below). Around 65% of the total investment amount for sewerage systems, consisting of Sewers and Sewage Treatment Plants, is categorized as the eligible portion for the subsidy from the central government. The eligible portion not covered by the subsidy and the non-eligible portion is mainly financed by the municipal bonds.



Note: Ratios of subsidy and others shown above have been applied from 1993.

Figure Breakdown of Fund for Construction of Sewage Work

In the budget for the year 2006, the total project cost for development of sewerage systems in Japan was estimated to be 2,283 billion yen (US\$19.0 billion), and the amount of the eligible portion for subsidy was estimated to be 1,480 billion yen (about 65%, US\$12.3 billion). The amount of central government's subsidy was estimated to be 786 billion yen (US\$6.6 billion, about 34% for total budget or about 53% of the eligible portion). The amount of municipal bond to be issued was budgeted at 1,637 billion yen (US\$13.6 billion). (Applied exchange rate yen 120 = US\$1.00)

3.2 Financial Resources for Operation and Maintenance (Cost Recovery)

Costs for operation, maintenance and management of sewerage systems (sewerage management costs), consists of repair costs of facilities, costs for chemicals and electric power in treatment plants,

personnel expenses (maintenance and management costs) etc., and redemption costs for municipal bonds (principal and interest redemption of bonds).

Among these costs, in principle, the portion related to rainwater drainage shall be borne by the local governments (municipal general account) and the portion related to sewage and wastewater shall be borne by the users (sewerage charges). It has been considered that the rainwater portion shall be borne by the local governments as it is a naturally occurring phenomena; the sewage and wastewater portion, on the other hand, shall be borne by the users from the viewpoint of the Polluter Pays Principle. However, 50% of funds for the redemption of the bond is counted as the subject for distribution of local allocation tax for municipalities and prefectures (except for Tokyo Metropolitan Government which is not subjected to the mentioned distribution due to its affluence). Thus, a significant portion of the management cost of the sewerage system is covered by the public money through the municipalities' general account. As a result, the sewerage charges from users cover only 35.8% of the total sewerage management costs for both rainwater and wastewater management costs inclusive of bond redemption costs, or 55.8% of the wastewater management costs inclusive of bond redemption costs, or 197.9% of the O&M costs for wastewater system excluding bond redemption costs.

In other words, in Japan, the level of the sewerage charges is set at the level which is good enough to cover the O&M costs of wastewater management, but not at all sufficient to recover the investment costs of the wastewater system even if the investment costs for rainwater system are excluded. This situation is very different to the situation of the water supply system in Japan where the water rates, in principle, are set at the level which is sufficient to recover both the O&M costs and the investment costs.

(unit: million Yen)

Expense	Sewerage Management Cost 3,791,371				
Finance	Transfer from Municipal General Account 2,434,011 64.2%			Sewerage Charge 1,357,360 35.8%	
Expense	Others 174,664 4.6%	Management for Rainwater 1,184,092 31.2%	Management for Wastewater 2,432,615 64.2%		
Finance	Transfer from Municipal General Account 100.0%		Transfer from Municipal GA. 44.2%	Sewerage Charge 55.8%	
Expense	Others 174,664	Bond Redemption 1,000,099 84.5%	O&M Cost 183,993 15.5%	Bond Redemption 1,746,774 71.8%	O&M Cost 685,841 28.2%
Finance	Transfer from Municipal General Account		Transfer from Municipal GA. 61.6%	Sewerage Charge 38.4%	Sewerage Charge

Figure Sewerage Management Cost and Financial Source (National, 2004)

3.3 Levy Methods of Sewerage Charges

Developing countries sometimes encounter difficulty in collecting sewerage charges because of the lower willingness of the people to pay or their lack of ability to afford to pay.

Japan's Sewerage Law (Clause No. 20) stipulates that "the Public Sewerage System Administrator can levy the charges on the public sewerage system users based on an ordinance."

In Japan, the sewerage charges are levied based on the metered water consumption and are collected together with water rates.

In addition, a progressive charging system is applied commonly in Japan in order to lessen the charge for sewerage in basic use.

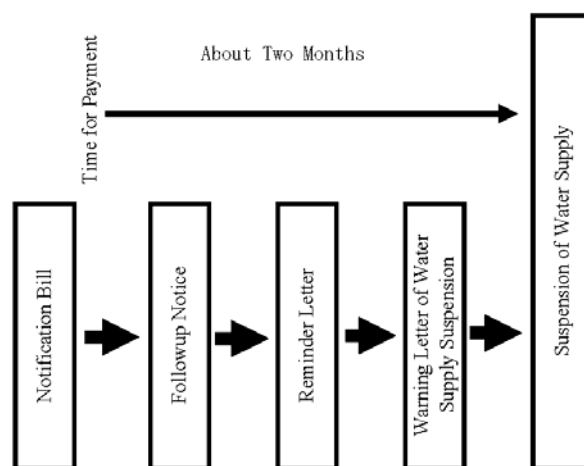
In Japan, nationwide average sewerage charges in 2000 were 2,442 yen/month/20m³, whereas the nationwide average water rates in 2000 were 3,083 yen/month/20m³. The total average water charge (water rates + sewerage charges) is about 275 yen (US\$2.5)/m³ which is relatively low among industrialized countries.

Sewerage charges were slightly lower than those of water rates, because a large portion of the investment costs is covered by the subsidies from the central government and a large portion of the bond redemption costs is also compensated by the central government through the distribution of local allocation tax.

3.4 Regulatory Measures to Prevent Nonpayment of Sewerage Charges

Many developing countries encounter the issue of non-payment. In general, people's willingness to pay for sewerage charges is considered to be lower than their willingness to pay for water. Therefore, prevention of non-payment of sewerage charges is an important issue for developing countries.

In Japan, sewerage charges is commonly levied and collected according to the volume of water consumption. Municipalities, as the administrator of sewerage systems, can issue administrative orders to the defaulters of sewerage charges ordering to them pay, in accordance with the Local Governing Law. If the defaulter fails to fulfill the administrative order, s/he will be subject to penalties (there have been cases where the defaulters' assets have been confiscated by the authorities). Although the default of the payment of sewerage charge does not necessarily cause the suspension of sewerage service, since the defaulter of sewerage charges is sometimes at the same time the defaulter of water charges, as the result of the suspension of water supply due to the non-payment of water charge, the defaulter is sometimes put in a situation where s/he cannot use the sewerage service. As a reference, the procedural flow from Issuance of Notification Bill to Suspension of Water Supply by the local government is as follows.



Example of Suspension of Water Supply

Punishment through the suspension of water supply is commonly carried out based on the rules and regulations of the Waterworks Law and Water Supply Ordinance of municipalities in default of charge payments, in spite of being repeatedly urged.

3.5 Sewerage Service for the Poor

Many developing countries share the same problems concerning individual connections to households located in poverty-ridden areas. Construction costs on individual connections and sewerage charges bear a heavy burden on poor households, who request immunity from or mitigation of their burden.

In many municipalities in Japan, exemption measures for sewerage charges have been adopted together with those for water rates to families on relief or households with elderly persons only. In general, an amount equivalent to the minimum charge is exempted in most cases. When the sewerage charge is exempted, its cost on the sewerage executing agency is compensated by the general account of the local government and thus the finances of the sewerage executing agency remain unaffected.

In general, municipalities provide the system of non-interest loans for the conversion of toilet facilities to flush toilet type to accelerate connection work with the sewerage system.

IV. Executing Agency to Implement Sewage Works

- Role-sharing Arrangement between Central Government, Local Government and Japan Sewage Works Agency (JS) -

The sewage works in Japan are implemented mainly by prefectures and municipalities. The Ministry of Land Infrastructure and Transport (MLIT) has jurisdiction over the sewage works in Japan. The Japan Sewage Works Agency (JS) is a kind of public corporation which undertakes the implementation of sewerage system construction work, complying with requests from municipalities. Regarding the main roles and activity of these organizations, refer to the following:

Bodies to Implement Sewage Works

(1) Ministry of Land, Infrastructure and Transport (MLIT)

The national government enacts the laws and regulations needed to preserve the water quality and carry out sewerage works. Also, it designs the basic frameworks of sewerage works in Japan and makes long-term and medium-term plans for sewerage systems. MLIT is a key and fundamental organization for the nationwide budget for sewerage works, watershed management, planning for new tasks of sewerage systems, establishment of technical standards, policy and project evaluation, publicity and public involvement, and international cooperation.

(2) Prefecture and Municipalities (Local Government)

The construction, operation, and renewal of sewerage facilities are conducted by local governments, namely prefectures and municipalities. These public bodies construct sewerage systems mainly through subsidies from the central government, local bonds, and municipal general expenditures. Costs for operation and maintenance of the wastewater portion of sewerage systems are covered by sewerage charges paid by users as stated in Section 3.

(3) Japan Sewage Works Agency (JS)

The Japan Sewage Works Agency (JS) was established in 1975, as a successor of the former Japan Sewage Works Center. It provides technical support to local governments on planning, designing and construction of fundamental sewerage systems such as wastewater treatment plants, pumping stations and trunk sewers based on the local governments' requests. The agency also conducts technical support on operation and maintenance of wastewater treatment plants for municipalities, training of local government staff involved in sewerage, and research and technology development on sewerage systems.

Since the implementation of sewage works was an urgent task for conservation of water quality of public water bodies in Japan, shortage of engineers was the one of the bottlenecks which needed to be solved. In this regard, JS has contributed to the smooth implementation of sewage works while maintaining the technical level of sewerage systems of local governments which lack technology for sewage works.

V. Responsibility and Regulatory Measures for Central Government, Local Government, and Users on Sewage Works

The sewerage utilities in developing countries sometimes encounter the problem of a low connection rate which results in a lower rate of return of the sewerage-related investment and a lack of funds for operation and maintenance.

Sewerage systems had been developed for the purposes of Improvement of Living Environment and Prevention of Inundation in the past in Japan. However, after amendment of the Sewerage Law in 1970, intensive investment for development of sewerage systems has been conducted from the view point of pollution control of public water bodies.

The Water Pollution Control Law obliges prefectural governments and municipal governments to implement development of domestic wastewater treatment facilities and to conduct measures against domestic wastewater. It also obliges people to keep water quality as well as the conservation of public water bodies in mind, and to cooperate with the national and local governments for implementation of measures against domestic wastewater. In response to this, the Sewerage Law, which is recognized as one of the laws for water pollution control in the legislation system for Environmental Pollution Control, obliges residents within the sewered area to convert a toilet to flush toilet within three years of commencement of sewerage service in the area.

Responsibility and regulatory measures of the central government, local government, and users on sewage works are summarized as follows:

Role of Central Government	Ministry of Land, Infrastructure and Transportation manages the public administration on sewerage, and its major roles are as follows:
	<ul style="list-style-type: none"> - Contribution of national subsidy and enactment of regulation based on the Sewerage Construction Decree (Government Ordinance stipulating the percentage of national subsidy on public sewerage and regional sewerage, and various regulations/criteria) - Formulation and implementation for the Sewerage Development Program (with preparation of budget, priority items, and target year etc.) - Approval for the Basin-Wide Sewerage Development Plan formulated by local governments based on Sewerage Development Program - Inspection of the Formulated Sewerage Project Plan and approval of its implementation based on Basin-Wide Sewerage Development Plan - Indispensable instruction, recommendation and superintendence for the project - Project reevaluation - Development and research on sewerage engineering - Superintendence of the Japan Sewage Works Agency
	The Ministry of Public Management, Home Affairs, Posts and Telecommunications carries out licensing of the issuance of municipal bonds (bond certificates issued by local government) to be credited to the construction costs or O&M costs on sewerage facilities besides the national subsidy.
	The Ministry of the Environment manages the environmental conservation administration, and determines the water quality criteria applied to the nationwide public waters stipulated in the Basic Law for Environmental

	<p>Pollution Control. In addition, regulatory measures for the treated water from the sewage treatment plant and drainage resulting from the corporations etc. were conducted based on the Water Pollution Control Law.</p>
Role of Local Governments	<p>Local governments (prefecture and municipalities) perform the sewerage construction. It also contributes to the maintenance of the water quality in the public waters and O&M. Construction of public sewerage systems, basin-wide sewerage systems, and urban rainwater drainage systems are to be entrusted to Japan Sewage Works Agency case by case.</p>
	<p>Prefectures manage the following items.</p> <ul style="list-style-type: none"> - Formulation of the Basin Sewerage Construction Master Plan (each basin-wide sewerage with location, facility capacity, and implementation priority to achieve the water quality criteria) - Formulation of the Basin-Wide Sewerage Project - Construction of the Basin-Wide Sewerage Project - Administrative instruction on municipalities under jurisdiction - Contribution of subsidy to the sewerage projects of municipalities under jurisdiction - Issue of the municipal bonds etc.
	<p>Municipalities manage the following items.</p> <ul style="list-style-type: none"> - Formulation of public sewerage project planning based on the Basin Sewerage Construction Master Plan - Preparation of budget to the public sewerage and city sewerage - Preparation of allotted charges to the basin sewerage - Construction and O&M of the public sewerage - Set-up and levy of public sewerage charges - Construction and O&M on the urban rainwater drainage system - Issue of municipal bonds etc.
Role of Users	<ul style="list-style-type: none"> - Participation in public hearings or submission of written opinions, etc. (residents' participation during the period from the planning formulation until the implementation of sewerage projects) - Installation obligation on drainage facilities stipulated in the Sewerage Law (Landowners and users or occupants in the Drain Area of public sewerage should install the necessary drainage facilities to discharge the area's sewage into the public sewerage) - Rebuild obligation of vault toilet into flush toilet stipulated in the Sewerage Law, Clause 48 - Responsibility for treating the sewage with bad quality stipulated in the Sewerage Law (factory or business unit etc.), Clause 46 -2 - Charge obligation stipulated by the local government's ordinance based on the Sewerage Law, Clause 20.

VI. References/ Sources:

- 1) Appraisal Guidance, internal document prepared by JBIC, March 2000 (in Japanese)
- 2) <http://www.sbmc.or.jp/english/index.html>
- 3) [http://www.sbmc.or.jp/english/051026/Total Population and Sewered Population.htm](http://www.sbmc.or.jp/english/051026/Total%20Population%20and%20Sewered%20Population.htm)
- 4) <http://www.mlit.go.jp/crd/city/sewerage/data.html> (in Japanese)
- 5) http://www.mlit.go.jp/crd/city/sewerage/data/basic/juekisha_hutan.html (in Japanese)
- 6) http://www.mlit.go.jp/crd/city/sewerage/data/basic/gesui_siyouryou.html (in Japanese)
- 7) Sewage Works in Japan, 2006, Japan Sewage Works Association (in Japanese)
- 8) Guideline for Planning of Sewage Works, Japan Sewage Construction Training Center (in Japanese)
- 9) Guideline for Implementation of Sewage Works, Japan Sewage Construction Training Center (in Japanese)

Appendix 3 Water Quality of the Kelani River and Maha Oya

Water quality monitoring of the Kelani River and Maha Oya have been carried out systematically and linked to the UNEP water programme. This work started from 1995 with the help of a Netherlands fund, and coordinated by the Engineering Faculty of the Moratuwa University for the purpose of the water quality modeling of the Kelani River. From year 2002 this programme was extended to analysis of fourteen water quality parameters (pH ,electrical conductivity ,turbidity, temperature, dissolved oxygen, chemical oxygen demand, biochemical oxygen demand, chloride ,dissolved chromium, dissolved lead , nitrate nitrogen, phosphate, total coliform and faecal coliform) at twelve selected locations (six locations from the river water and six from its main tributaries - These were near bridges at Thalduwa, Seethaweke, Hanwella Welivita ,Peliyagoda and Victoria. The main tributaries are Eswathu Oya, Pugoda Ela, Wak Oya, Pusseli Oya, Maha Oya, and Raggahawatte canal at a frequency of once in two weeks with the World Bank funds.

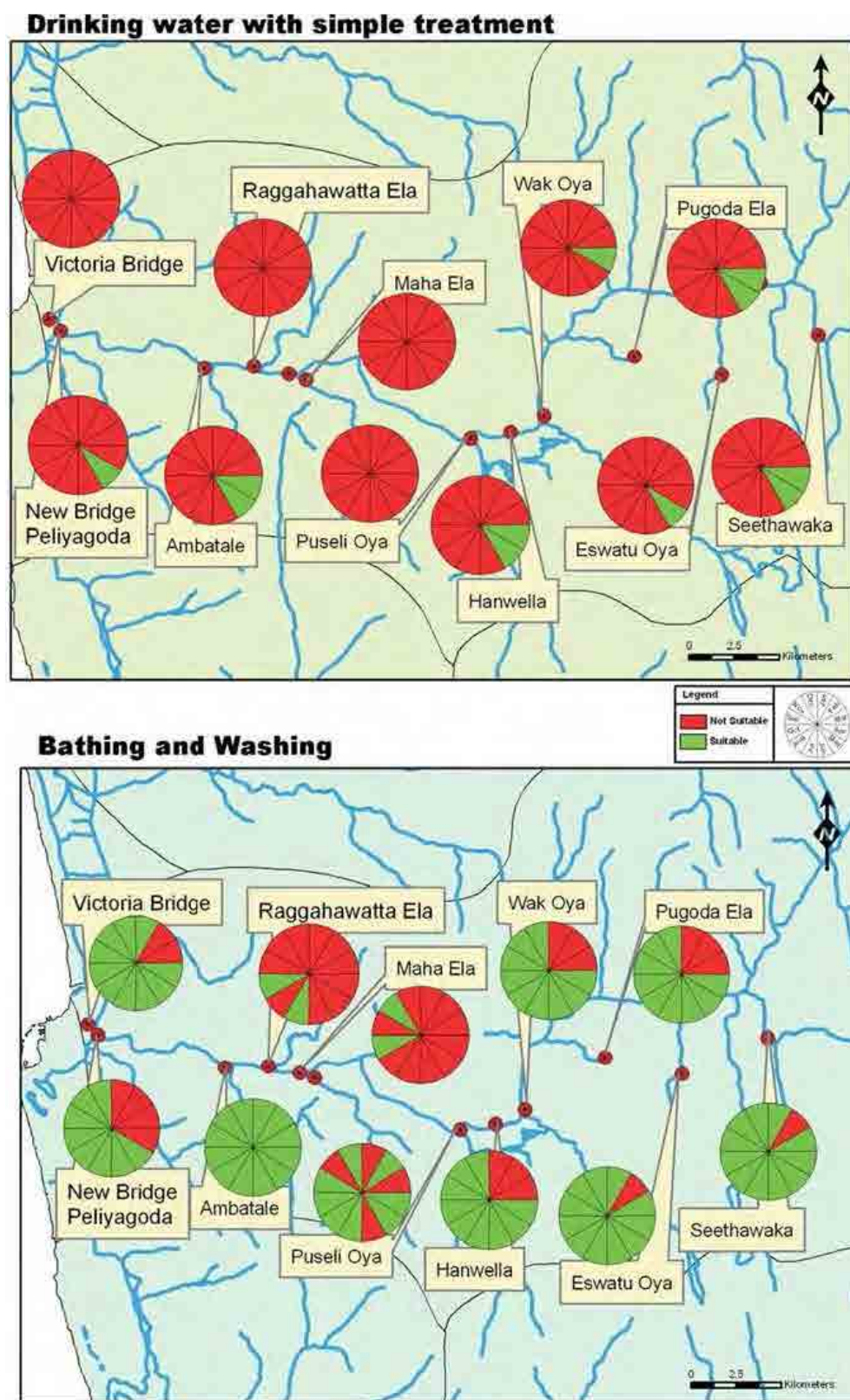
Kelani River Water Quality Monitoring

The main theme of the work was to create awareness among the public on the suitability of water for designated usage (drinking water with simple treatment, and bathing or washing purposes). The analytical data along with the indication of the suitability is indicated on a display board located at each sampling location. The analytical results revealed an increasing trend of the electrical conductivity at the lower end of the river up to Welivita Bridge which seriously affected the supply of drinking water for the Colombo Metropolitan area. This is due to the upstream intrusion of sea water due to the lowering of the river bed caused by excessive sand mining activities. This was shown during the early part of the year. The relatively high levels of COD, BOD, and extremely high count of total coliform and fecal coliform under rainy weather condition were due to heavy surface runoff. Dissolved heavy metals and nitrate nitrogen were always reported at the lower end of the river especially near bridges at Peliyagoda and Victoria.

Maha Oya Water Quality Monitoring

This monitoring work was started in the year 2004 at eight locations along the Maha Oya (bridges at Kochchikade, Badalgama, Kotadeniyawa, Girualla, Allawwa, Karadena and Hiriwaddunna). Monitoring concentrated on pollution indicative parameters such as physical parameters, chemical oxygen demand, biochemical oxygen demand at five day intervals, micronutrients, trace metals and bacteriological properties. According to the monitoring data Maha Oya is not heavily polluted with industrial waste. Water quality of the highly urbanized and commercialized areas such as near the bridges at Kotadeniyawa, Allawwa, Hiriwadunna, and Mawanella indicate comparatively high levels of COD, BOD, and microbiological contaminations.

Figure A3.1 is the water quality monitoring results disclosed by the CEA.



Source: Central Environmental Authority – 2004

Figure A3.1 Water Quality Monitoring Results

Appendix 4 JICA Workshop for Wastewater Management in Sri Lanka

A-4.1 Purpose

The main purpose of the workshop was the following three items.

- To enhance knowledge of sewerage work
- To introduce Japanese technologies, which are useful and applicable for sewerage works in Sri Lanka
- To have an open discussion on the issues related to the sewerage works in Sri Lanka

A-4.2 Outline

JICA Workshop for Wastewater Management in Sri Lanka was held at the Mount Lavinia Hotel on August 24. Participants in the workshop were a total of about 50 people including the central governments and NWSDB staff and mayors, Chairmen, and officers of 14 local governments. Participants list is shown in **Table A4.2**.



Figure A4 .1 Situation at the Time of Presentation

A-4.3 Program

The program is shown in **Table A4.1** and details of the presentations are shown in **Figure A4.2**.

Table A4.1 Program of JICA Workshop for Wastewater Management in Sri Lanka

Time	Agenda
8:30 - 9:00	Registration
9:00 - 9:10	Welcome Speech by Chairman, NWS&DB - Purpose of the Workshop
9:10 - 9:15	Speech by Secretary to the Ministry of Local Government & Provincial Councils
9:15 - 9:20	Speech by Secretary to the Ministry of Water Supply & Drainage
9:20 - 9:25	Speech by Chief Representative JICA
9:25 - 9:30	Speech by Hon. Minister of Water Supply & Drainage
9:30 - 9:40	Opening Remarks(by JICA Consultants)
9:40 - 10:20	Sewerage Works in Japan ◆Speaker Yasuhide Honda, Director-project arrangement dept,Yokohama city Japan
10:20 - 10:40	Coffee Break & Poster Session
10:40 - 11:20	Introduce Japanese Technologies I ◆Speaker Takashi Ishida, Japan Institute of Wastewater Engineering Technology Japan
11:20 - 11:40	Introduce Japanese Technologies II ◆Speaker Isamu Sato, Japan Global Center for Urban Sanitation Japan
11:40 - 12:00	Economic Impact of Sanitation ◆Speaker Kazushi Hashimoto, Financial Analyst-a team member of Data Collection Survey on Sewerage Sector in Sri Lanka Japan
12:00 - 13:00	Lunch Break & Poster Session
13:00 - 13:40	Sewerage Works in Sri Lanka ◆Speaker G A Kumararathna, Additional General Manager(Sewerage) NWS&DB
13:40 - 14:20	Fundamental Knowledge in Sewerage Works ◆Speaker J.K.S Pathirana, Assistant General Manager(P&D-Sewerage) NWS&DB
14:20 - 14:50	Coffee Break & Poster Session
14:50 - 16:20	Discussion
16:20 - 16:35	Closing Remarks(by JICA Consultants)
16:50 - 17:00	Close

A-4.4 Panel Discussion

In addition to the presenters, Mayor of Nuwara Eliya MC, Mayor of Matara MC, Chairman of Kelaniya PS and Deputy Mayor of Dehwala / Mount Lavinia MC joined the panel.

Main Pints of discussion area as follow;

- Mr. Varusamana, AGM (NWSDB) asked that any limitation in Advanced Oxidation Ditch Process. Mr. Takashi Ishida clarified that 10,000 m³/day is a possible ceiling for the process.
- Dr. Lalith Jayawardena, JICA study team inquired about the technology used in Greater Kandy Wastewater management Project. Eng. G.A. Kumararathna, Additional GM (NWSDB) explained that Advanced Oxidation Ditch Process is selected.
- Mr. Yasuhide Honda, Yokohama city again explained the role of national organisations and municipal councils. Small Municipal councils are supported by outsourcing the technical capabilities.
- Municipal Engineers of Badulla and Kalmunai and DGM (UVA), AGM (JPU) highlighted several problems faced by Municipal Councils such as technical support, connection cost and participatory approach of citizens in project formulation.
- Costing of micro tunnelling is explained by Dr. Asada and Mr. G.A. Kumararathna. It was revealed that deep excavation more than 4.0m and traffic congested areas, the micro tunnelling is more economical.
- The cost of micro tunnelling is approximately 1.5 times higher than open trench excavation.
- The cost of micro tunnelling, more than 4.0 m depth and 300 mm dia. is around 1,000 US\$ per metre in Japan. Similarly smaller diameter (100 mm dia) is around US\$ 60 - US\$70.
- Deputy mayor Dehiwala Mout Lavinia requested to translate the technical documents to local languages (Tamil and Sinhala).
- All mayors agreed that the money allocated for local government is not adequate. The centre should strengthen the local governments.
- JICA representative explained the next cause of actions after this survey.

Table A4.2 Participants List of JICA Workshop for Wastewater Management in Sri Lanka

No.	Name	Organization	Position	Address
1	P. Jayamanna	Ministry of Water Supply & Drainage	Addl. Secretary(Dev)	Ministry of Water Supply & Drainage - Sri Lanka, "Lakdiya Medura", No. 35, New Parliament Road, Pelawatta, Battaramulla
2	A. Wijethunga	NWS&DB	Addl. GM (Western)	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
3	G. A. Kumararathna	NWS&DB	Addl. GM (Sewerage)	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
4	J. K. S. Pathirana	NWS&DB	Asst. General Manager(P&D - Sew)	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
5	M. M. Umar Lebbe	NWS&DB	Asst. General Manager(JPU)	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
6	L. K. M. C. B. Jayawardene	NWS&DB	Chief Engineer (P&D - Sew)	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
7	DP Chendren	NWS&DB	Manager(GCS)	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
8	K.P.D Dhamasens	NWS&DB	Chief Engineer	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
9	A. D. K. K. Wijegunawardene	NWS&DB	Chief Engineer (Sew)	National Water Supply & Drainage Board, Head Office, Galle Road, Ratmalana
10	Upali Nassanka Gunasekera	Badulla MC	Mayor	Hon. Mayor, Baddula Municipal Council, Baddula
11	A.M.J.T. Gangananda	Badulla Provincial Council & Municipal	Engineer	Municipal Council, Baddula
12	Prabakaran Sivageetha	Batticaloa MC	Mayor	Mayor, Municipal Council, Batticaloa
13	V. Rameshkumar	Batticaloa MC	Engineer	Municipal Council, Batticaloa
14	Ms.Vishaka Dias	Colombo Municipal Council	Deputy Commissioner - Engineering	Colombo Municipal Council, Purahala, Colombo 09
15	Ms.Badra Jayawaudena	Colombo Municipal Council	Municipal Commissioner	Colombo Municipal Council, Purahala, Colombo 09
16	Ms.Kumudunie Samarasinghe	Colombo Municipal Council	Project Director	Colombo Municipal Council, Purahala, Colombo 09
17	Kesaralal Gunasekera	Dehiwala/Mt Lavinia MC	Deputy Mayor	Hon. Deputy Mayor, Municipal Council - Dehiwala - Mt. Lavinia
18	Dr. S. Siraz Meerasahib	Kalmunai MC	Mayor	Hon Mayor, Municipal Council, Kalmunai
19	A.J.A.H. Jowsi	Kalmunai MC	Municipal Engineer	Municipal Engineer, Municipal Council, Kalmunai
20	M.M.M. Juwfer	Kalutara UC	Chairman	Urban Council, Kalutara
21	Asoka Ranasinghe	Kalutara UC	Secretary	Urban Council, Kalutara
22	Prasanna Ranaweera	Kelaniya PS	Chairman	Kelaniya Pradeshiya Sabha, Bulugaha Handiya, Kelaniya
23	W. K. Ranjani	Kelaniya PS	Development Officer	Kelaniya Pradeshiya Sabha, Bulugaha Handiya, Kelaniya
24	Mr.Neranjani	Kelaniya PS	Work Superintendent	Kelaniya Pradeshiya Sabha, Bulugaha Handiya, Kelaniya
25	A.L.D.N Kanchana	Kelaniya PS	Revenue Officer	Kelaniya Pradeshiya Sabha, Bulugaha Handiya, Kelaniya
26	D.G. Ravindra Udayashantha	Kolonnawa UC	Chairman	Urban Council, Kolonnawa
27	Mrs. Gamlath	Kolonnawa UC	Secretary	Urban Council, Kolonnawa
28	Mr.Sumendha Gunasekera	Kolonnawa UC	Public Health Inspector	Urban Council, Kolonnawa
29	Mohamed Hilmy	Matale MC	Mayor	Hon. Mayor, Municipal Council, Matale
30	S.B. Halangoda	Matale MC	Municipal Engineer	Municipal Council, Matale
31	Mahinda Dodampagamage	Nuwara Eliya MC	Mayor	Mayor, Municipal Council, Nuwara Eliya
32	S.Sivakumar	Nuwara Eliya MC	Technical Officer	Municipal Council, Nuwara Eliya
33	Mr. S.N. Hadunge	Matara MC	Mayor	Municipal Council, Matara
34	Mr. Sarath Weerasooriya	Matara MC	Engineer	Municipal Council, Matara
35	Dr. Nalinda Rajapakshe	Matara MC	Medical Officer of Health	Municipal Council, Matara
36	N.A. Perera	Peliyagoda UC	Chairman	Urban Council, Peliyagoda
37	Ms. Nelum Kumari	Peliyagoda UC	Secretary	Urban Council, Peliyagoda
38	Mangalika Lokuliyana	Solid Waste Manag. Secretariat	Director	Ministry of Local Gov. & Prov. Councils, 330, Union Place, Colombo 02
39	Mrs. M.K. Bandara	NWS&DB	DGM (Western - North)	NWS & DB, Regional Office -Western- North, 433/4A, Ganemulla Rd, Kadawatha
40	Mr. M.I.A. Lathiff	NWS&DB	DGM (UVA)	NWS & DB, Vishaka Mawatha, Bandarawella
41	Mr. R.H. Ruvinis	NWS&DB	DGM (Southern)	NWS & DB, Regional Support Center - Southern, Pamburana, Matara
42	Mr. R.S. Warusamana	NWS&DB	AGM (Greater Colombo - Sewerage)	NWS & DB, Greater Colombo Sewerage, 26/2, Attidiya Road, Ratmalana
43	Mr. Yasuhide Honda	Speaker, Yokohama City, Japan		
44	Mr. Takashi Ishida	Speaker, Japan Institute of Wastewater Engineering technology		
45	Mr. Isamu Sato	Speaker, Global Center for Urban Sanitation		
	Mr. Harumi Ao Ms. Tomoko Kashiwara Ms. Manjuri Adikaram	JICA Sri Lanka Office		
	Mr. Hayashi Mr. Hashimoto, Dr. Asada Mr. Anezaki Mr. W. Stanley Dr. L.P. Jayawardena Mr.S.W.B. Ruwanpura, Mr.R.Y. Silva	JICA Study Team		

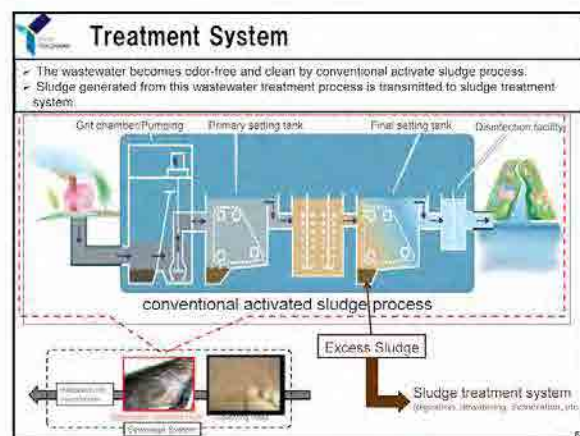
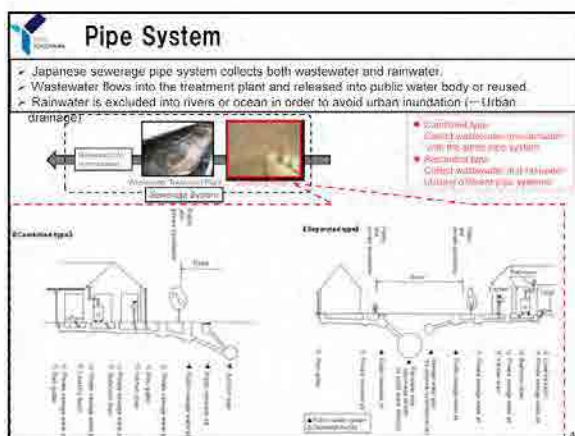
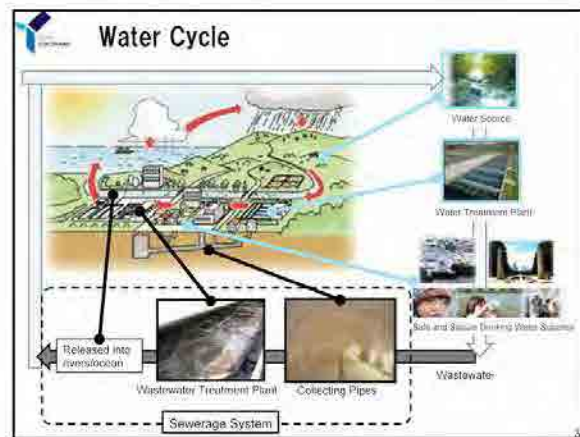
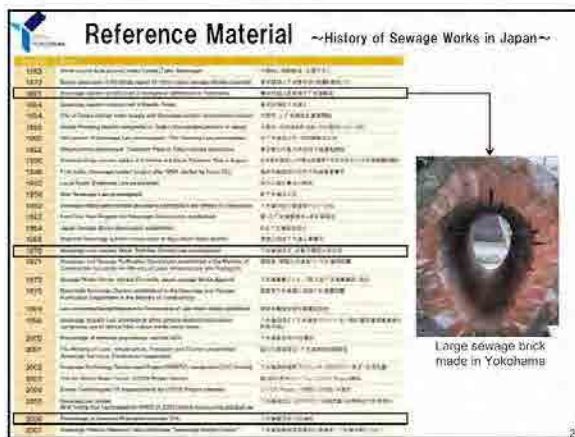


Figure A4.2 Presentation Power Points ①(Sewerage Works in Japan)-1

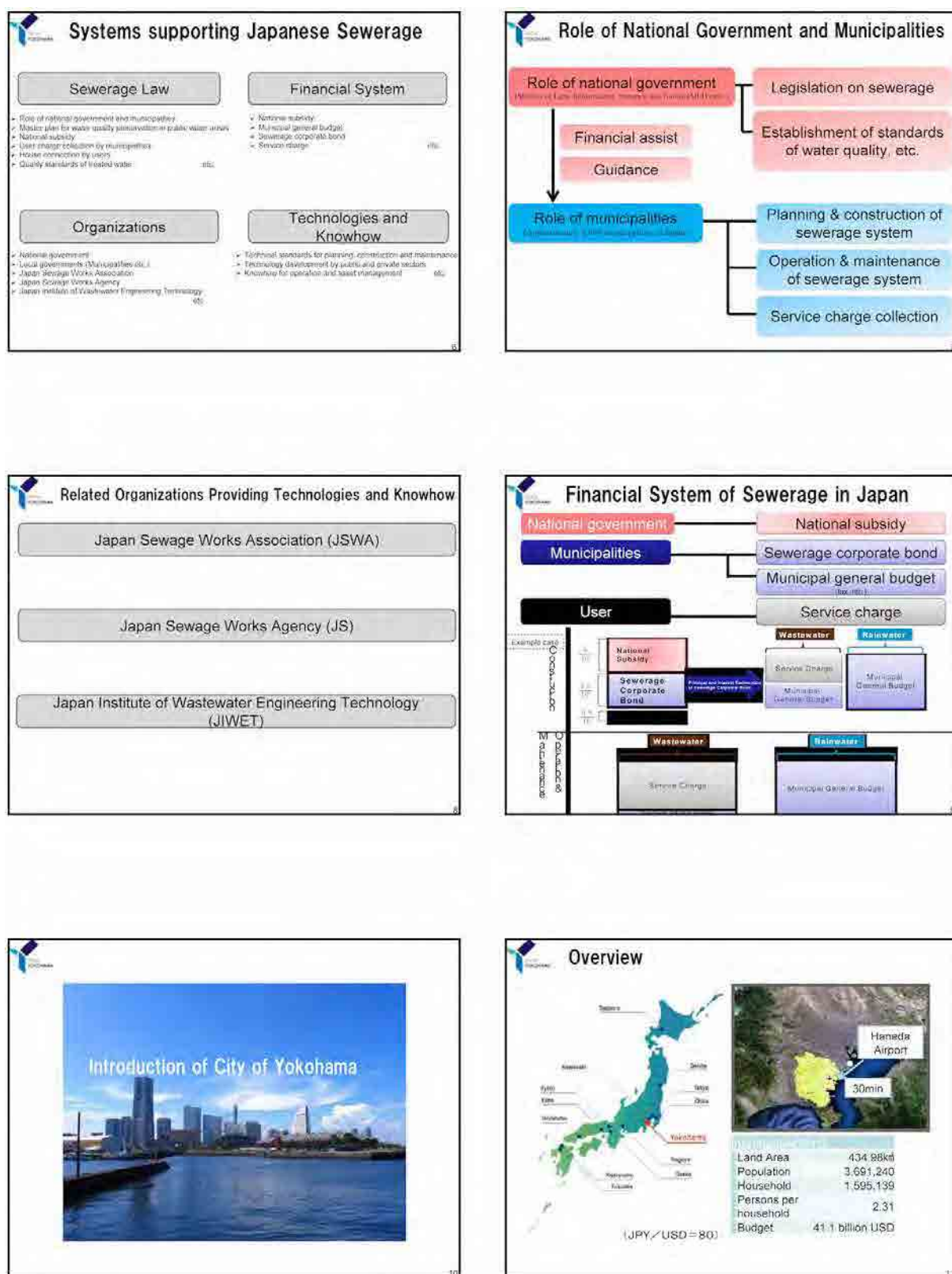
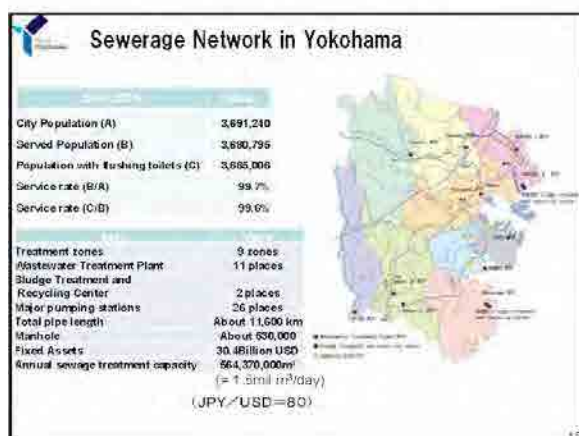
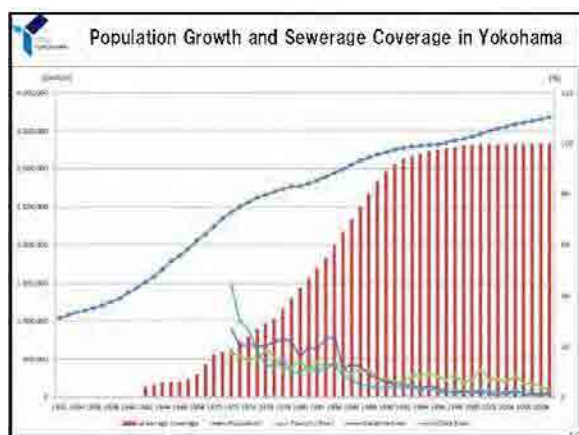


Figure A4.2 Presentation Power Points ①(Sewerage Works in Japan)-2

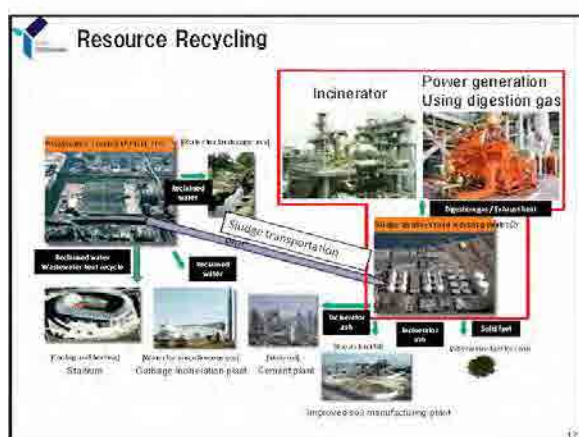


Sewerage Budget and Personnel

	Budget (2013)	BUDGET (USD)	Composition ratio
Total Budget	41.1	100%	
Sewerage	3.5	8.5%	

(JPY/USD=80)

	Personnel	Composition ratio
All employees	25,497	100%
Sewerage	872	3.5%



- ### International Contributions in the Sewerage Field
- 1 Acceptance of Overseas Trainee**
 - ▶In FY2011, 265 trainees were accepted from a total of 10 countries, including four of the facilities and lectures on 880.
 - ▶[Countries] Indonesia, Vietnam, the Philippines, Iraq, Brazil, etc.
 - 2 Delegation of Experts to JICA Technological Cooperation Project etc.**
 - ▶Total of 27 expert staff members sent to 10 countries to provide technological instruction, etc. in-the-field.
 - ▶[Countries] Thailand, Malaysia, Vietnam, Indonesia, etc.
 - 3 International Technological Cooperation on the Water Body's Environment**
 - ▶"Yokohama Shanghai Friendship Exchange Program (environment planning technology cooperation)" since FY2004.

Figure A4.3 Presentation Power Points ①(Sewerage Works in Japan)-3

International Contributions in the Sewerage Field

- 1 Acceptance of Overseas Trainee**
 - >In FY2011 265 trainees were accepted from a total of 10 countries, (running tour of the facilities and lectures on O&M)
 - >[Countries] Indonesia, Vietnam, the Philippines, Iraq, Brazil, etc.
- 2 Delegation of Experts to JICA Technological Cooperation Project etc.**
 - >Total of 27 expert staff members sent to 10 countries to provide technological instruction, etc. in-the-field
 - >[Countries] Thailand, Malaysia, Vietnam, Indonesia, etc.
- 3 International Technological Cooperation on the Water Body's Environment**
 - >"Yokohama Shanghai Friendship Exchange Program (environment planning technology Cooperation)" since FY1994.




18

On-site Training in Foreign Countries



Training in pump station O&M (pump performance examination)



Training in labor safety and hygiene (oxygen measurement)



Training in labor safety and hygiene (artificial respiration)



On-site OJT (energy-conservation theory)

19

On-site training



Holding of technical seminars



Support for preparation of technical manuals

20

Training Programs in Japan With Tours of Sewerage Facilities



Central control room



Model of sludge digestion tank



Tour of treatment plant



Model of sludge treatment and recycling center

21

Message from City of Yokohama



22

Message from City of Yokohama

- > City of Yokohama has developed sewerage systems from planning to construction, operation and maintenance with equipment of organization and systems (financial etc.) in cooperation with related organizations (Public and Private Sectors).
- > Therefore, we have overcome hygiene, environmental and disaster issues.
- > We make it a strong policy of city of Yokohama to contribute to other countries' sewerage development with our experience to solve global environmental issues.
- > We are prepared to cooperate with Sri Lanka as a same "Local Government" with JICA and related organizations.
- > We are looking forward to meeting you again in Yokohama with various sewerage sites and sightseeing sites.

23


Figure A4.3 Presentation Power Points ①(Sewerage Works in Japan)-4



Figure A4.3 Presentation Power Points ①(Sewerage Works in Japan)-5

Advanced Oxidation Ditch Process and Screw Press Dewatering

24th Aug. 2012



Takashi Ishida
Director of the Resources Recycling Research Division
Japan Institute of Wastewater Engineering and Technology
(JIWET)

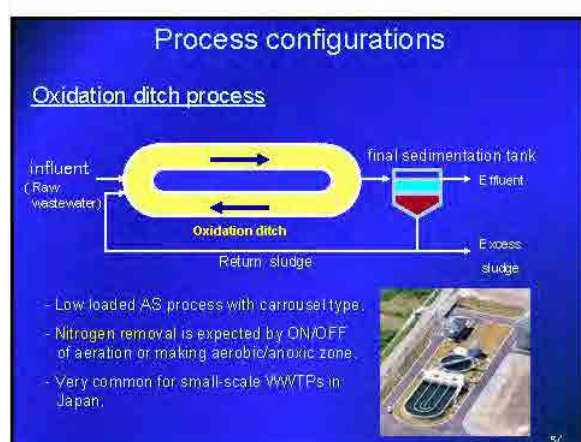
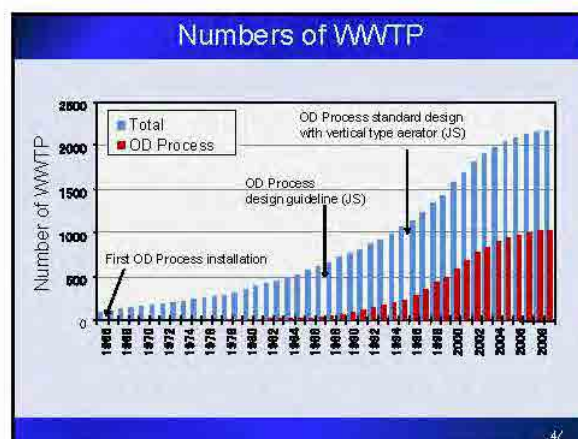
1/

1. Advanced Oxidation Ditch Process
2. Screw Press Dewatering

2/

1. Advanced Oxidation Ditch Process

3/



Water Quality of OD Process (2009)

	WTP NO.	BOD	SS	T-N	COD (Mn)	T-P	BOD ₅ -P	BOD ₅ -N
OD Process:	1,016							
Influent(mg/L)		204.6	183.6	36.9	111.2	4.9	41.8	5.5
Effluent(mg/L)		2.6	4.7	4.8	7.3	1.3		
Removal Rate(%)		98.7	97.4	87.0	93.4	73.5		

- OD process is a advanced treatment process, judging from effluent quality

6/

Figure A4.3 Presentation Power Points ②(Introduction Japanese Technologies I)-1

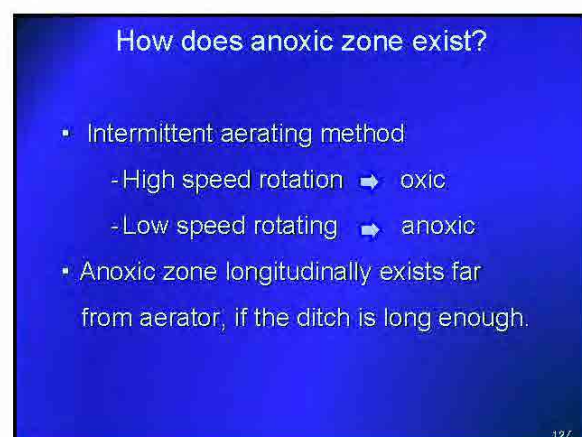
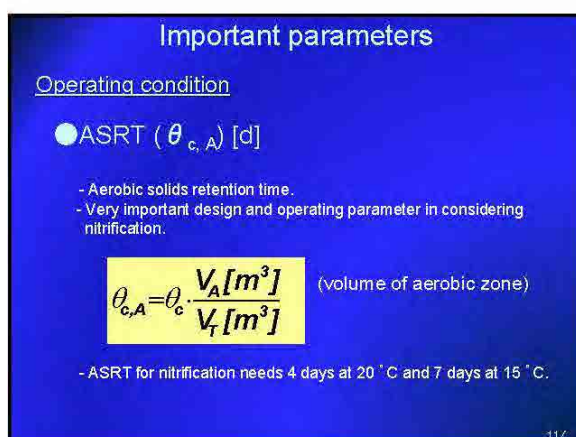
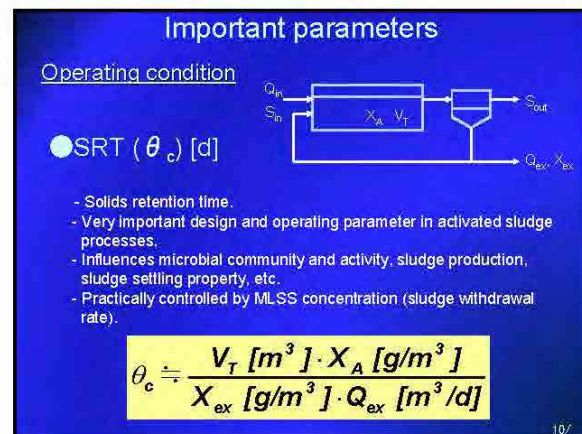
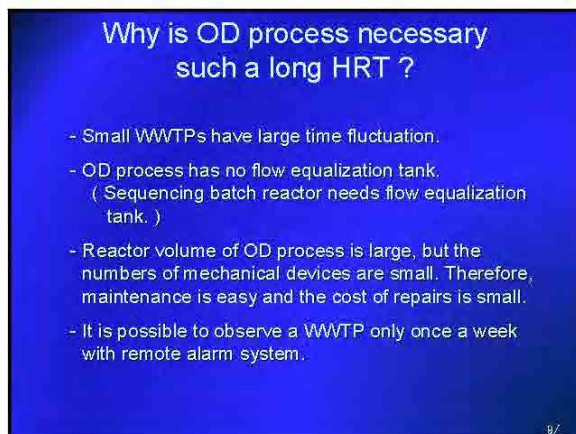
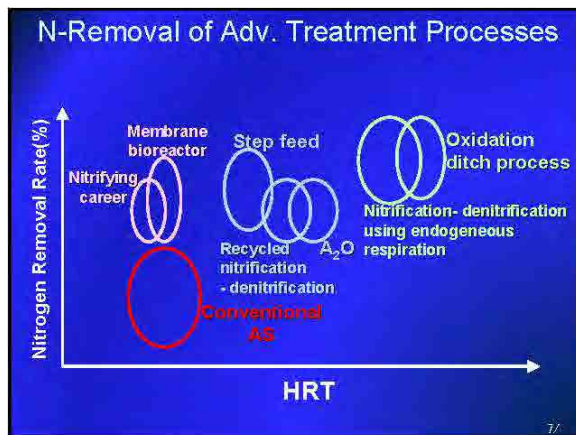


Figure A4.3 Presentation Power Points ②(Introduction Japanese Technologies I)-2

Why is anoxic zone in ditch necessary ?

- OD process has long SRT.
Therefore nitrification occurs inevitably.
- Perfect nitrification consumes alkalinity and induces low pH which causes concrete corrosion.

13/

Comparison of nitrification and denitrification

	Nitrification	Denitrification
Oxygen	necessary (4.57g-O ₂ /gNH ₃ -N)	inhibitory
Organic carbon	(inhibitory)	necessary (2.86gOrg-C/gNO ₃ -N)
Growth rate	slow	fast
Alkalinity	consumed (7.14g-Alk/gNH ₃ -N)	generated (3.57g-Alk/gNO ₃ -N)

14/

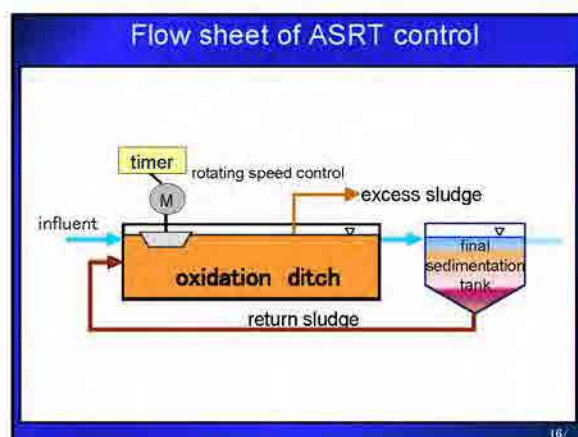
Advanced Oxidation Ditch Process

<Nitrogen Removal> ASRT Control

- Sludge withdrawal control
 - Sludge is directly removed from the ditch.
 - MLSS concentration is stable.
 - Withdrawal volume is relatively large.
- Aeration time control

<Phosphorus Removal> Coagulant Addition

15/



Operation method of a vertical type aeration

intermittent aeration method

The diagram shows two states of a vertical type aeration system. In the first state, the aeration is at high speed, creating a large air-lift effect. In the second state, the aeration is at low speed, creating a mixing effect. The diagram is labeled 'aeration (high speed)' and 'mixing (low speed)'.

17/

Lower electricity consumption by oxygen requirement control

Apply oxygen requirement control

↓

following 5 reasons

↓

Lower electricity consumption

18/

Figure A4.3 Presentation Power Points ②(Introduction Japanese Technologies I)-3

On line measurement of influent water quality
→ Catching inflow road all the time

↓

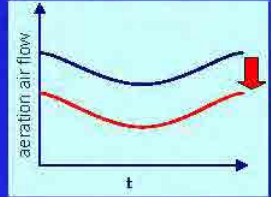
① Aeration control according to the inflow road fluctuation

Not necessary to have excess MLSS concentration.
→ Possible to maintain lower MLSS concentration.
→ ② Reduction of oxygen demand by endogenous respiration of activated sludge

19/

$S_{O_2} = K_L a (V \times (C_s - C))$
 S_{O_2} : Supplied oxygen, $K_L a$: Overall volumetric oxygen transfer coefficient,
 V : Capacity of oxidation ditch, C_s : Saturated CO concentration,
 C : DO concentration

→ Low DO concentration causes high $K_L a$
 → ③ Reduction of aeration air flow by higher oxygen transfer efficiency



20/

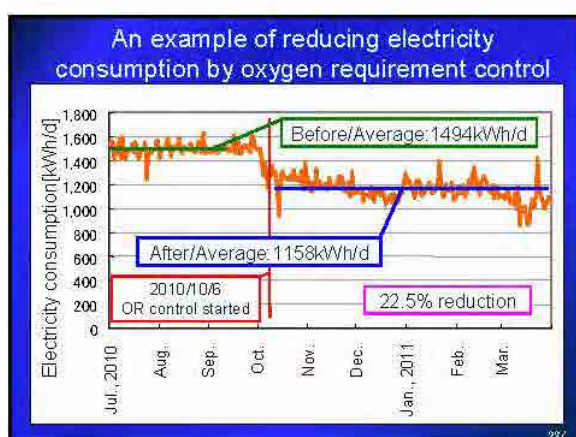
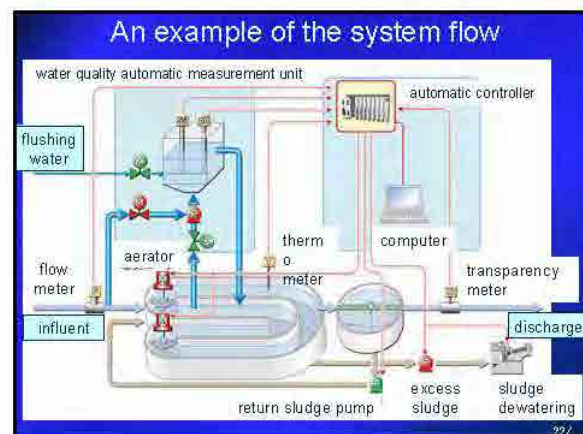
If DO concentration of oxic zone could be lower.

↓

Denitrification in oxic zone consumes BOD .
→ ④ Reduction of biochemical oxygen demand

Unused DO can be lower.
→ ⑤ Reduction of outflow oxygen from oxidation ditch

21/



2. Screw Press Dewatering

24/

Figure A4.3 Presentation Power Points ②(Introduction Japanese Technologies I)-4

What is Screw Press?

- **Conventional Screw Presses** are used for the separation of fibers from fluids. Screw Press is well known in fruits, oil fruits applications and in the paper and pulp industry.
- **Pressure-type Screw press** developed in Japan is specially designed for solid liquid separation of coagulated sewage sludge with organic polymer coagulant.



25/

Background of Development

Problems of Conventional Dehydrator

Belt Press Filter

1. Clogging of Filter Cloth
2. Huge amount of Cloth washing water
3. Erosion trouble of bearings and frame

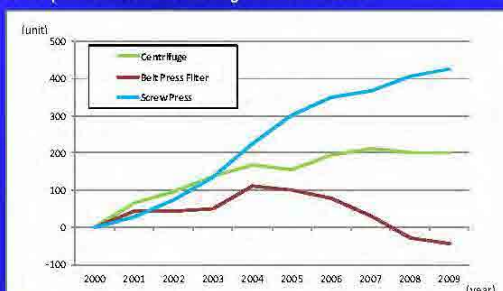
Centrifuge

1. Huge amount of energy consumption
2. Noise and Vibration from high rotation speed
3. High Overhaul cost

26/

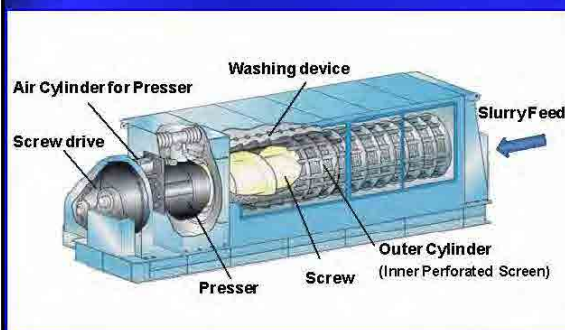
Tendency of Installation in last 10years

In these 10years, the screw press is leading dewatering equipment in Japanese sewage works. Belt Press Filter is decreasing its installation and replaced to others. Centrifuge also slow down.



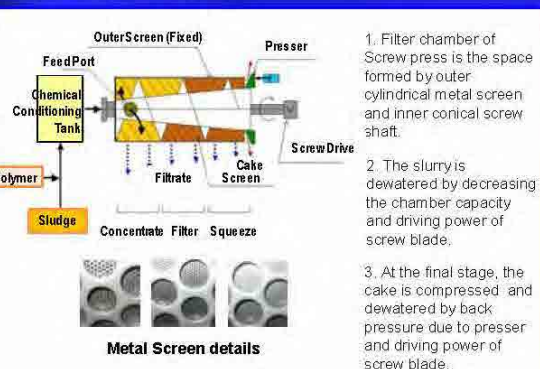
(Quoted from Sewage States of Japan Sewage Works Association (JSWA)) 27/

Structure



28/

Mechanical Design



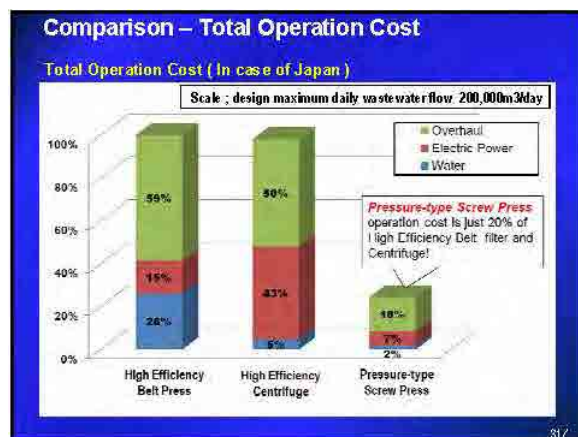
29/

Advantage of Pressure-type Screw Press

1. Adjustable cake moisture content (%) and treating capacity (kg.ds/hr) by adjusting the rotation speed
2. Consumed electric power is very low, since motor rotation speed is low.
3. Structure is simple and not heavy so maintenance work is very easy
4. Less vibration and noise due to low speed rotation
5. Metal filter is applied so less clogging and easy for washing
6. Little odor due to enclosed construction
7. Less washing water is required
8. Less maintenance time during regular inspection
Ref. In case of Centrifuge, it is necessary for a month in supplier's site
9. It is possible to stop and start the operation as it is
Ref. In case of others, it is necessary to discharge all cake out of body and need to fill the sludge in the body before start operation

30/

Figure A4.3 Presentation Power Points ②(Introduction Japanese Technologies I)-5



Conclusion

- ◆ The Pressure-type Screw Press provides not only less electricity consumption than Belt Press Filter or Centrifuges, but also reduces the maintenance cost.
- ◆ Sludge dewatering capacity depends on Polymer and sludge properties.
- ◆ Good selection of the Pressure-type Screw Press will bring about the best result for customer.
- ◆ The Pressure-type Screw Press is trend of dehydrator in Japanese sewage treatment plant.

33/

- Organic content of sewage sludge is gradually increasing.
70% in 1980 - 85% in 2010
- Sewage sludge becomes good energy resources, we are planning to develop sewage gas generation and sewage sludge derived solid fuel which is used in power plant instead of coal.

34/

Thank you for your kind attention

35/

Figure A4.3 Presentation Power Points ②(Introduction Japanese Technologies I)-6

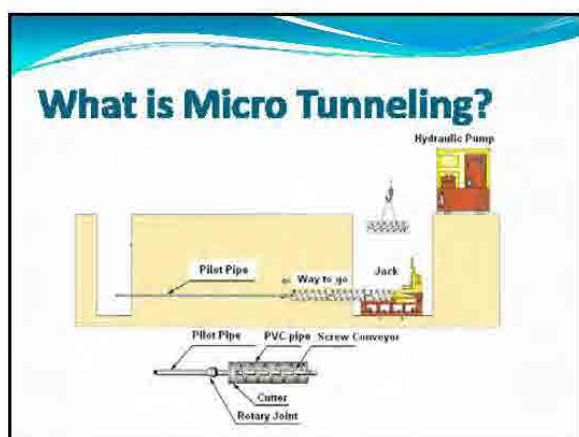
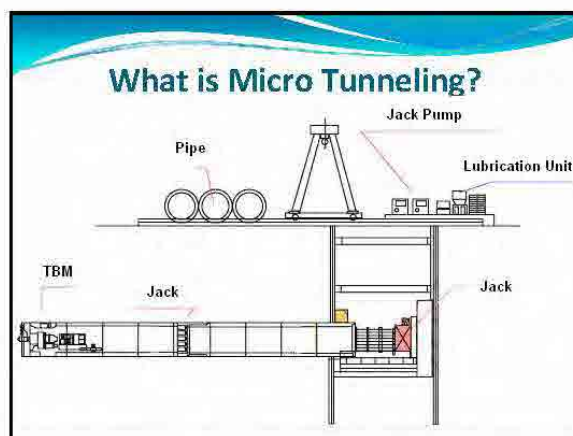
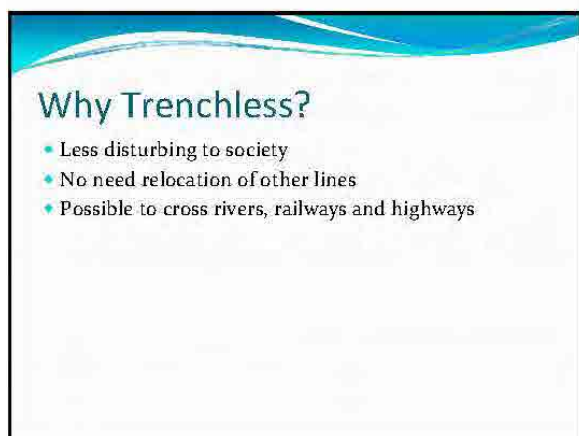
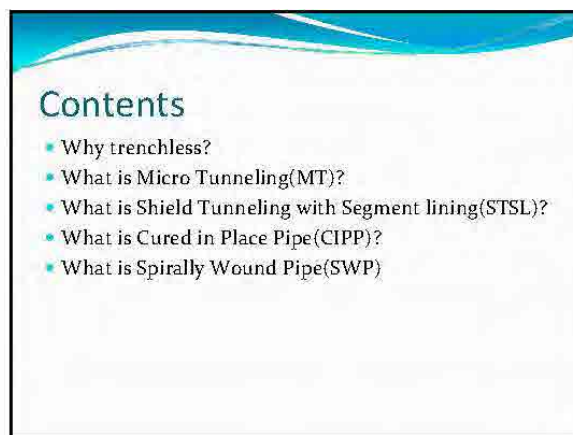


Figure A4.3 Presentation Power Points ③(Introduction Japanese Technologies II)-1

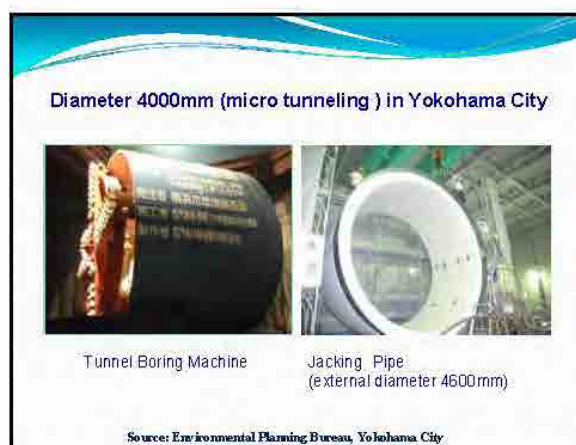


Figure A4.3 Presentation Power Points ③(Introduction Japanese Technologies II)-2

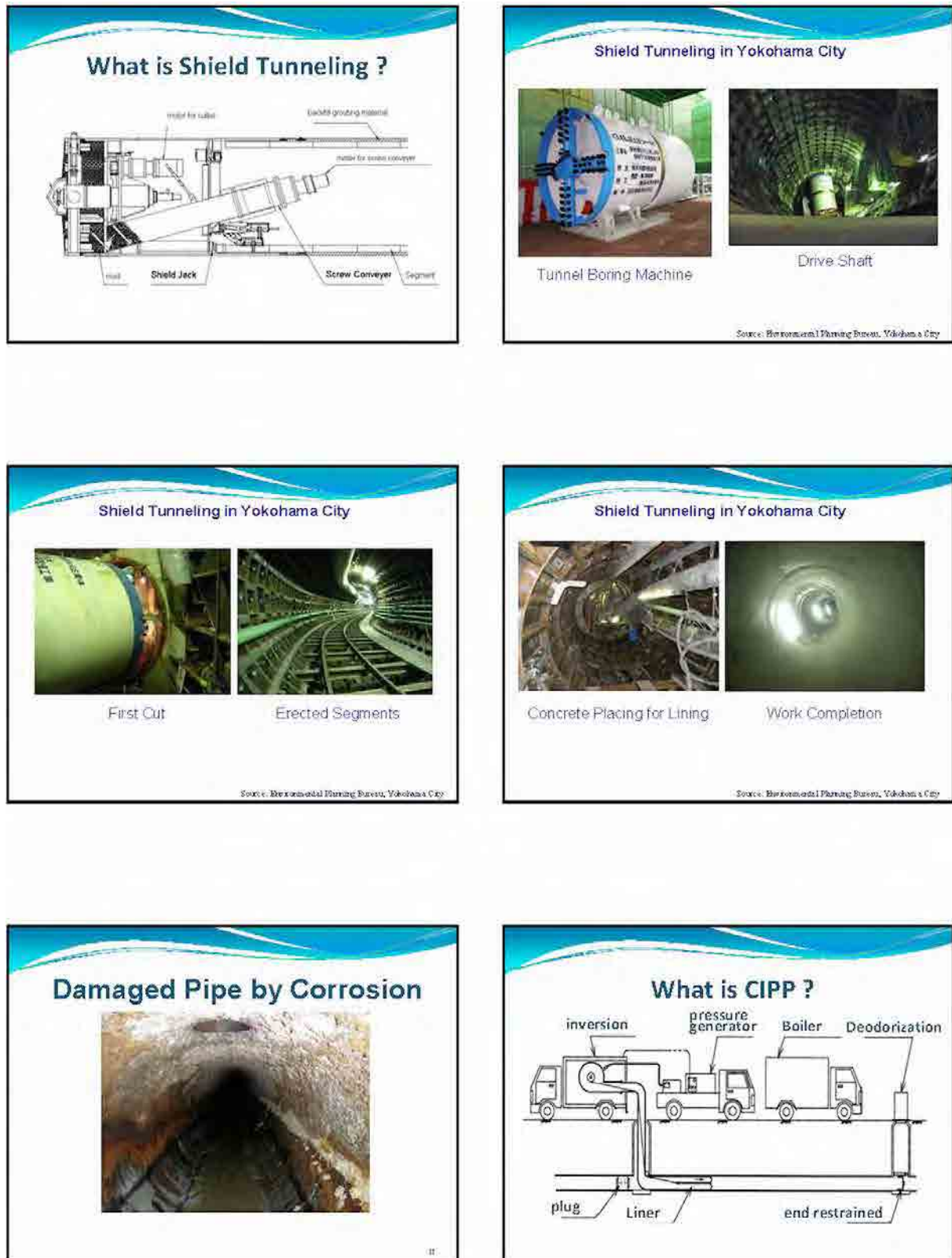


Figure A4.3 Presentation Power Points ③(Introduction Japanese Technologies II)-3

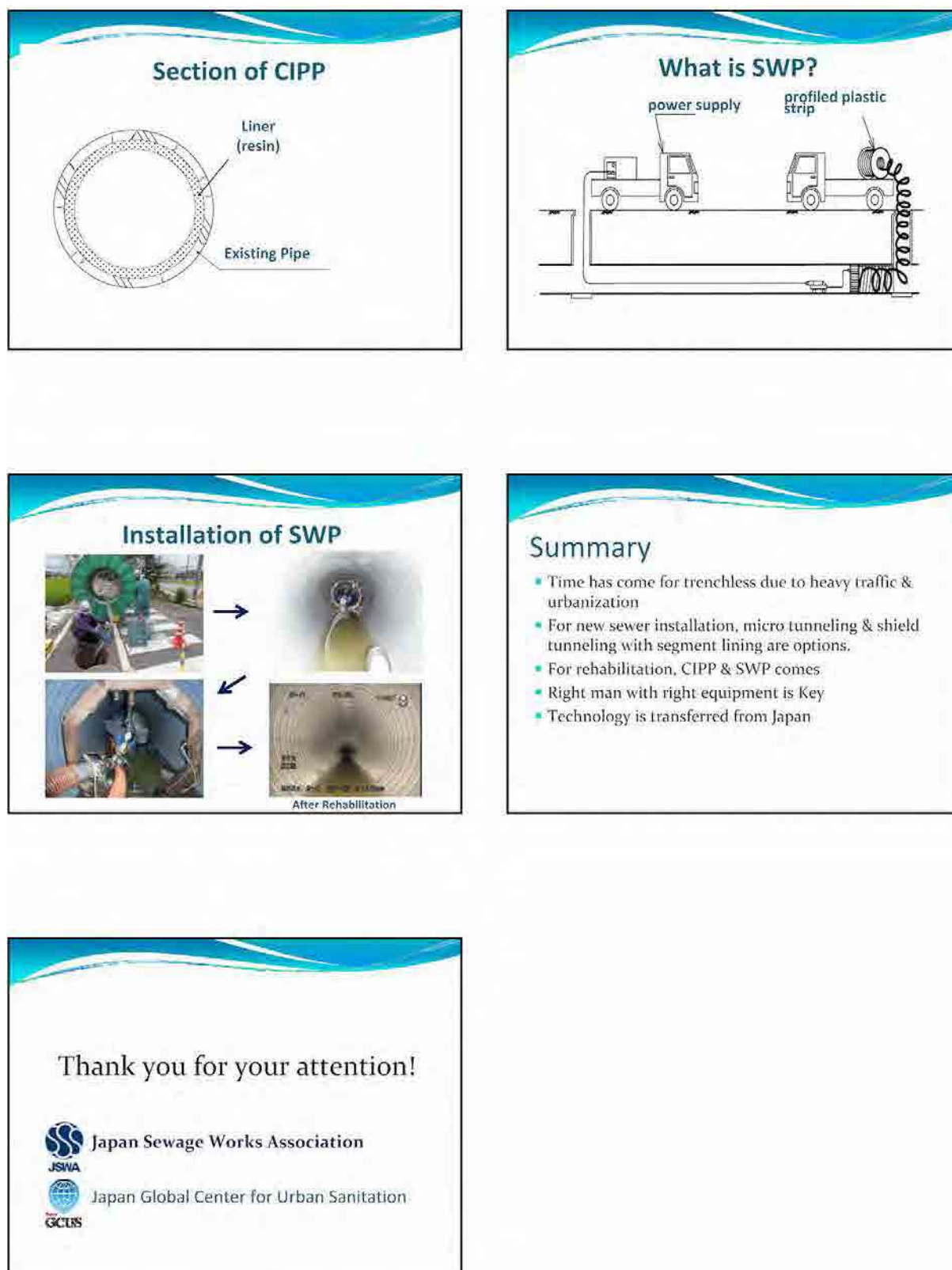


Figure A4.3 Presentation Power Points ③(Introduction Japanese Technologies II)-4

Economic Impact of Sanitation
Based on WSP's study 'Economic Impact
of Sanitation in Southeast Asia'

August 24, 2012
Colombo, Sri Lanka
Kazushi HASHIMOTO
Financial Analyst
JICA Data Collection Survey for
Sewerage Sector in Sri Lanka

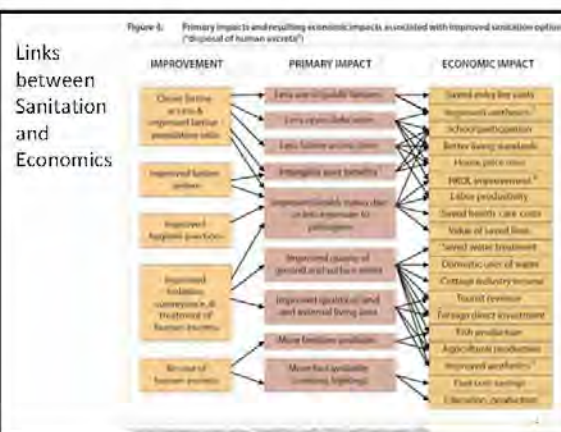
Why did WSP conduct this study?

- Sanitation is one such neglected aspect of development. Among the many priorities of households as well as governments, it is often pushed down the agenda, and left as an issue to be dealt with by someone else, or not at all. Indeed, without information on the link between sanitation and economic development, it is hardly surprising that sanitation is sidelined.
- If governments and households are to be convinced that expenditure on improving sanitation is worthwhile, strong evidence is needed to better understand the various impacts of poor sanitation: on health, the environment, population welfare, and, ultimately, on economic indicators.

(In the Foreword of 'Economic Impacts of Sanitation in Southeast Asia'. WSP Research Report August 2008)

WSP's study on Economic Impact of Sanitation in South East Asia
WSP = Water and Sanitation Program (World Bank)

- Economic impact of Sanitation in Southeast Asia 2008
- Economic impacts of sanitation in **Cambodia** 2008
- Economic impacts of sanitation in **Indonesia** 2008
- Economic impacts of sanitation in **the Philippines** 2008
- Economic impacts of sanitation in **Vietnam** 2008



WSP uses these cost items in their analysis.

Table 2. Financial and economic costs of poor sanitation measured in the study

Impact category	Sub-impacts evaluated	Financial costs attributable to poor sanitation	Economic costs attributable to poor sanitation
1. Health	<p>Health care costs</p> <p>Productivity costs</p> <p>Premature mortality</p>	<p>Marginal health seeking costs including patient transport, medication cost in public sector, and private sector tariff increase due to lost adult working days due to sickness</p> <p>Short-term household income loss due to adult death (1 year)</p>	<p>Investment in household & community health care and patient transport costs</p> <p>Welfare loss due to adult and child sickness time</p> <p>Discounted lifetime productivity loss to adult & child death</p>
2. Water resources	<p>Drinking water costs</p> <p>Domestic water use</p> <p>Recreation</p>	<p>Water treatment and distribution</p> <p>Additional expenditure sourcing water from non-polluted sources</p>	<p>Investment in household water treatment</p> <p>Investment in water treatment plant</p> <p>Investment in water treatment plant</p>
3. External environment	Land quality		Economic value of land made unusable by poor sanitation
4. Other welfare	Time loss		Welfare loss due to adult & child travel time for sanitation
5. Tourism	Tourism costs		Revenue lost from tourism industry

Results of WSP's Study (1)

- Cambodia, Indonesia, the Philippines and Vietnam lose an estimated US\$9 billion a year because of poor sanitation (based on 2005 prices). That is approximately 2% of their combined Gross Domestic Product, varying from 1.3% in Vietnam, 1.5% in the Philippines, 2.3% in Indonesia and 7.2% in Cambodia.
- The annual economic impact is approximately US\$6.3 billion in Indonesia, US\$1.4 billion in the Philippines, US\$780 million in Vietnam and US\$450 million in Cambodia.

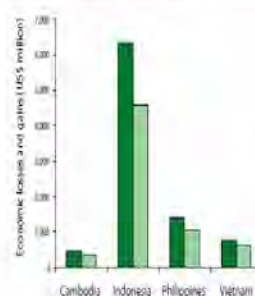
Figure A4.3 Presentation Power Points ④(Economic Impact of Sanitation)-1

Results of WSP's Study (2)

- With the universal implementation of improved sanitation and hygiene, it is assumed that all the attributed impacts would be mitigated, except for health, for which 45% of the losses would be mitigated.
- This would lead to an annual gain of US\$6.3 billion in the four countries.

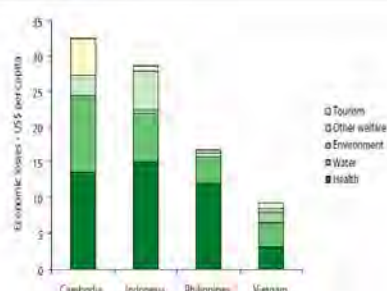
Results of WSP's Study (3)

Overall annual economic losses and gains (in US\$ million)



Results of WSP's Study (4)

Annual per capita losses, by impact (US\$)



Losses caused by the poor sanitation (Case of Indonesia)

Impact	Financial Losses			Economic Losses		
	Value (IDR billion)	Per capita (IDR thousand)	%	Value (IDR billion)	Per capita (IDR thousand)	%
Health Costs	2,719	12.4	25.3	29,512	133.3	52.7
Health care costs	1,236	5.3	11.5	1,642	7.1	2.9
Productivity costs	1,033	4.4	9.6	3,090	14.1	5.5
Premature death costs	441	1.8	4.1	24,780	112.1	44.3
Water Resource Costs	8,016	36.2	74.7	13,379	60.0	73.9
Drinking water	7,063	31.6	66.0	11,379	51.2	20.3
Domestic water uses	936	4.4	6.7	1,156	5.3	2.1
Fish production				912	3.5	1.5
Environment Cost				847	3.5	1.5
Land use				847	3.5	1.5
Tourism Cost				1,465	7.1	2.6
Tourist loss				1,465	7.1	2.6
Other welfare Cost				10,770	48.6	19.3
Time use				10,770	48.6	19.3
TOTAL	10,735	48.6	100.0	55,952	252.5	100.0

Rivers in Indonesia are very polluted.

Table 11. Total release of domestic human waste to water bodies

Province	Total release			Polluting substances (thousand tons)					
	Feces (thousand kg)	Urine (thousand m3)	Gray (million m3)	BOD	N	P	TSS	Coliform count (10^4/15)	
Daily									
National	1,728	170	2,356	48	22	10	91	13	
Sumatra	111	7	94	19	9	4	51	8	
Annually									
National	628,080	62,000	858,160	17,520	8,040	3,650	33,095	4,745	
Sumatra	40,590	2,667	34,064	6,840	3,240	1,456	18,585	2,920	

Source: Aekomassion

Losses caused by the poor sanitation (Case of Indonesia)

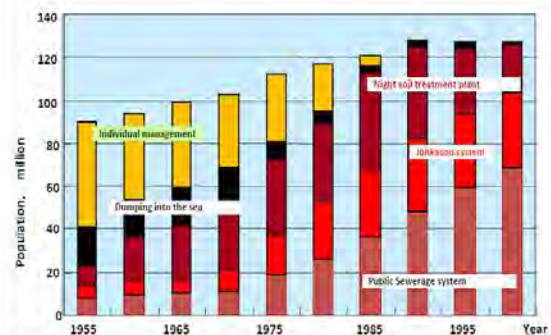
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Figure A4.3 Presentation Power Points ④(Economic Impact of Sanitation)-2

Japan's Case

- Sanitation including sewerage is usually given low priority. Japan was no exception 40 years ago. — In 1964 when the first Olympic Game in Asia was held in Tokyo and the Bullet Train started operation, the sewerage coverage in Japan was only 8%.
- In 1960s, many incidents of human suffering due to environmental pollution happened such as 'MINAMATA' disease.
- Politics brought changes. In 'Pollution Parliament' in 1970, only environmental issues were debated and 14 laws related to environment were passed.
- Everybody started to invest in the wastewater management since then. Nowadays, Japan's wastewater is 100% treated by either the public sewerage system or the well regulated on-site system (Johkasou system + nightsoil treatment).

Japan's Sanitation Coverage



How much money is spent for sanitation (sewerage)?

Country	How much is spent for sanitation (sewerage)?	Percentage in GDP
Japan	¥ 3.5 Trillion (2000) sewerage only	1.00%
Tunisia	TD 525 Million sewerage only	0.26%
Malaysia	RM 992 Million (2006) sewerage only	0.17%
Indonesia	US\$ 5.5 Billion (2010-2014) all sanitation	0.13%
Sri Lanka	LKR 5,880 Million (NWSDB 4,930 Million + CMC 950 Million) (2012 Budget) sewerage only	0.06%

Thank you very much for your attention!

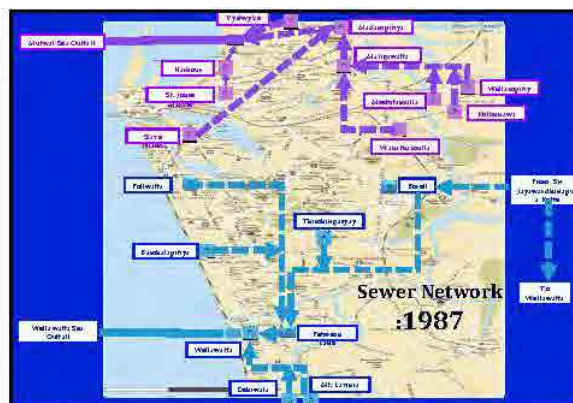
Figure A4.3 Presentation Power Points ④(Economic Impact of Sanitation)-4



Figure A4.3 Presentation Power Points ⑤(Sewerage Works in Sri Lanka)-1

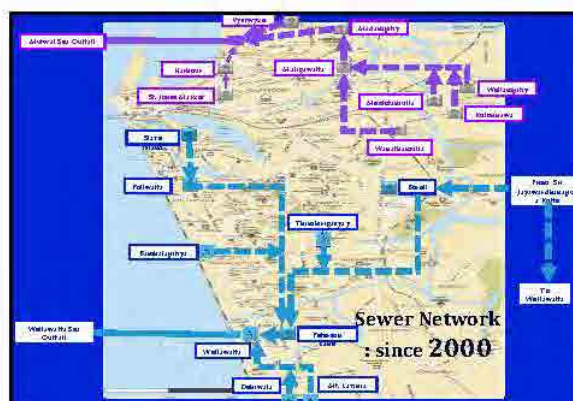
History: Continued..

- ❖ 1983-1987: Greater Colombo Sewerage System rehabilitated with World Bank and Saudi Assistance and two sea outfalls of 1500mm diameter were constructed at Mutwal and Wellawatta.



History: Continued..

- ❖ 1993 : Updating of Wastewater Master Plan for the Greater Colombo area by an American Consultancy Firm with the assistance of World Bank
- ❖ 1998-2000: Preparation of feasibility study for the Greater Colombo area including immediate works by Atkins with the assistance of British funding
- ❖ 2000: Beiral Lake Restoration Project implemented with World Bank Assistance (New PS at Slave Island and diversion of wastewater flow)
- ❖ 2006-2008: Rehabilitation of Northern Catchment (Construction of new PS at Madampitiya and 7.4 km line rehabilitation)
- ❖ 2008-2010: Colombo Sewerage Rehabilitation Project (Southern Catchment): (Construction of new PS at Wellawatta and 7.7 km line rehabilitation)



History: Development of Other Physical Infrastructure

1980 - 2012:

The following Schemes with treatment plants were constructed

- | | |
|------------------------------|---------------------------------|
| ❖ Mattegoda Housing Scheme | ❖ Digana Village Housing Scheme |
| ❖ Soysapura Housing Scheme | ❖ Kataragama Sewerage Scheme |
| ❖ Raddolugama Housing Scheme | ❖ Hikkaduwa Sewerage Scheme |
| ❖ Hantana Housing Scheme | ❖ Modarawile Sewerage Scheme |

History: Development of Other Physical Infrastructure Cont..

1980 - 2012:

Others

- ❖ Jayawardenagama Housing Scheme
- ❖ Maddumagewatte Housing Scheme
- ❖ Maligawatte Housing Scheme
- ❖ Crow Island Housing Scheme
- ❖ Stace Road Housing Scheme

Figure A4.3 Presentation Power Points ⑤(Sewerage Works in Sri Lanka)-2



Figure A4.3 Presentation Power Points ⑤(Sewerage Works in Sri Lanka)-3

Development Goals of Sewerage

Millennium Development Goals (MDG)

- ❖ Access to adequate sanitation for 90% of population of Sri Lanka by 2015 and 100% by 2025
- ❖ Piped Sewerage systems to major urban areas and selected growth centers
- ❖ Availability of Standard On-site sanitation to all those not connected to a sewer system.

Development Goals of Sewerage

GOSL Goals (Mahinda Chinthanaya)

- ❖ Provision of Piped Sewerage systems to major urban areas and selected growth centers
- ❖ Facilitate for Standard On-site sanitation to all those not connected to a sewer system
- ❖ Sri Lanka Government Targets for Pipe Borne Sewerage (Mahinda Chinthanaya 2010, P61-62)

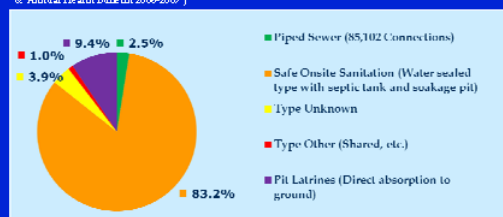
Year	2005	2009	2015	2020
Pipe borne sewerage coverage (%)	2.0	2.5	3.0	7.0

Present Status of Sewerage In Sri Lanka

Present Scenario of Sanitation Coverage

Sanitation Type	Estimated Population Coverage
Piped Sewerage (Offsite)	507,435 (02.5%)
Onsite Sanitation	19,887,200 (83.2%)
Without Proper Sanitation (Includes Type Unknown/Other Pit Latrines)	2,902,500 (14.3%)

(Projection as at end of 2010 based on sources from: NWS&DB, Census and Statistical Data Publication 2001 & Annual Health Bulletin 2006-2007)



Population coverage by Piped Sewerage

City	Total Population	Estimated Population coverage
Columbo city	715,000	48,5615
Dollavala / Mt. Lavinia	115,000	10,790
Kolonnawa	60,000	6,380
Pattunnamma	20,000	4,300
Hikkaduwa	30,000	5,000
Total	940,000	40,255

Housing Scheme	No. of Connections	Population Covered
Soyagapura Housing Scheme	2,268	11,940
Mattigoda Housing Scheme	1,240	6,200
Jayawardanapura Housing Scheme	630	4,230
Madumagawatta Housing Scheme	192	960
Eddelugama Housing Scheme	2,100	10,500
Malgawatta Housing Scheme	1,510	7,550
Crowland Housing Scheme	294	1,470
Stace Road Housing Scheme	240	1,200
Hantana Housing Scheme	385	1,925
Digana Village Housing Scheme	250	1,250
Total	9,459	47,250

Wastewater Treatment Systems at BOI assisted Export Processing Zones

No	Export Processing Zone	Capacity m ³ /day	Wastewater Treatment System	Remarks
1	Diyagama	18,000	1. Mechanical Aerated Lagoon (Flow through type) 2. Extended Aeration system	Proposed to augment up to 20,000 m ³ /day
2	Seethawala	9,900	Extended Aeration System	Proposed to augment up to 12,900 m ³ /day
3	Pattunnamma	5,000	Mechanical Aerated Lagoon (Flow through type)	Completed
4	Mugama	400	Package Plant	Completed
5	Waddugittivala	900	Package Plant	Completed
6	Poggalawa	450	Extended Aeration System	Completed
7	Poggala	675	Extended Aeration System	Proposed to augment up to 2,000 m ³ /day
8	Kandy	1,000	Extended Aeration System	Under construction
9	Mawathagama	300	Extended Aeration System	Completed
10	Horana	1,000	Package Plant (Rotating Biological Contactors)	Completed
Total Capacity		30,625		

Figure A4.3 Presentation Power Points ⑤(Sewerage Works in Sri Lanka)-4

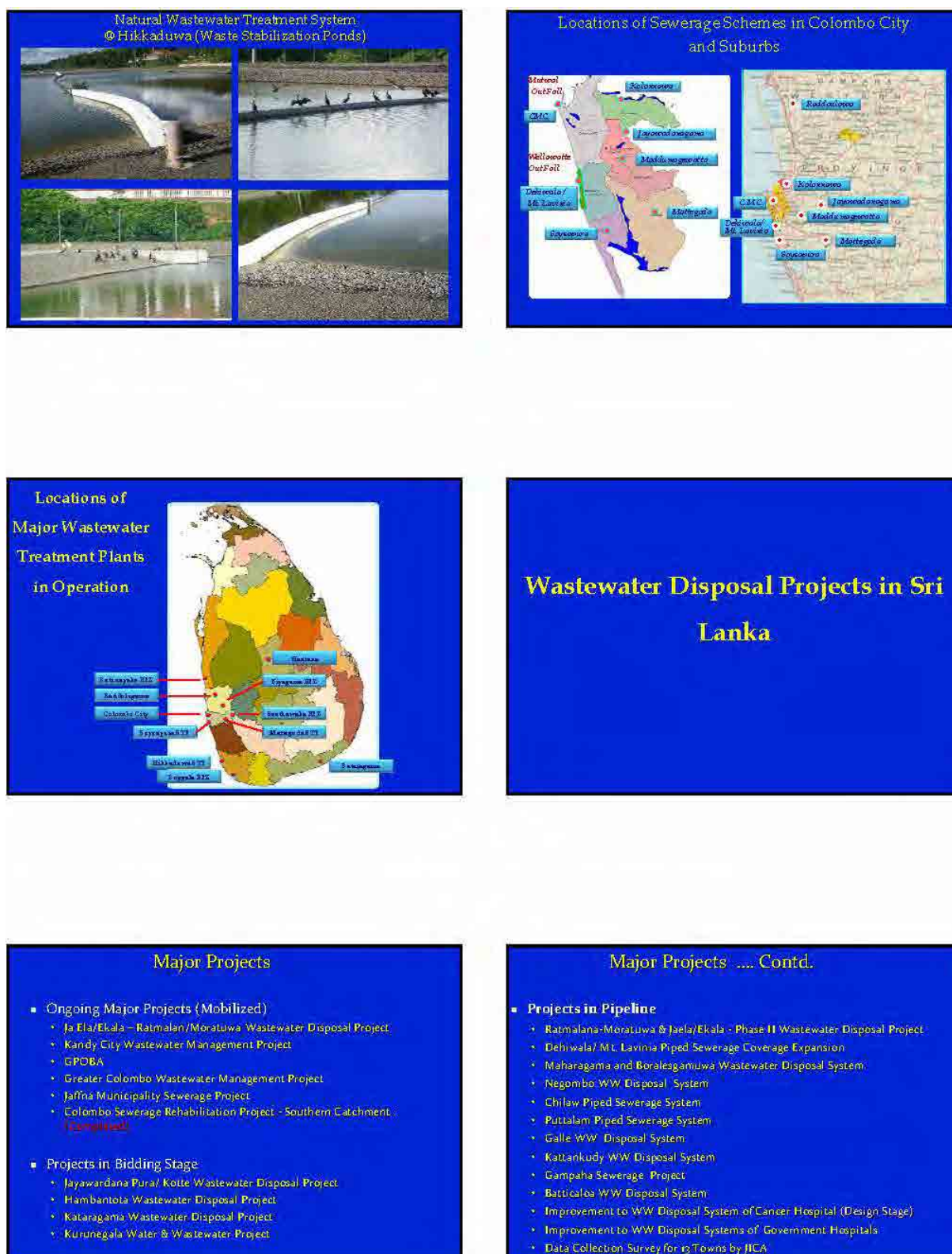
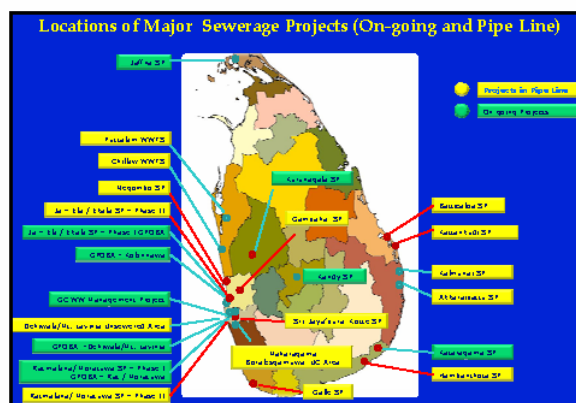


Figure A4.3 Presentation Power Points ⑤(Sewerage Works in Sri Lanka)-5

Details of On Going Piped Sewerage Projects			
	SCHEME	POPULATION COVERAGE	TOTAL ESTIMATED COST (Rs. M.)
1	Colombo Sewerage Rehabilitation Project – Southern Catchment	180,000	Total – 1,322 [F – 1,585 L – 6,37]
2	Wastewater Disposal Project for Ratmalana/ Moratuwa and Jaela / Ekala Areas - Phase I	80,000	Total – 16,155 [F – 11,033 : L – 5,122]
3	Kandy City Wastewater Disposal Project	55,000 + 150,000 Floating population	Total – 22,591 [F – 18,317 : L – 4,274]
4	GPOBA (The Global Partnership on Output Based Aid)	764,000	Total – 1,197 [F – 636 : L – 561]
5	Jaffna Municipality Sewerage Project	100,000	4,500
6	Greater Colombo Waste Management Project – NWSDB	150,000	1,012
7	Greater Colombo Waste Management Project – CMC	600,000	12,300
	TOTAL	1,394,400	50,977

Details of Projects In Pipe Line			
	PROJECT	POPULATION	TEC / RS. M
01	Kuruogala Water & Wastewater Project	32,000	8,283
02	Hambantota WW Treatment System	30,400	6,782
03	Sri Jayawardenepura Kotte Sewerage Project	138,300	22,060
04	Wastewater Disposal Project for Ratmalana-Moratuwa & Jaela/Ekala - Phase II	49,600	8,462
05	Augmentation of Kataramana Sacred City Sewerage Project	23,000	1,324
06	Waste Water Disposal System for Maharagama and Boralesgamuwa UC Area	27,300	2,281

Details of Projects In Pipe Line ... Contd.			
	PROJECT	POPULATION	TEC / RS. M
07	Negombo WW Disposal System	86,700	6,700
08	Chilaw Piped Sewerage System	4,700	2,445
09	Puttalam Piped Sewerage System	7,300	2,605
10	Kattakudy WW Disposal System	79,000	3,194
11	Galle WW Treatment System	34,600	2,248
12	Expansion of Piped Sewerage Coverage to Dehiwal / ML Lavitola	138,000	7,446
13	Batticaloa WW Disposal System	64,200	1,960
14	Gampaha Sewerage Project	25,000	803
15	Cancer Hospital - Connects to Ratmalana /Moratuwa wastewater treatment plant	2,000	238
	TOTAL	742,000	76,786

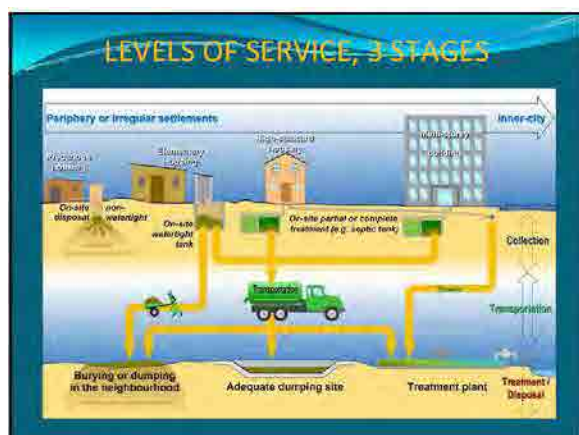


Thank You

Figure A4.3 Presentation Power Points ⑤(Sewerage Works in Sri Lanka)-6



Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-1



Characteristics of On-Site Sanitation

The autonomous part of on-site sanitation refers to the techniques used (purification of water), its design, as well as its financing, implementation and maintenance.

- Individual on-site sanitation, when a house (plot) makes use of the soil as a treatment medium (example of soak-away, latrines, etc),
- Grouped On-Site sanitation (or semi off-site sanitation), when many individual houses are linked to a network leading to a treatment system, or small communities: grouped sanitation doesn't always use the soil as treatment medium (filtration beds, activated sludge are examples of purification systems at the end of the chain).

Simple Pit latrine

Pit latrine or traditional latrine

- Wooden or concrete slab with a drop hole installed over a pit of 2 m or more in depth. This support should stand on a sufficiently waterproof edge of the pit to avoid surface water (runoff and grey water) entering and destroying the facility. The pit should be lined in case of unstable soil where there is a risk of walls collapsing. However, in the case of lining, openings have to be provided in the walls to allow infiltration of liquid in the soil.
- A superstructure is necessary to provide privacy and protection:

Advantages

- Relatively cheap
- Can be constructed by the user (particularly in rural areas)
- Does not need water to function
- Easy to maintain

Disadvantages

- Nuisance because of flies, insects (mosquitoes if pit is wet)
- Bad smell

NWSDB ONSITE SANITATION SYSTEMS

SIMPLE PIT LATRINE

- Most common & simple
- Excrete fall directly into a hole in the ground
- In the pit excreta decompose
- Gases like carbon dioxide and methane escape to atmosphere or absorbed by the soil
- Water infiltrates through the bottom and sides
- Solid residue gradually accumulates in the pit
- Unsatisfactory pit latrines are nuisance from flies, bad smell and due to mosquitoes breeding

Manual Pit Latrine Construction
Technical Manual Series on Rural Water Supply & Sanitation
NWSDB, Colombo Sri Lanka

VENTILATED IMPROVED PIT LATRINES (VIP)

Ventilated improved pit latrines (VIP)

Self-ventilated improved pit latrines. The principle is to cancel or to reduce harmful side-effects (smells and flies) related to traditional latrines by providing a vent pipe higher than the superstructure. Wind that blows at the top of the pipe creates an ascending air current between the pit and the outside atmosphere, and a descending air current between the superstructure and the pit through a drop hole. Smells are evacuated through the vent pipe. There are two types of VIP latrines: one pit latrines and double or multiple pit latrines.

Advantages

- Relatively cheap
- Can be constructed by the user
- Does not need water to function
- Easy to maintain
- No smell and no flies
- It can take different sorts of cleansing materials (solid and liquid)

Disadvantages

- Darkness is indispensable within the superstructure to fight off flies
- Only functions properly when conveniently oriented towards the wind
- No surrounding obstacle (trees and buildings) should be higher than the vent pipe

NWSDB ONSITE SANITATION SYSTEMS

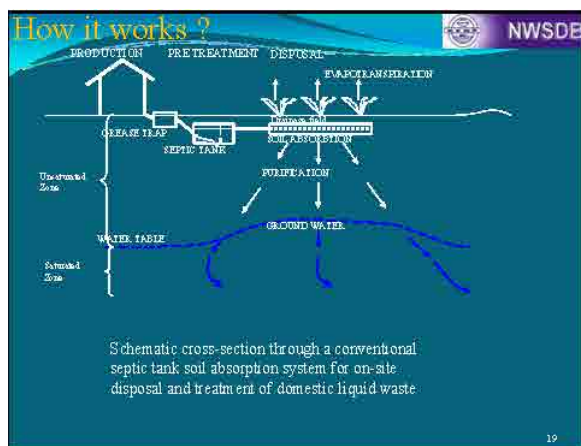
VENTILATED IMPROVED PIT LATRINE

Manual Pit Latrine Construction
Technical Manual Series on Rural Water Supply & Sanitation
NWSDB, Colombo Sri Lanka

Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-2



Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-3



Problems in on site systems?

- Faulty design & construction of septic tanks
 - Inadequate water depth for solid separation
 - Failure in construction/water tightness
- Faulty design of soakage arrangements
 - High seasonal ground water table
 - Presence of non favorable soils
 - Presence of shallow rock
 - Prone for flooding
 - Overloading

What are the Consequences?

- Spreading of water borne diseases
- Contamination of water resources
- Environmental consequences
 - Algal blooms (Eutrophication of lakes/water bodies)
 - Capital Investment for restoration work is massive
 - Depletion of Oxygen

NWSDB Treatment Options

SLS 745:Part I: 2004

- Part I- Small systems disposing to ground

SLS 745:Part II: 2009

- Part II- Systems Disposing To Surface, Systems For On-site Effluent Reuse And Larger Systems Disposing To Ground



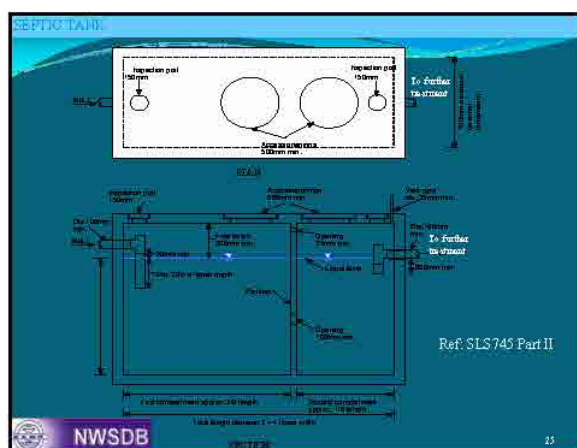
What Are We Talking About?

Septic Tank Performance

Parameter	Concentration in Raw Sewage from the House, (mg/L)	Percent Reduction in the Tank
BOD ₅	200 - 290	40 - 50 %
TSS	200 - 290	50 - 70 %
Nitrogen	35 - 100	20 - 30 %
Phosphorus	18 - 30	30 %
Fecal coliforms (#/L)	10 ⁸ - 10 ¹⁰	?

BOD₅ - Biochemical Oxygen Demand; TSS - Total Suspended Solids

Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-4



NWSDB SEPTIC TANKS

Design Requirements-SLS 745:Part I: 2004
Part I- Small systems disposing to ground

- Main functions
- Free board
- Vent pipe & cowl
- Access
- Commissioning
- Desludging

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SIZING OF SEPTIC TANKS

For existing tanks & New	2			3		
No. of Connections	2	3	4	5	6	7
ST Volume (m³)	1.31	1.80	2.52	1.81	2.51	3.53
ST Length (m)	1.00	1.00	1.20	1.00	1.00	1.20
ST Width (m)	0.75	0.75	0.80	0.75	0.90	1.00
ST Depth (m)	1.75	2.40	2.63	2.42	2.78	2.94
Length / Width	2.33	3.20	3.28	3.23	3.09	2.94
Surface Area (m²)	1.31	1.80	2.10	1.81	2.51	2.94

27

NWSDB SOKAGE PITS

Soakage pits

- Soak septic tank effluent
- Effluent get treated before reaching GW

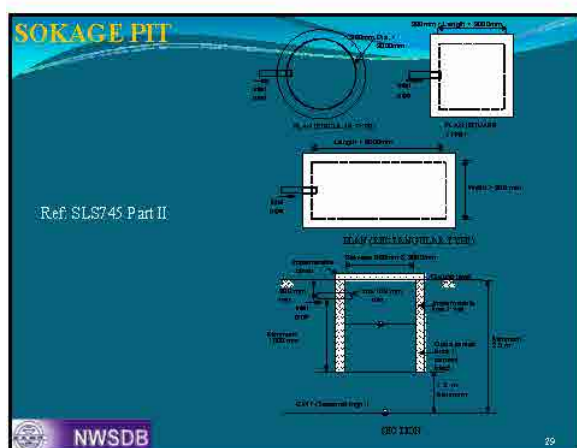
Applicability

- GWT below 2.5m
- Soil percolation rate between 25mm/h to 125mm/h

Location

- At least 18m away from nearest well/drinking water source

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MINIMUM DISTANCE BETWEEN SOKAGE PITS

Ref: table 2, SLS 745 part 2

Average daily flow (m³/d)	Minimum distance between soakage pits (m)
<2	10
2-5	15
5-10	20
10-30	36

30

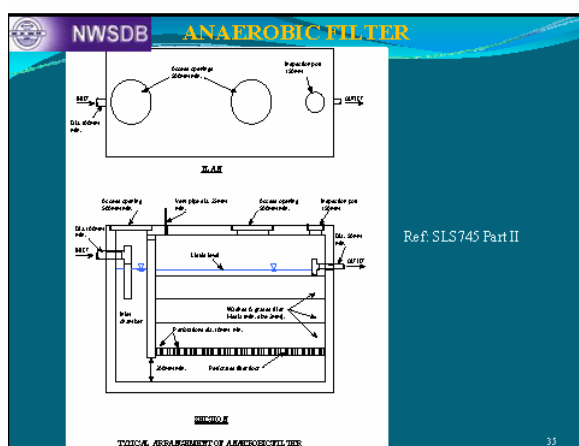
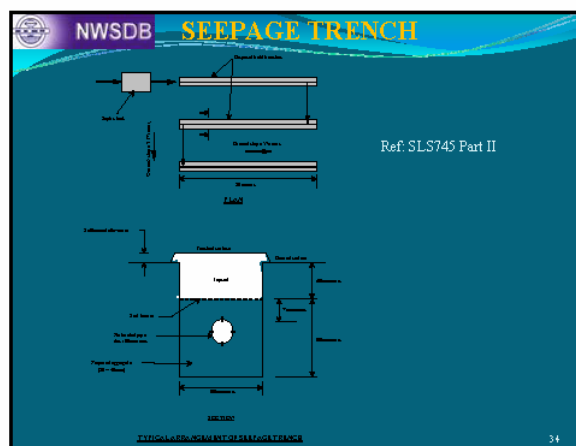
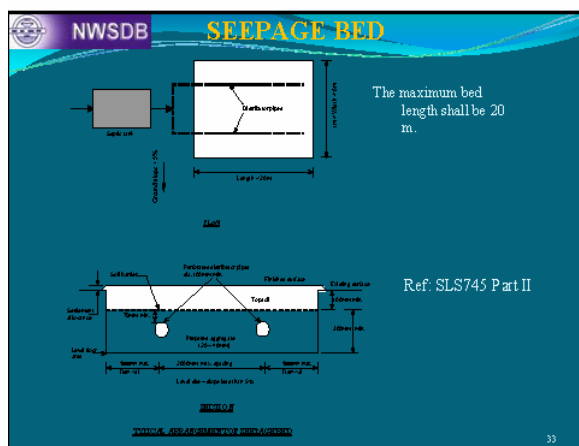
Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-5

Specific Effective Areas for Soakage Pits
Ref :table 3,SLS 745 part 2

Percolation Rate mm/hr	Specific Effective Area (m ² / m ³ per day)
25	34
50	17
75	11
100	8.4
125	6.6

Minimum depth to groundwater table from bottom of soakage pit
Ref :table 4,SLS 745 part 2

Percolation rate (mm/hr.)	Minimum depth to GWT (m)
25-50	1.2
50-75	1.8
75-100	2.4
100-125	3.0



Specific effective areas for seepage beds and seepage trenches
Ref :table 5, SLS 745 part 2

Percolation rate (mm/hr)	Specific effective area (m ² / m ³ per day)
25	50
50	25
75	17
100	12.5
125	10
150	8.3
175	7.1
200	6.25
225	5.6
250	5.0

Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-6

Minimum, maximum and typical dimensions of seepage beds
Ref: table 6, SLS 745 part 2

Bed dimension	Typical Range (mm)	Maximum (mm)	Minimum (mm)
Width	1000-6000	6000	1000
Depth of aggregate	300-600	600	300
Depth of topsoil	100-150	N/A	100
Spacing between beds (sidewall to sidewall)	-	N/A	1000

Typical dimensions of seepage trenches
Ref: table 7, SLS 745 part 2

Trench dimension	Typical Range (mm)	Maximum (mm)	Minimum (mm)
Width	300-600	600	300
Depth of aggregate	300-600	600	300
Depth of topsoil	100-150	N/A	100
Spacing between beds (sidewall to sidewall)	1000-2000	N/A	1000

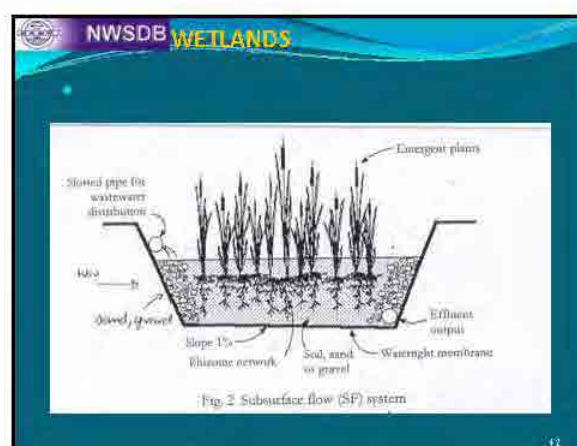
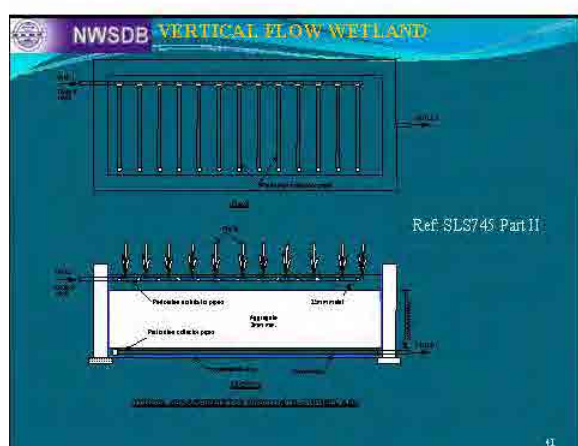
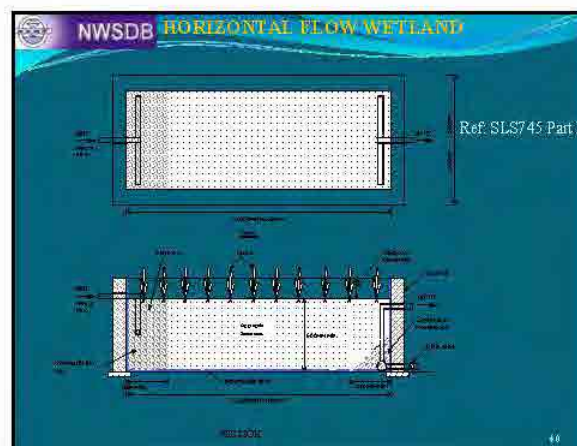
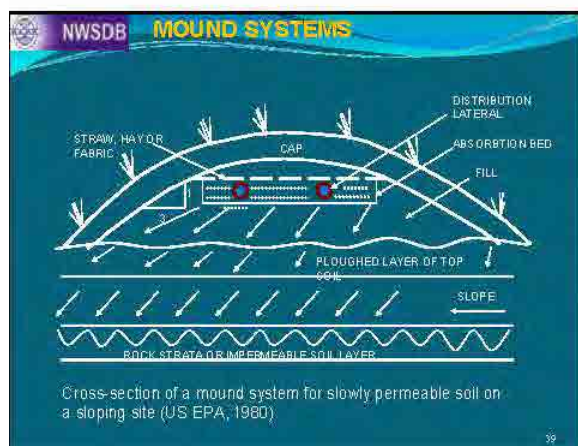
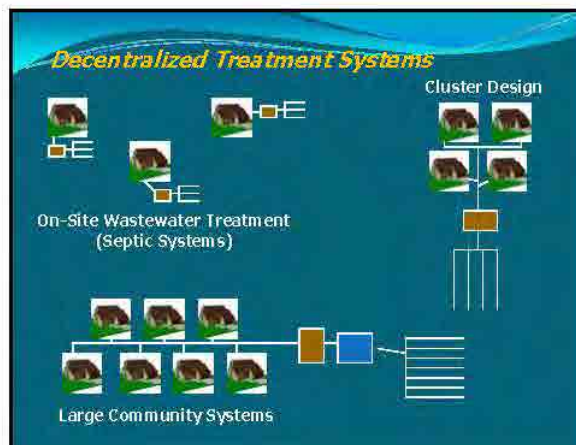
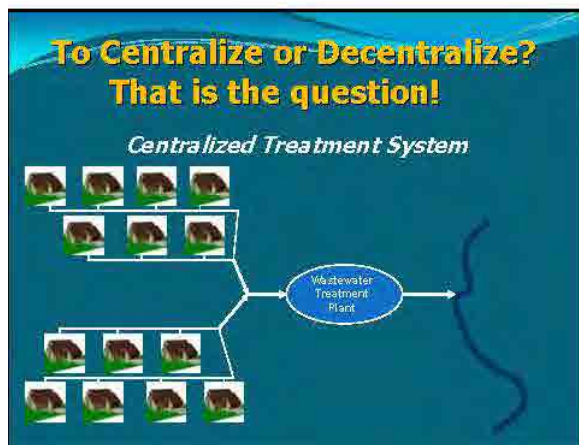
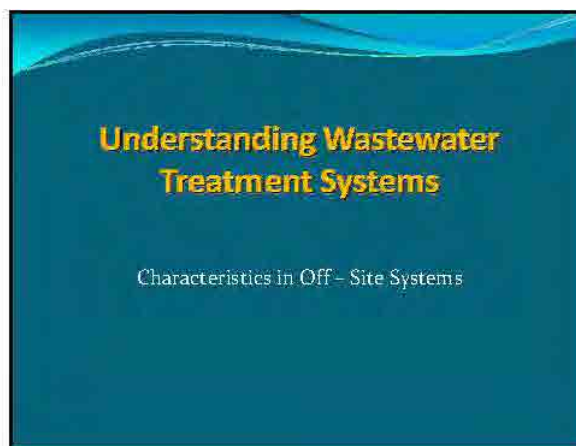


Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-7



Centralized	vs.	Decentralized
On Approval of NPD, CEA, UDA, UC / PRS approval		On approval of UDA, UC, PRS, CEA
<ul style="list-style-type: none"> • Discharge system • Capital intensive • Labor intensive • Provides higher degree of treatment 		<ul style="list-style-type: none"> • Can be a Non-discharge system or a discharge system • Less capital • Less labor, but still needs maintenance (Who maintains?) • Uses soils or plant soil system or a small treatment plant for final treatment

Centralized System Treatment

- **Large Debris:** screened and sent to a landfill
- **Grit Removal:** collected and sent to a landfill
- **Biological Treatment:** microbes use organic matter to grow
- **Clarifiers:** remove floating oil & grease and biosolids
- **Biosolids:** Treated and stabilized sludge containing microbe bodies

Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-8

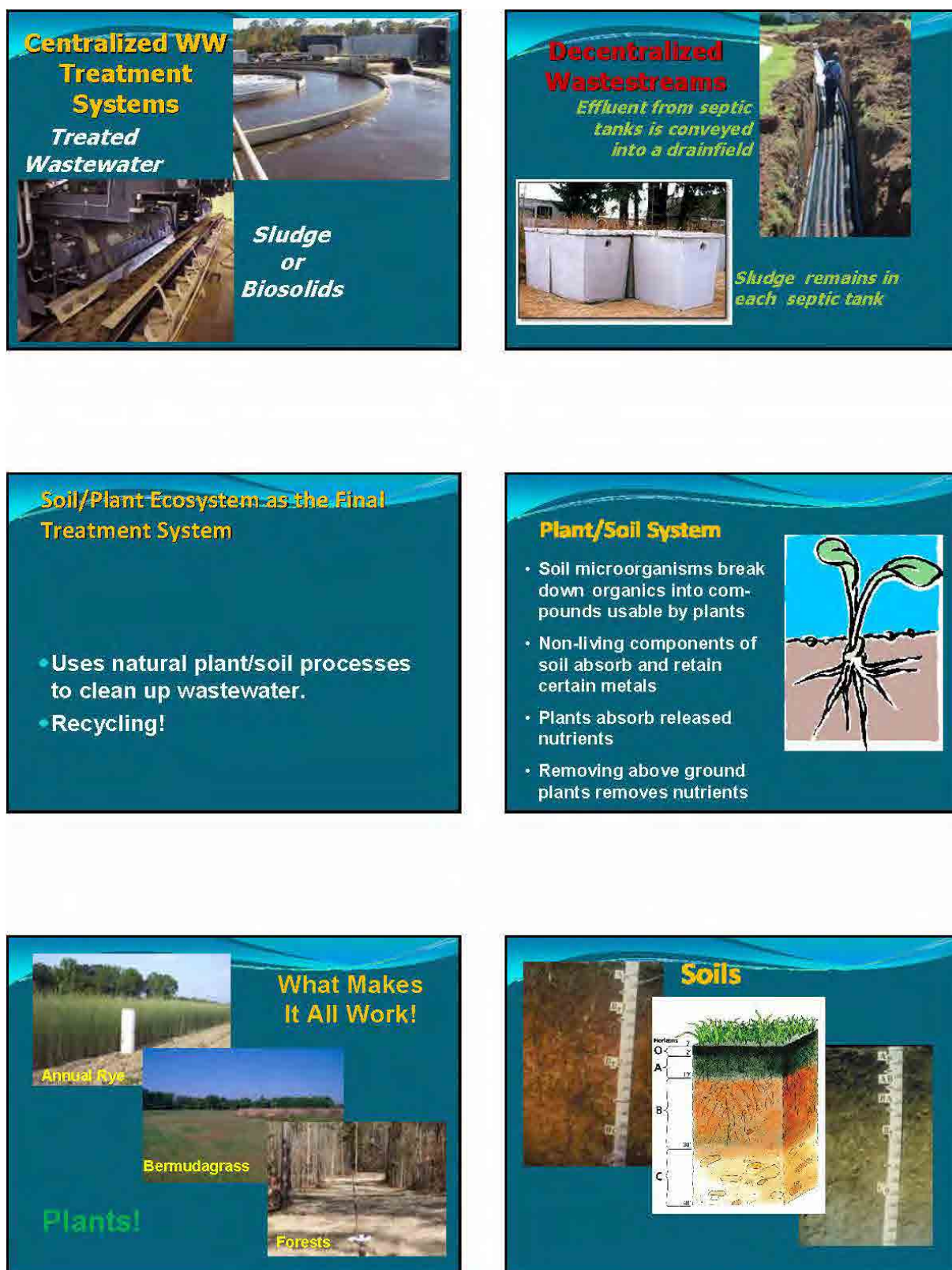


Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-9

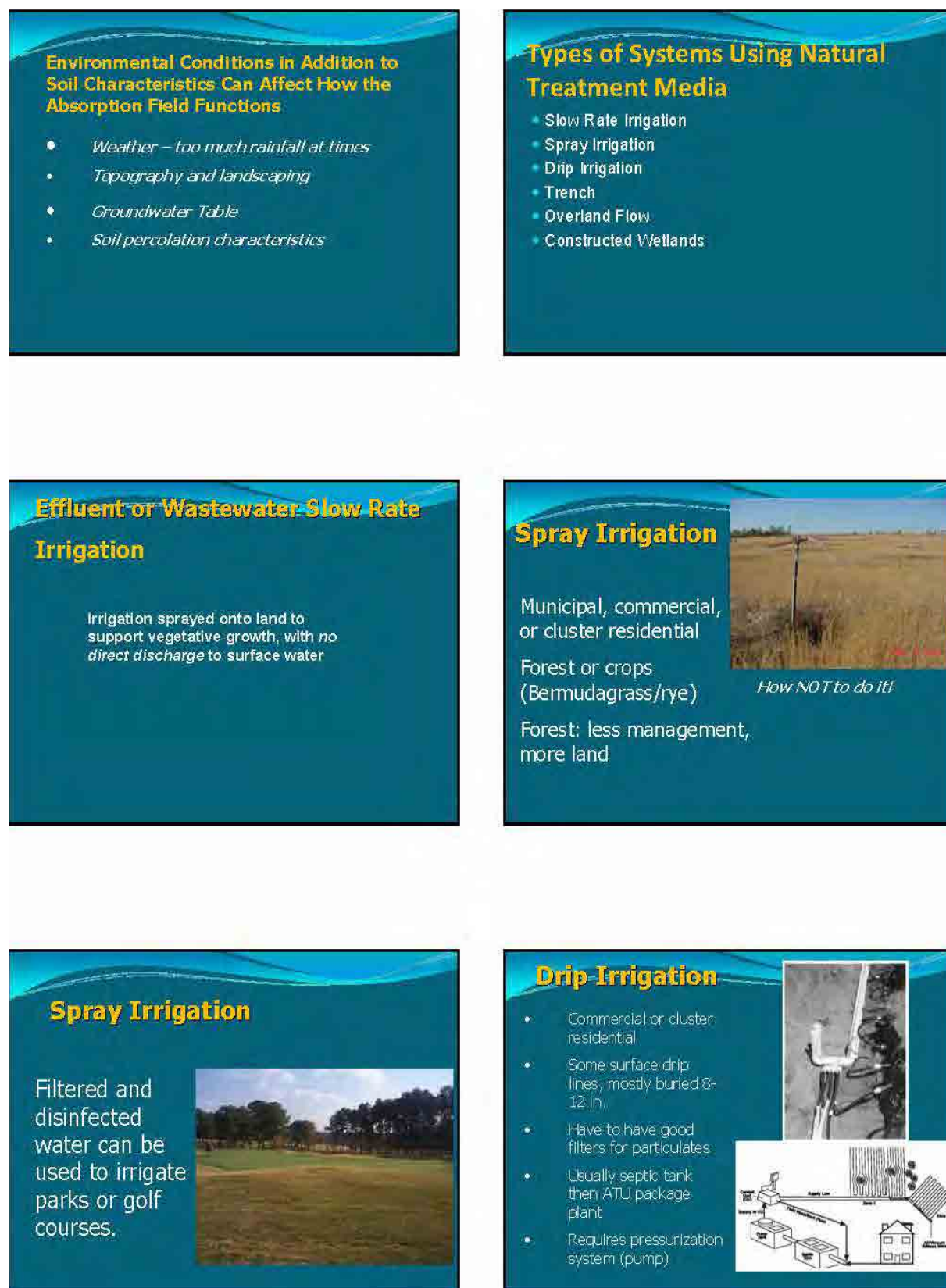


Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-10

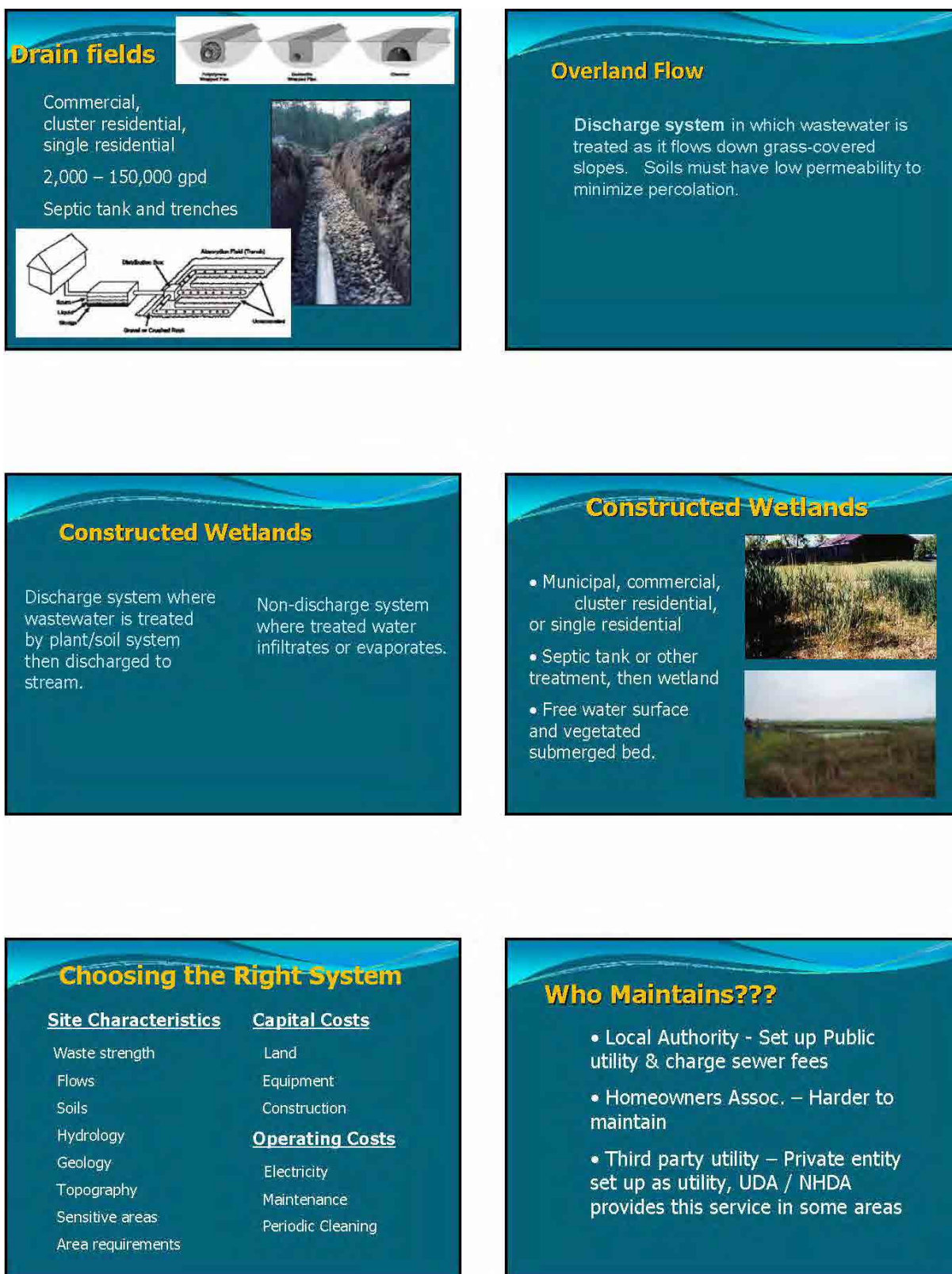


Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-11

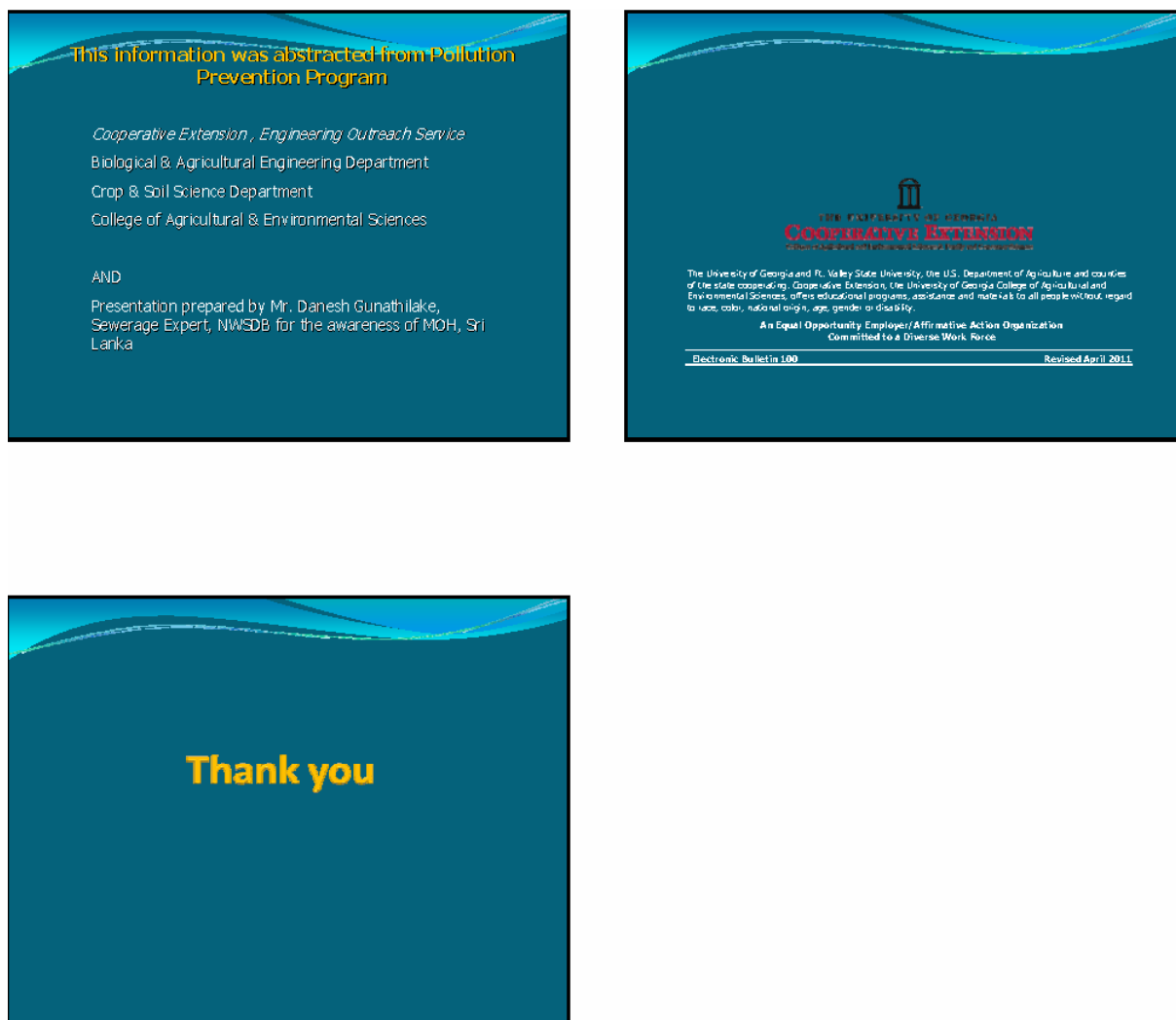


Figure A4.3 Presentation Power Points ⑥(Fundamental Knowledge in Sewerage Works)-12

Appendix 5 Site Visit Training in Japan

A-5.1 Outline of Training Course

(1) Period

From September 8, 2012 to September 15. 2012

(2) Number of Trainees

- Mr. Jayamanne Padmasiri, Additional Secretary (Development), Ministry of Water Supply and Drainage
- Mr. Kumararathna G Asoka, Additional General Manager (Sewerage), National Water Supply and Drainage Board
- Mr. Thushantha Mahindra Ratwatte, Mayor, Kandy Municipal Council

(3) Objectives

- The objective of the site visit is to enhance the participant's knowledge on sewerage planning, management and technology through taking part in the sewerage facility visit and relevant lectures and workshops held in Japan. The knowledge and experience gained in the site visit are expected to be shared in their organizations.
- The tour is designed considering the needs of relevant authorities to expand sewerage sector in Sri Lanka, identified in the Data Collection Survey on Sewerage Sector which starts from June, 2012. Participants visit sewerage treatment plants and other waste water disposal facilities located in the cities such as Tokyo and Yokohama. They also participate in the lectures of Japanese sewerage management and technology before and during the visit.

A-5.2 Details of Training Course

(1) Schedule

Data		Time	Schedule	Site	Responsible Organization
2012/9/8	Sat	-	Departure from Colombo		-
2012/9/9	Sun	-	Arrival at Tokyo		-
2012/9/10	Mon	10:30-11:30	Briefing on Training Schedule	NSC	NSC
		13:00-14:00	Courtesy Call to MLIT	MLIT	MLIT
2012/9/11	Tue	10:00 - 10:30	Briefing on Training Schedule at Yokohama Explanation of Yokohama City	Yokohama City Hall	Yokohama City
		10:30-11:30	Lecture on Wastewater Management of Yokohama City	Yokohama City Hall	Yokohama City
		13:30-14:30 15:00-16:00	Site Inspection on sewer pipe construction (13:30- pipe jacking method and 15:00- shield tunneling method)	Kohoku-ku, Yokohama City, etc.	Yokohama City
2012/9/12	Wed	9:50-10:10	Courtesy Call to Mayor of Yokohama City	Yokohama City Hall	Yokohama City
		10:30-11:30	Lecture on sewer pipe rehabilitation work	North Sludge Recycle Center	Yokohama City
		11:30-12:10	Site visit on North Sludge Recycle Center	North Sludge Recycle Center	Yokohama City
		13:30-15:30	Site visit on Wastewater treatment plant	KOHOKU Wastewater Treatment Plant, Yokohama City	Yokohama City
		15:30-16:15	Site visit on Yokohama International Stadium (Nissan Stadium)	Yokohama International Stadium	Yokohama City
2012/9/13	Thu	10:00-12:00	Site Inspection on Yokohama City	Sankeien, Yokohama City	Yokohama City
		14:15-15:15	Site Inspection on Yokohama Port	Yokohama Port	Yokohama City
		15:30-17:30	Business Matching Session with Members of Yokohama Water Business Conference	Hotel Monterey, Yokohama	Yokohama Water Business Conference, Global Center for Urban Sanitation
		17:30-19:30	Discussion with the companies participated Business Matching Session	Hotel Monterey, Yokohama	
2012/9/14	Fri	10:00-16:00	Site Inspection on Tokyo	Odaiba, Tokyo, etc.	NSC
		16:00-17:00	Report to JICA	JICA	JICA
2012/9/15	Sat		Departure from Narita, Arrival at Colombo		

(2) Syllabus

Date & Time	September 11, 2012 10:00~10:30
Subject	Briefing on Training Schedule at Yokohama Explanation of Yokohama City
Lecturer	Mr. Nagahide Nakamura, Manager, Sewage Works Promotion Division, Sewerage Planning and Coordination Department, Environmental Planning Bureau, City of Yokohama
Points	<ul style="list-style-type: none"> • He explained about outline of Yokohama City as the population, climate, history, international friendship, economy, sightseeing, MICE, art & culture, sports, environment. • The population of Yokohama city is second in Japan. Yokohama city is the contact point for Japan economically and historically. • Yokohama city has many sightseeing spot and facilities for sports, art & culture.
Date & Time	September 11, 2012 10:30~11:30
Subject	Lecture on Wastewater Management of Yokohama City
Lecturer	Mr. Kiyoshi Ibuka, Manager for Sewerage Policy Coordination of Policy Division, Policy Coordination Department, Environmental Planning Bureau, City of Yokohama Mr. Nagahide Nakamura, Manager, Sewage Works Promotion Division, Sewerage Planning and Coordination Department, Environmental Planning Bureau, City of Yokohama
Points	<ul style="list-style-type: none"> • Mr. Ibuka explained about introduction to sewerage systems in Yokohama. • Yokohama city has 11 water reclamation centers and two sludge treatment and recycling center. • Sewerage system access in Yokohama is 99.8% now. It's higher than the national average of same size city (the population is more than one million). • In the period of approximately 20 years, 11 wastewater treatment plants and two sludge treatment plants were put into operation in Yokohama. • The advanced treatment methods as anaerobic-anoxic-aerobic process (A2O process) is adopted in several wastewater treatment plants. • The sewage treatment and sludge treatment are separated in all treatment districts to enable aggregated treatment of sludge. • Mr. Nakamura explained about sewage works management in Yokohama. • The total budget of Yokohama city is 3,340 billion yen. 8.7% of total budget is for sewage works. • All employees of Yokohama is 25,597 persons. The employees for sewage works is 658 persons (2.6%) • The organization of sewage works is organized in environmental planning bureau and it has three departments as sewerage planning and coordination department, sewer department and sewage facilities department. • The unit price of sewage service charge in Yokohama is proportional to the discharge amount. • The share of sewerage service charge is 0.56% of total household account. • The main challenge of next mid-term management plan 2014 in Yokohama developed "Stock Management Plan" based on suitable O&M, proper repair and efficient renewal construction.
Date & Time	September 11, 2012 13:30~16:30
Subject	Site Inspection on sewer pipe construction (pipe jacking method and shield tunneling method)
Lecturer	Mr. Dai Ariizumi, Sewer Pipeline Design Division, Sewer Pipeline Department, Environmental Planning Bureau, City of Yokohama Mr. Shinji Kaneko, Assistant Manager, Sewerage Facility Construction Office, Environmental Planning Bureau, City of Yokohama
Points	<ul style="list-style-type: none"> • The site inspection on construction work for small diameter pipe jacking method at Shinohara-cho in Kouhoku district. Visitor saw a jacking machine for 300mm and the two vertical shafts. One is in preparing to start and other one is excavating. • The site inspection on construction work for shield tunneling method at Futo Pumping Station. Visitor saw a vertical shaft for starting and they are lectured to shield tunneling method in the shield tunnel at the point of 200m from starting shaft.







Date & Time	September 12, 2012 10:30~11:30
Subject	Lecture on sewer pipe rehabilitation work
Lecturer	Mr. Kaname Nisida, Subsection Chief, Urban Infrastructure & Environmental Product company, Higashinihon Sales Headquarters, Public Sector Value Chain Sales Department, Tokyo Public Sector Sales Office Pipeline Renewal Group, Sekisui Chemical Co., Ltd.
Points	<ul style="list-style-type: none"> Yokohama city has started the first rehabilitation and renewal pipe plan at mainly seaside since 2001 and the investigation for the second rehabilitation and renewal pipe has started since 2004. There are three methods for rehabilitation and renewal of sewer; 1. Using an existing pipe, 2. remaking an existing pipe, and 3. changing a pipe. The work flow for preparation of the rehabilitation and renewal pipe are as follows; 1. Collect information of the state of the pipe (Materials, pipe diameter, incline, extension, construction data, surveying data, etc.), 2. Evaluation of the function and the evaluation that is in a state, 3. Select from the three methods. SPR (Spirally Pipe Renewal) method, which is a pipe lining technique, is one of the Using an existing pipe method. SPR is a double locked spiral wound rigid PVC wall liner formed inside an existing pipe and grouted in place. New SPR pipeline will even increase the flow over 20% to 30% because its inner surface is slickness. Basic SPR process flow is as follows; 1. Install winding machine, 2. Wind the SPR Profile, 3. Remove winding machine & install internal bracing, 4. Inject SPR special grout, 5. Remove Bracing, and 6. Renewed pipe if ready for service.
Date & Time	September 12, 2012 11:30~12:10
Subject	Site visit on North Sludge Recycle Center
Lecturer	Mr. Naoyoshi Koyama, Assistant Manager, Hokubu Sewerage Center, Environmental Planning Bureau, City of Yokohama
Points	<ul style="list-style-type: none"> Yokohama city is working on utilizing various resources including digestion gas generated from sludge and ash of incinerated sludge in order to create a recycling-based society. Hokubu (North) Sludge Recycled Center is reducing the cost of construction and maintenance through centralized treatment, effectively utilizing the energy and resources generated in the process of sludge, operating safely by monitoring its equipment around the clock, and an environmentally sound facility. The digestion gas from sludge is utilized as electricity and fuel and incineration ash is utilized as a material of improved soil and cement. The process of recycling is as follows; 1. A squeeze pump force feed sludge generated in 5 wastewater treatment plants to sludge recycling center. 2. Sludge receiving equipment receives sludge sent from WWTPs, removes screened refuse from sludge and send it to the thickening equipment. 3. Thickening equipment mechanically thickens sludge and put it in the digestion tank. 4. Digestion tank decomposes the organic matter in sludge to reduce the quantity of sludge as well as stabilize the condition of the sludge. 5. Dehydration equipment produces sludge cakes by adding chemicals to the sludge reduced in the digestion tank and sends it to incineration equipment using the squeeze pump, etc. 6. Sludge cakes are burned in the incineration and the resulting ash is utilized for improved soil and cement.

Date & Time	September 12, 2012 13:30~15:30
Subject	Site visit on Wastewater treatment plant
Lecturer	Mr. Nobuyoshi Suzuki, Assistant Manager, Kohoku Wastewater Treatment Plant,, Environmental Planning Bureau, City of Yokohama
Points	<ul style="list-style-type: none"> • In the Kohoku wastewater treatment Plant, wastewater is treated by activated sludge process and advanced treatment method, and treated effluent is discharged to Tsurumi River. Then we keep the quality of public water body clean, and also prevent city area from flooding by rapid discharging of storm water. • A lot of machines (pumps, blowers, etc.) always run by centralized monitoring system with many computers in the Plant. • The process of the treatment is as follows; 1. In the grit chamber the velocity of the sewer is reduced, and sand and other heavy inorganic materials are removed. Then sewage is lifted up to the primary settling tank by main pumps. 2. In the primary settling tank, the velocity of flow is greatly reduced. All sinkable particles are settled out and removed as primary sludge. They are transported to sludge concentration conditioning tank. 3. Effluent from the primary settling tank is mixed with activated sludge, mass of microorganism from final settling tanks. In the reaction tank, the mixed liquor is maintained in aerobic condition by diffused air. The microbes convert carbon into cell tissue and oxidized end products that include carbon dioxide and water. 4. The activated sludge is separated from the treated sewage by settling in the final settling tank. Some of the sludge is withdrawn as excess sludge to keep the same mixed liquor concentration in the aeration tank and it is transported to sludge concentration conditioning tank. 5. Sewage sludge (primary sludge, excess sludge) which is removed by sedimentation from the treated sewage is transported to Hokubu Sludge Treatment Center. 5. The effluent of the final settling tank is sterilized by chlorination. • The second treatment water is further treated by advanced treatment process with ozone and sent to Nissan Stadium as recycled water.
Date & Time	September 12, 2012 15:30~16 : 15
Subject	Site visit on Yokohama International Stadium (Nissan Stadium)
Lecturer	Mr. Naotaka Morita, Manager, Yokohama Sports Association
Points	<ul style="list-style-type: none"> • The reclaimed water from Kohoku waste water treatment is utilized to flush toilets. • The reclaimed water is also utilized for air conditioning (heating and cooling) by heat pumps.
Date & Time	September 13, 2012 10:00~12:00
Subject	Site Inspection on Yokohama City
Lecturer	-
Points	<ul style="list-style-type: none"> • The Sankeien park has the era of old Japanese style landscape, architecture ,life style which have deep connection with water. • Toilet of old age. • Water storage tank in the house that has a function as a heat exchanger that uses spring water.
Date & Time	September 13, 2012 14:15~15:15
Subject	Site Inspection on Yokohama Port
Lecturer	Mr. Yuichiro Imai, Manager, Port Promotion Division, Port Promotion Department, Port and Harbor Bureau, City of Yokohama
Points	<ul style="list-style-type: none"> • In 1859, The Port of Yokohama was opened. • In 2004, The Port of Yokohama was designated as the "Super Hub Port" by the Japanese government. • There was a time when pollution in the harbor has progressed , pollution was eliminated with sewerage. • The main goods traded between the Yokohama Port and Colombo Port, exports are automobiles, and imports are canned seafood.

Date & Time	September 13, 2012 15:30~19:00
Subject	Business Matching Session with Members of Yokohama Water Business Conference
Lecturer	-
Points	<ul style="list-style-type: none"> The objective of the Business Matching Session is to introduce Japanese advance technology to trainees for their sewerage facilities development. Four companies (JFE, Hitachi Plant Technology, Ishigaki, and Yasuda Engineering) of Yokohama Water Business conference presented their technology related to wastewater treatment and construction of sewer pipes. JFE introduced their company profile, especially their activities in overseas projects. Hitachi Plant Technology introduced PEGASUS, an advanced sewage treatment process that promotes nitrification and uses inclusive immobilization supports. Ishigaki explained high performance of their slide shaft screw dehydrator and Yasuda Engineering explained pipe jacking method.
Date & Time	September 14, 2012 10:00~16:00
Subject	Site Inspection on Tokyo
Lecturer	-
Points	<ul style="list-style-type: none"> Sewerage Exhibit Hall "RAINBOW" was opened in Rainbow Town as PR facility of Bureau of Sewerage to promote future-oriented sewerage for urban development. Aquarium in Shinagawa, innovative water treatment system was developed in Japan is adopted. Because the aquarium water treatment cost is kept low by this water treatment system, possibility that the children can enjoy the marine life.

A-5.3 Photos

	
Courtesy Call at MLIT (2012/9/10)	Lecture on sewerage management in Yokohama (2012/9/11)
	
Site Inspection on pipe jacking (2012/9/11)	Explanation at shield tunneling construction site (2012/9/11)

	
<p>Site Inspection on shield tunneling method (2012/9/11)</p>	<p>Courtesy Call to Mayor of Yokohama City (2012/9/12)</p>
	
<p>Site visit on North Sludge Recycle Center (2012/9/12)</p>	<p>Site visit on North Sludge Recycle Center (2012/9/12)</p>
	
<p>Site visit on wastewater treatment plant (2012/9/12)</p>	<p>Site visit on wastewater treatment plant (2012/9/12)</p>

	
<p>Site visit on Yokohama International Stadium (2012/9/12)</p>	<p>Site visit on Yokohama International Stadium (2012/9/12)</p>
	
<p>Site Inspection on Yokohama City (2012/9/13)</p>	<p>Site Inspection on Yokohama Port (2012/9/13)</p>
	
<p>Business Matching Session (2012/9/13)</p>	<p>Business Matching Session (2012/9/13)</p>