

WATER POLLUTION CONTROL IN INDONESIA

**Conference on Watershed Management for Controlling
Municipal Wastewater in South East Asia
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By: Dr. BUDI KURNIAWAN
Head of Sub Directorate of Inventory and Pollution Load Allocation
Directorate of Water Pollution Control,
Directorate General of Environmental Pollution and Degradation
Control
Ministry of Environment and Forestry of Indonesia

OUTLINE PRESENTATION

- WATER POLLUTION CONTROL POLICY IN INDONESIA
- WATER QUALITY AND WATER POLLUTION SOURCES
- WATER POLLUTION CONTROL STRATEGY AND PROGRAMME
- CASE STUDY OF WATER POLLUTION CONTROL IN CITARUM WATERSHED

REGULATION BACKGROUND: WATER POLLUTION CONTROL

- ▶ Act No. 23 of 1997 on Environmental Management, Act No. 7 of 2004 on Water Resources, require all parties to involve in water pollution control
- ▶ Government Regulation No. 82 of 2001 on Water Quality Management and Water Pollution Control establishes the framework for implementation of water pollution control, including aspects of prevention, protection and recovery.
- ▶ Act No. 18 of 2003 on Solid Waste Management
- ▶ The most recent Act No. 32 of 2009 on Environmental Protection and Management was enacted on October 3-th, 2009, Article 54 (2):
 - recovery of environmental function shall be done by:
 - (a) discontinuation of source of pollution and cleaning of pollutant;
 - (b) remediation;
 - (c) rehabilitation;
 - (d) restoration; and/or
 - (e) other measures in accordance with scientific and technological developments.
- ▶ In addressing the global warming and climate change issues in Indonesia, Article 57 (4) of the Act mandate the preservation of atmosphere function shall cover: (a) mitigation and adaptation to climate change; (b) protection of ozone layer; (c) protection against acid rain.
- ▶ MOE Decree for Effluent Standard of various sources: Concentration and Maximum Load
- ▶ Permit System: Effluent Standard → Concentration and Maximum Load

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MAIN OBJECTIVE – MID-TERM DEVELOPMENT PLAN 2015-2019

- Environment : To Improve environmental quality and sustainable development
- Main Target of Environmental Protection and Managment:

Indicator	Baseline 2014	Target 2019
Environmental Quality Index	63,0-63,0	66,5-68,5
Green House Gas Emission Reduction	15,5%	26%

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(POLICY DIRECTION)
Food, Energy and Water Security

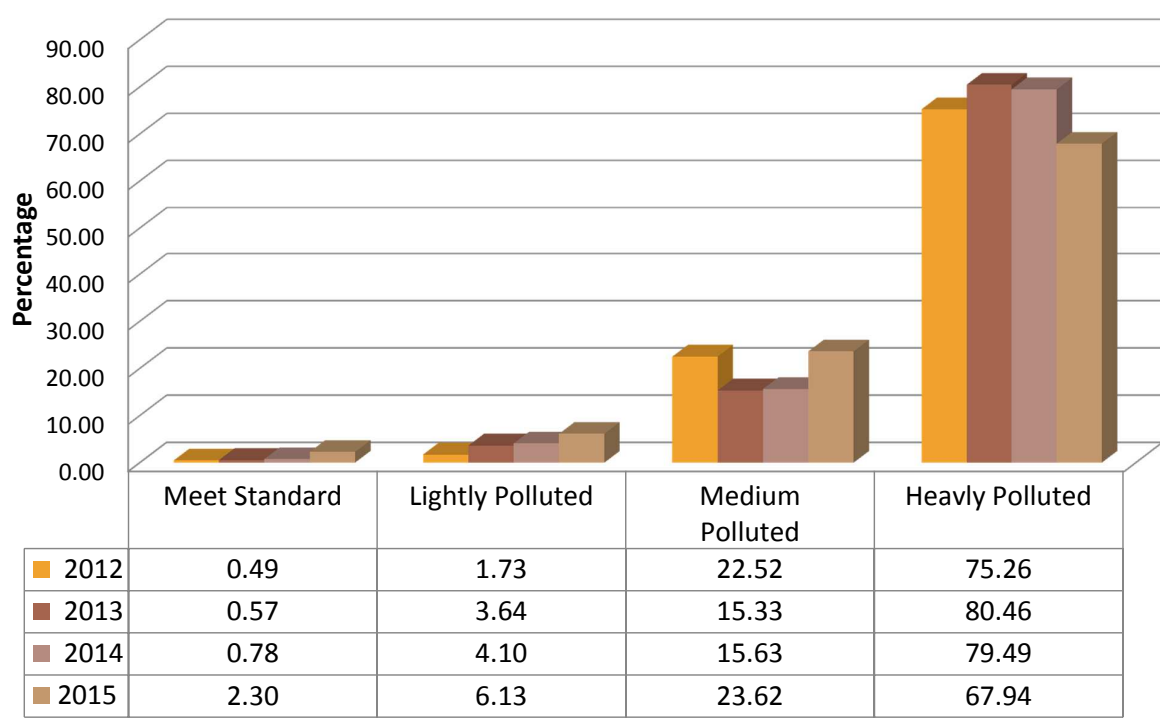
- Water Security
 1. To Ensure the fulfillment of need and water quality insurance for people daily life
 2. To meet water need for social and productive economic
 3. To increase people resilient in lowering the risk of water hazard force including climate change

Indicator	Baseline 2014	Target 2019
National Capacity of Drinking water source	51,44 m3/sec	118,6m3/sec
Irrigation availability from Dams	11	20

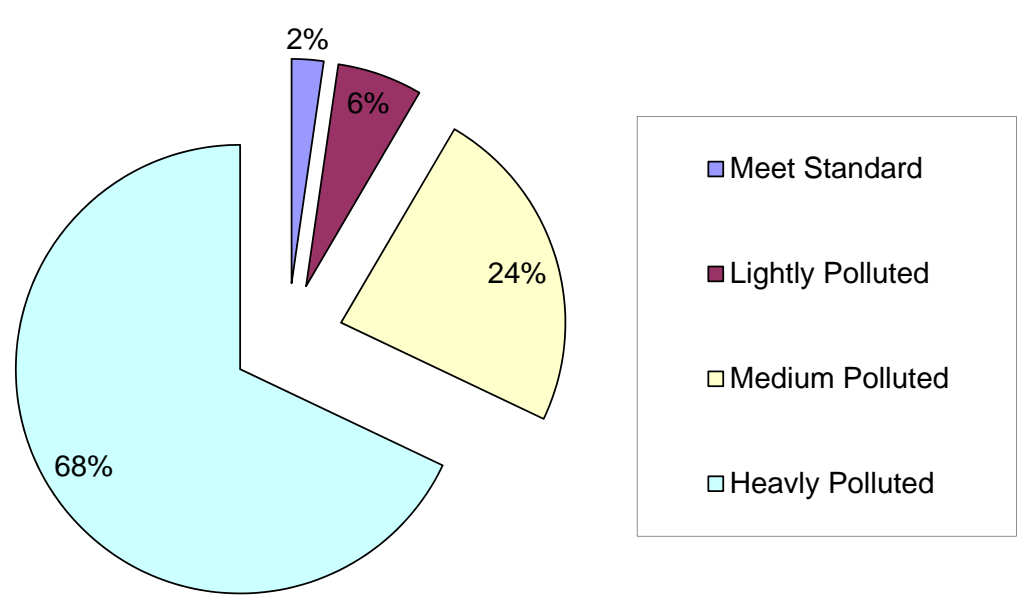
MID-TERM DEVELOPMENT PLAN
2015-2019
Acceleration of Infrastructure Development

INDICATOR	BASELINE 2014	2019
Access of Appropriate Drinking Water	70	100
Appropriate Sanitation	60	100

TREND OF WATER QUALITY STATE IN INDONESIA IN 2012-2015

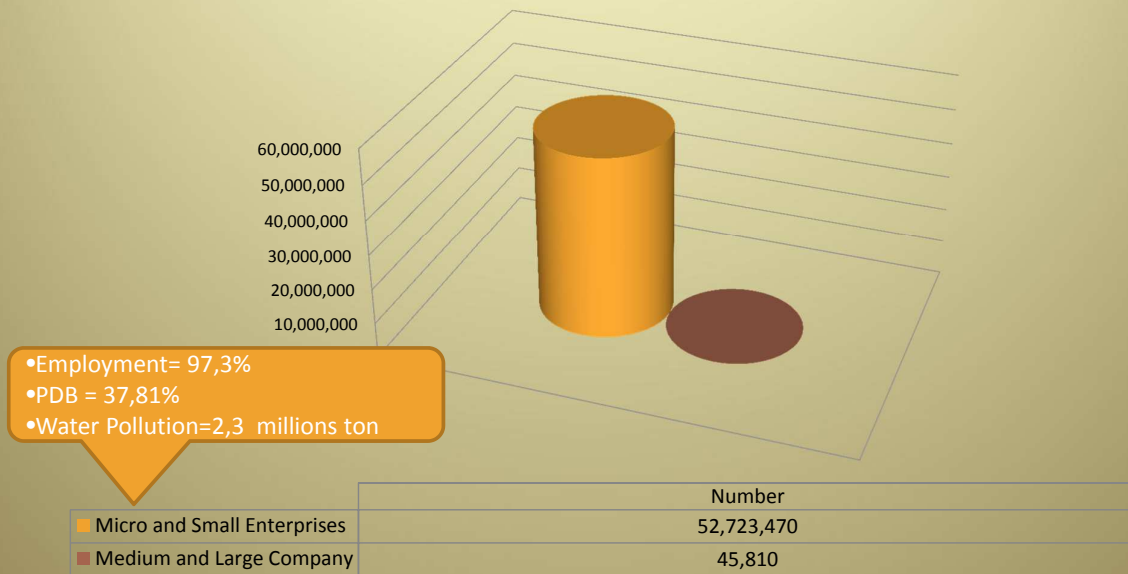


STATE OF WATER QUALITY IN INDONESIA IN 2015

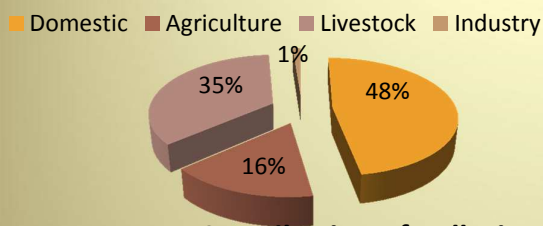


Catagory of Enterprises, (National Statistic 2012)

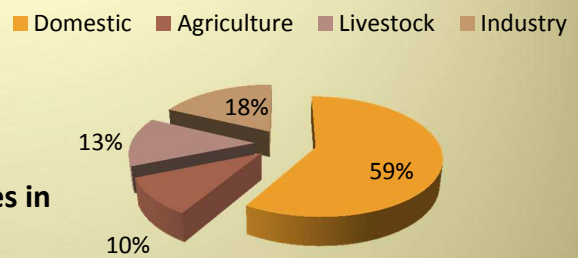
Catagory of Enterprises



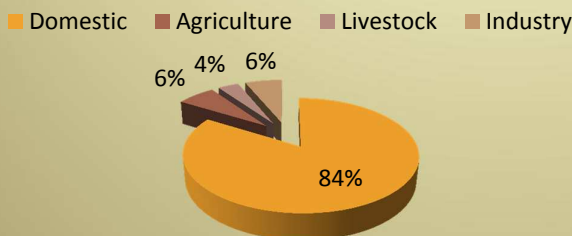
Contribution of Pollution Sources in MUSI River



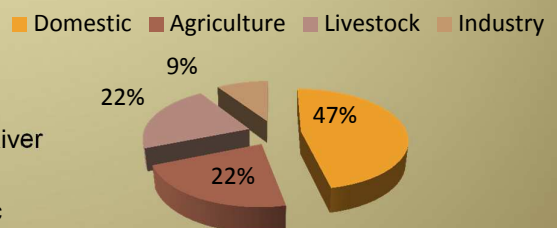
Contribution of Pollution Sources in CITARUM River



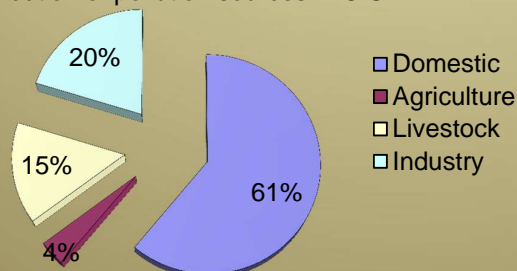
Contribution of Pollution Sources in CILIWUNG River



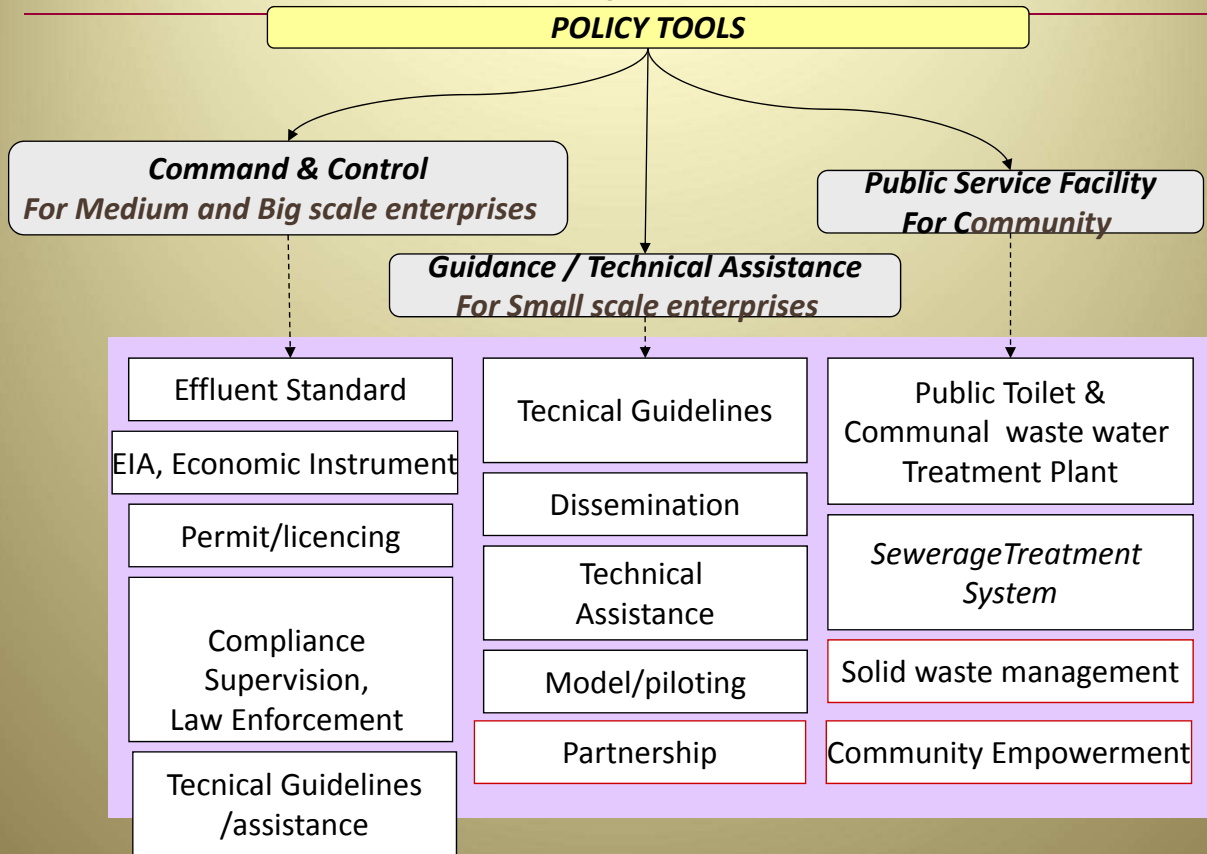
Contribution of Pollution Sources in BRANTAS River



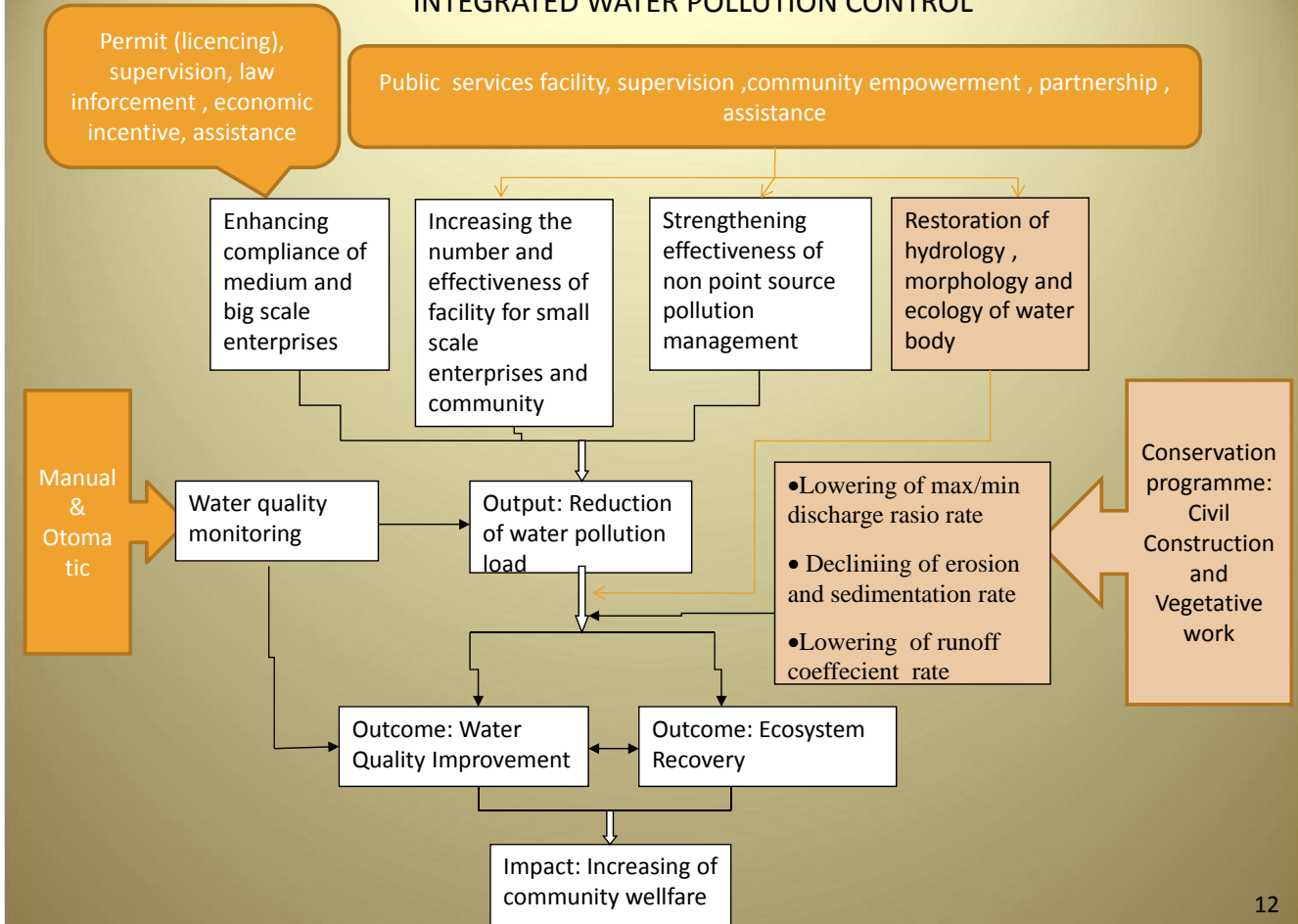
Contribution of pollution sources in CISADANE River



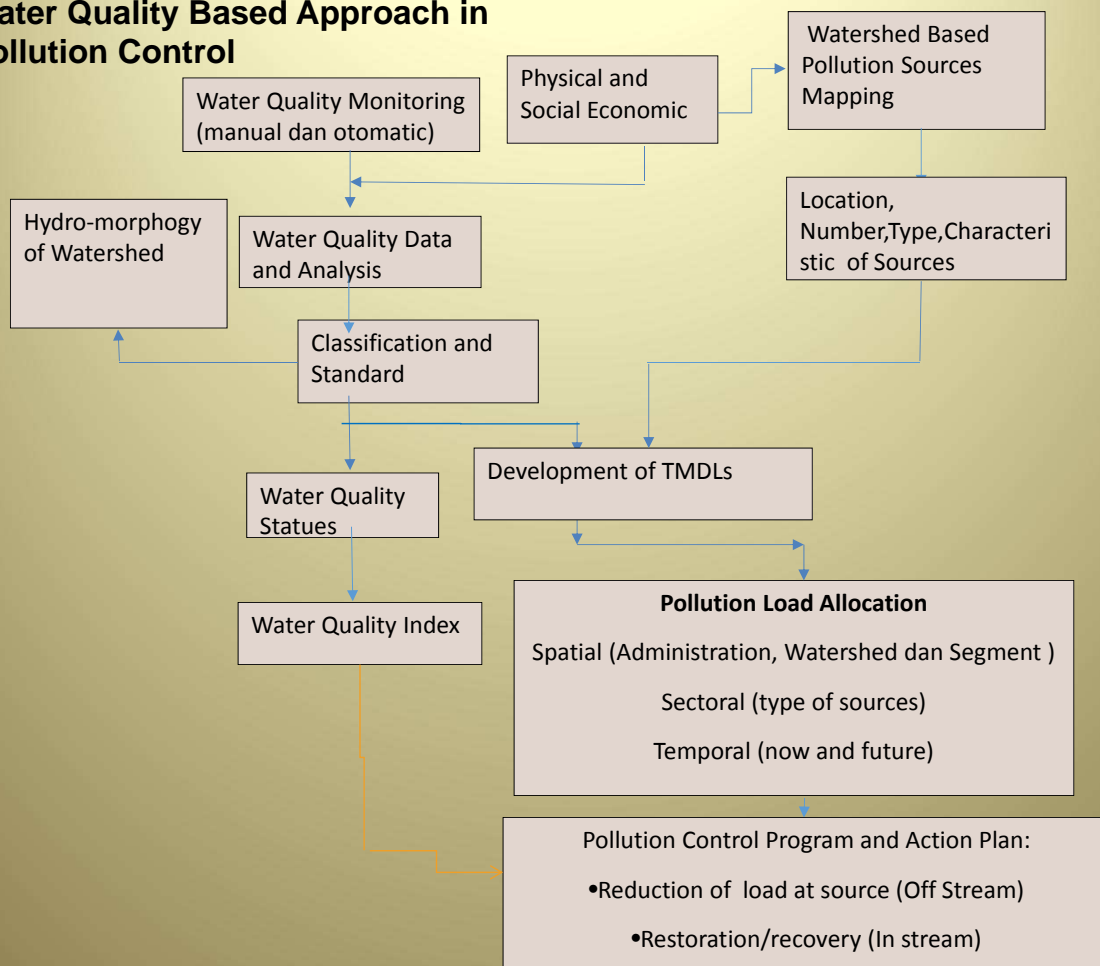
Policy Tools



INTEGRATED WATER POLLUTION CONTROL



Water Quality Based Approach in Pollution Control



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FORMULATION OF REGULATION AND TECHNICAL GUIDELINES

- Revising Government Regulation concerning with water pollution control
- Revising Ministerial Regulation on effluent standard for various industry type
- Finishing Ministerial Regulation on Domestic Waste Water Management
- Finishing Ministerial Regulation on Total Maximum Allowable Load and Waste Load Allocation
- Formulating Ministerial Regulation on Automatic and Continue Monitoring System for water quality and WWTP
- Finishing Guideline on Waste water reuse

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**PROPOSED EFFLUENT STANDARD OF DOMESTIC WASTE WATER IN THE DRAFT
OF MINISTERIAL REGULATION**

Parameter	Unit	Maximum Concentration *
pH	-	6 – 9
BOD	mg/L	30
COD	mg/L	100
TSS	mg/L	30
Minyak & lemak	mg/L	5
Amoniak	mg/L	10
Total Coliform	jumlah/100 mL	3000

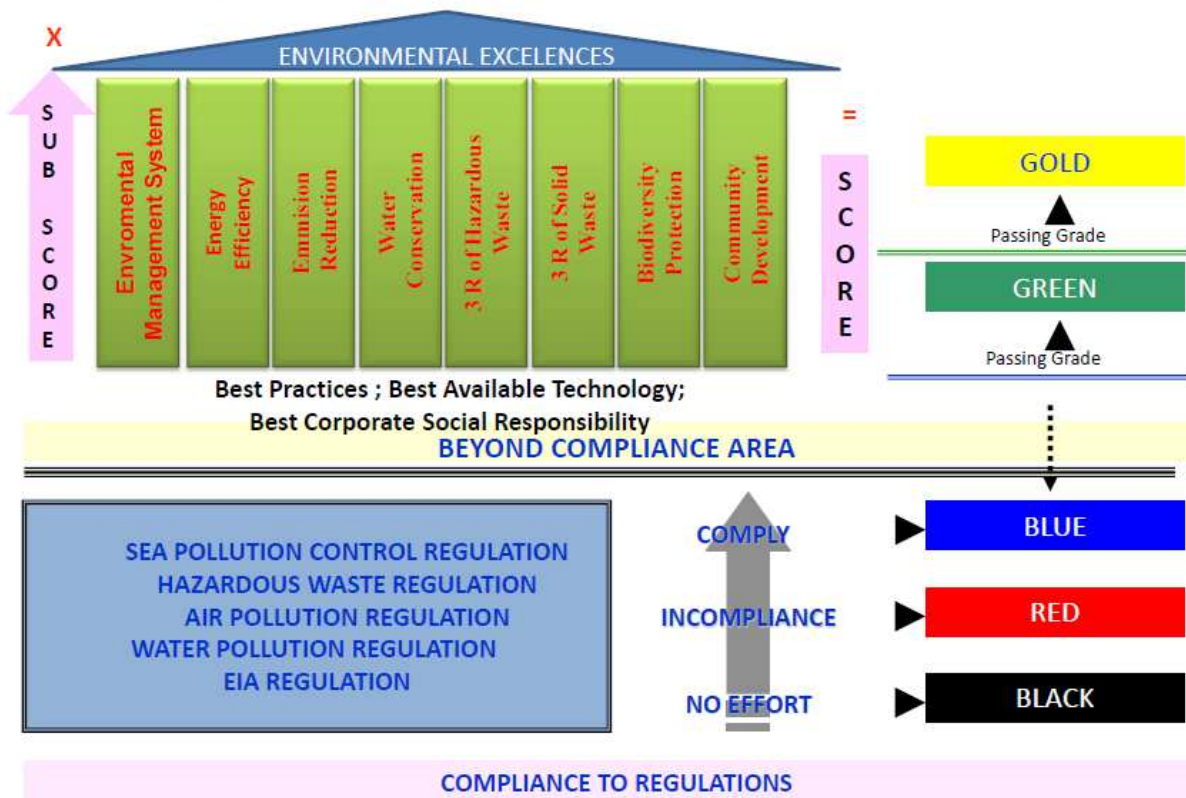
*= Apartement, losmen, dormitori, healthy clinic, educational institution, office and comercial building, departement store, market, housing, restorant, Municipal WWTP, harbour, airport, railway station, bus terminal, jail.

– PILOT PROJECT FOR DOMESTIC SOURCE- POLLUTION CONTROL-

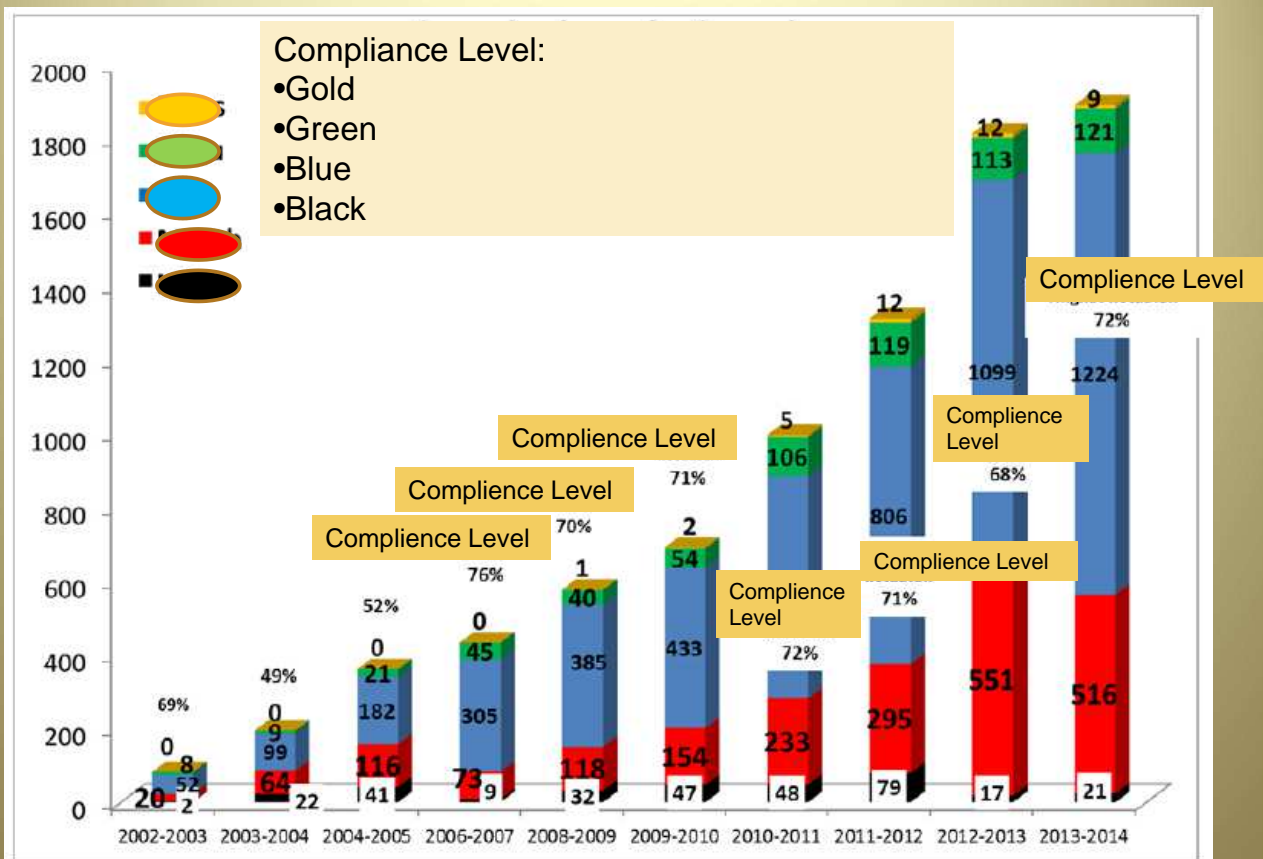
Year	Number of WWTP	Capacity (person)	Pollution load Reduction (ton BOD/year)	Generated Biogas (m3/day)	LPG-equal (kg/day)	LOCATION (WATERSHED)
2010	3	8756	115.72	69.99	32.21	Barito - Martapura
2011	3	1460	19.30	11.67	5.37	Musi
2012	4	5046	66.69	40.34	18.56	Barito, Bengawan Solo, Ciliwung
2013	4	800	10.57	6.39	2.94	Ciliwung, Musi, Lumajang, Semarang
2014	3	1643	18,7	13,34	6,05	Brantas, Bengawan Solo and Barito
2015	4	1500	19,83	47,96	5,51	Citarum, Ciliwung, Brantas

INDUSTRIAL RATING PROGRAM (PROPER)

BASIC PRINCIPAL OF PROPER CRITERIA



INDUSTRIAL RATING PROGRAM (PROPER)



WASTE TO ENERGY PROGRAM

Type of Industry	Estimated Production	Pollution Load Reduction	GHG Reduction	Generated Electricity
	Ton	Ton COD/day	Ton CO2 e/day	MW
Palm Oil Industry	31.5 million	17.86 million	93.55 million	2.55 million
Cassava Starch Industry (Lampung Province)	26.54	8,758	45,984	439

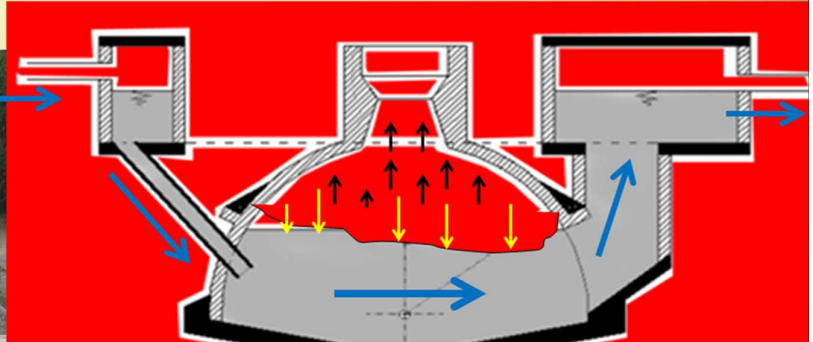
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– PILOT PROJECT FOR SMALL MEDIUM SCALED ENTERPRISES- POLLUTION CONTROL-

Year	SMEs Type of Pollution Control		
	Bio-digester for Tofu	Bio-digester for Livestock waste treatment	WWTP for Batik
2011	3	581	
2012	2	22	1
2013	4	74	1
2014		10	1
2015	1	10	1

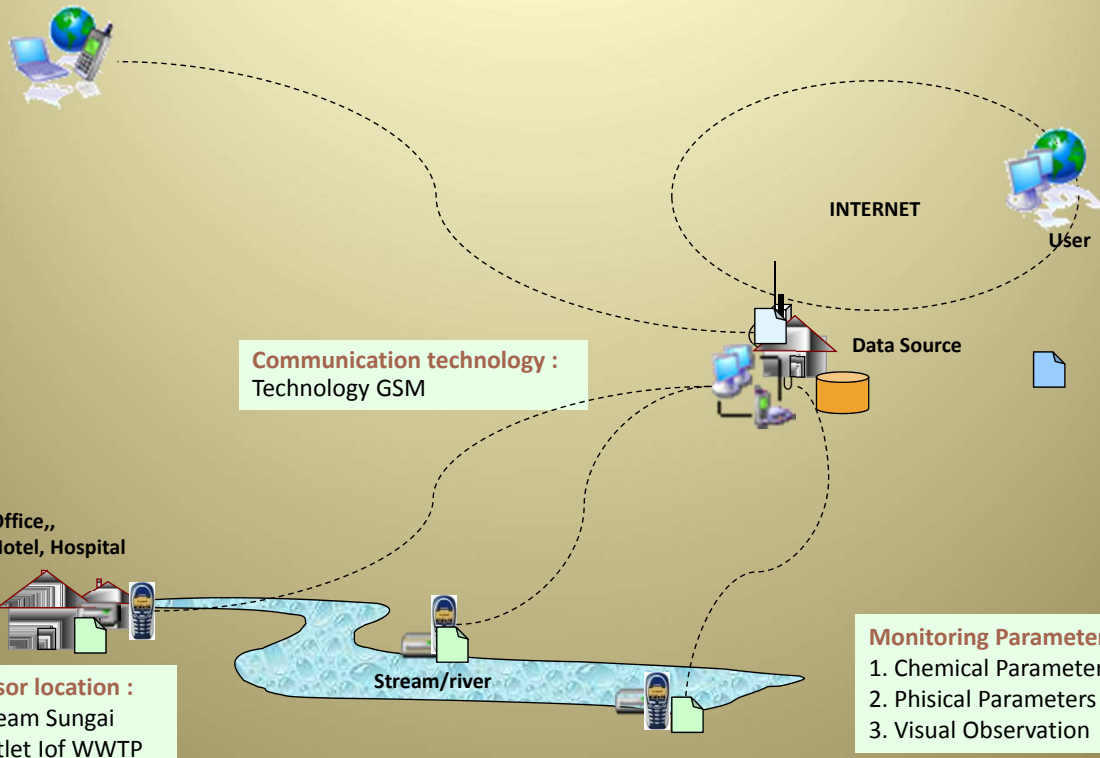
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BIODIGESTER FOR WASTE TREATMENT FROM TOFU AND LIVESTOCK (SMEs)

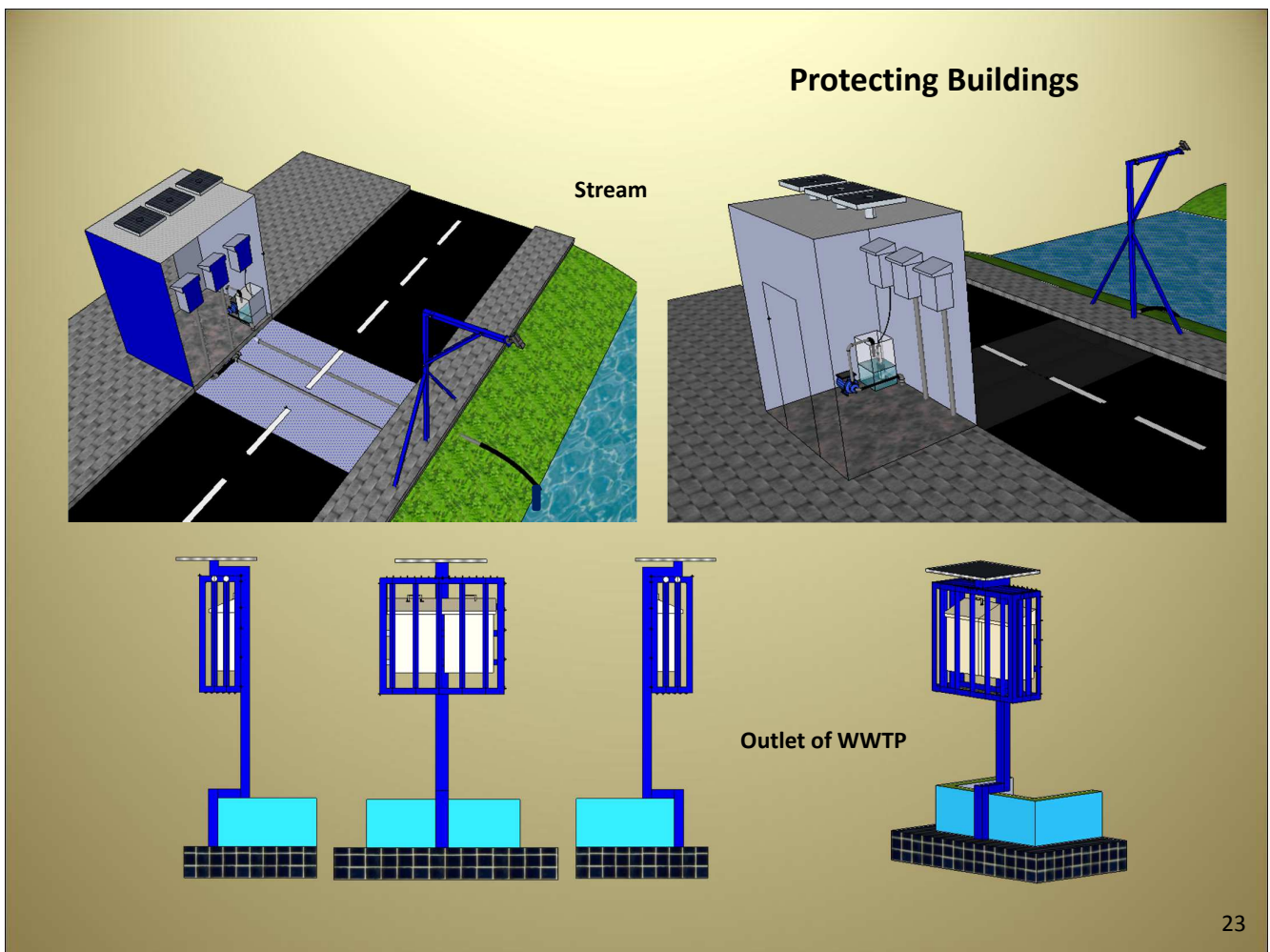


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MODEL ONLINE MONITORING IN CILIWUNG RIVER STREAM AND EFFLUENT OF POLLUTION SOURCES



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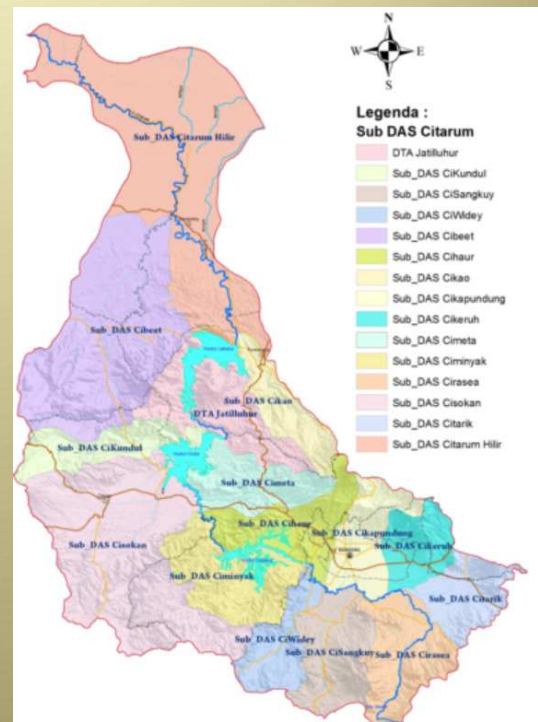
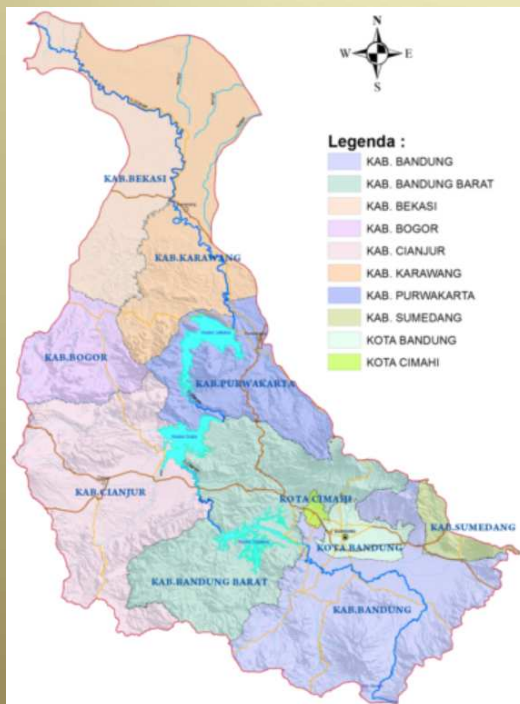


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- Name of Site : Citarum Watershed
- Province : West Jawa
 - 10 Regency
 - Up-Stream : Kabupaten Sumedang, Bandung, Bandung Barat, Kota Bandung, Cimahi
 - Mid-Stream : Kabupaten Cianjur, Purwakarta
 - Down-Stream : Kabupaten Bogor, Karawang, Bekasi
 - Area : About 70.5 km²
 - Paddy : 219,934 ha (31.2%)
 - Upland : 276,738 ha (39.2%)
 - Forest : 23,960 ha (3.4%)
 - Built-up Area : 85,425 ha (12.1%)
 - Others : 99,352 ha (14.1%)
 - Population : about 12.8 Million capita
(estimated based on data in statistical annual reports of each Kab)

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- Name of Case Study : Citarum Watershed
 - 10 Regency
 - 15 Sub-Watershed



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ASSESSMENT RESULT OF WATER QUALITY DESIGNATED CLASS OF CITARUM RIVER

Segment	Segment	Current Water Quality	Proposed Water Quality Class	Water Quality Target	
				2015-2019	2020-2024
Upstream	Cisanti-Wangisagara	II-III	I	II	I
1	Wangisagara-W.Saguling	III-IV->IV	II	III	II
2	W.Saguling-W.Ciarata	III-IV	II	III	II
3	W.Cirata-W.Jatiluhur	III-IV	II	III	II
4	W.Jatiluhur-Muara	III-IV	II	III	II

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POLLUTION SOURCES OF CITARUM



Livestocks have been discharging their waste into river



Settlements located in the river bank have been discharging their waste directly into river



Urban settlements have been discharging their waste into drainages that are connected into river



Industries have been discharging their waste into river without proper treatment

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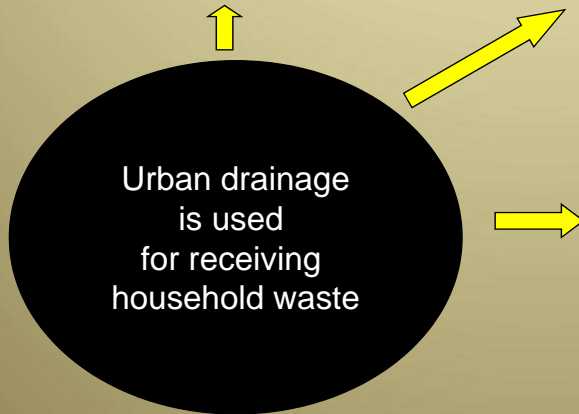
Pollution load from Domestic Source



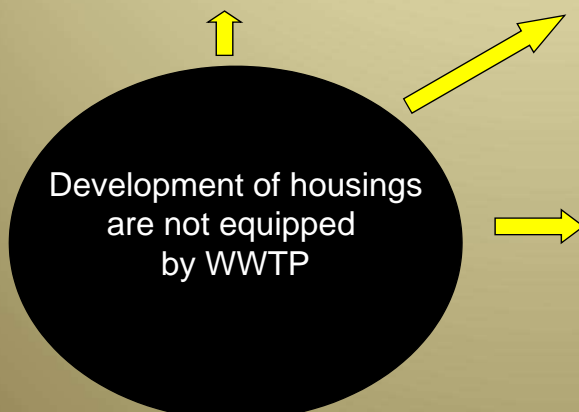
Domestic source is accounted as the biggest pollution load contributor

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Pollution load from Domestic Source



Pollution load from Domestic Source

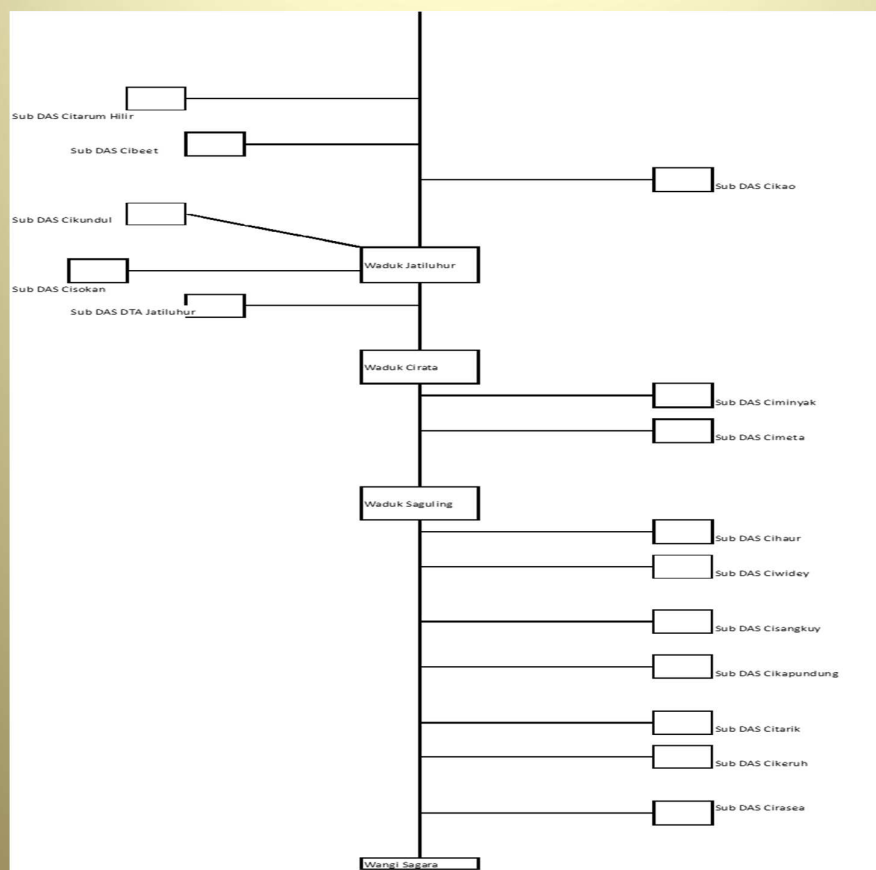


Model of Citarum Watershed

1. Saguling Upstream , from Wangisagara to Inlet of Saguling Dam
2. Saguling Dam – Cirata Dam , from outlet of Saguling Dam to inlet of Cirata Dam
3. Cirata Dam – Jatiluhur Dam , from outlet of Cirata Dam – inlet of Jatiluhur Dam
4. Outlet of Jatiluhur Dam – Downstream /coastal area, from outlet of Jatiluhur Dam to Coastal Area

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Model of Citarum Watershed



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Reduction of Pullution Load of 75% is needed for segment No. 1 and 4
Reduction of Pullution Load of 50% is needed for segment No. 2 dan 3

Segmen	Regency	Sub Watershed	Actual Load	Reduction of 25%	Reduction of 50%	Reduction of 75%
			BOD	BOD	BOD	BOD
			(Kg/day)	(Kg/day)	(Kg/day)	(Kg/day)
1	Kab.Bandung	Cirasea	22.873,91	17.155,43	11.436,96	5.718,48
	Kab.Sumedang	Citarik	20.382,82	15.287,12	10.191,41	5.095,71
	Kota Bandung	Cikeruh	24.788,34	18.591,25	12.394,17	6.197,08
	Kab.Bandung	Cisangkuy	19.482,94	14.612,20	9.741,47	4.870,73
	Kota Bandung	Cikapundung	77.341,19	58.005,89	38.670,59	19.335,30
	Kab.Bandung	Ciwidey	8.282,60	6.211,95	4.141,30	2.070,65
	Cimahi	Cihaur	45.532,04	34.149,03	22.766,02	11.383,01
2	Bandung Barat	Ciminyak	10.929,27	8.196,96	5.464,64	2.732,32
	Bandung Barat	Cimeta	10.076,68	7.557,51	5.038,34	2.519,17
	Kab.Cianjur	Cisokan	32.219,81	24.164,86	16.109,91	8.054,95
3	Kab.Cianjur	Cikundul	7.803,99	5.852,99	3.901,99	1.951,00
	Purwakarta	DTA Jatiluhur	17.749,33	13.311,99	8.874,66	4.437,33
4	Purwakarta	Cikao	13.985,97	10.489,48	6.992,98	3.496,49
	Kab.Bogor,Kab.Karawang	Cibeet	39.452,75	29.589,56	19.726,37	9.863,19
	Kab.Karawang, Kab.Bekasi	Citrarum Hilir	80.094,45	60.070,84	40.047,22	20.023,61

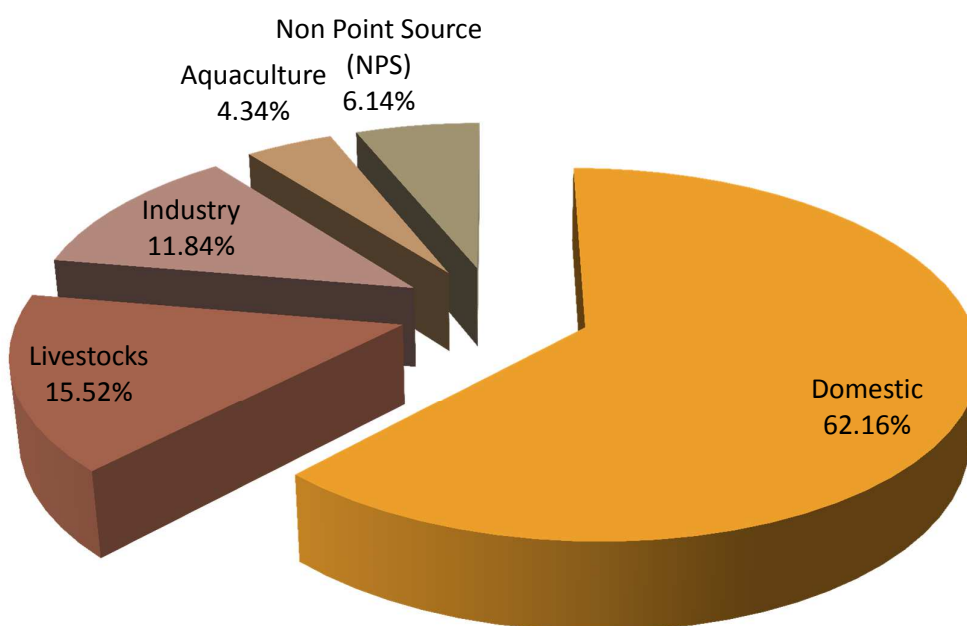
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RESULT OF TMDLs DEVELOPMENT FOR CITARUM RIVER

Segment	Regency	Sub-Watershed	Actual Pollution Load (kg BOD/day)	TMDLs(kg BOD/day)	Load Reduction needed (kg BOD/day)	Pollution Load for each Segment (kg BOD/day)	Pollution Load for each Segment on (%)
1	Kab.Bandung	Cirasea	22.873,91	5.718,48	17.155,43	218.683,85	50,74
	Kab.Sumedang	Citarik	20.382,82	5.095,71	15.287,12		
	Kota Bandung	Cikeruh	24.788,34	6.197,08	18.591,25		
	Kab.Bandung	Cisangkuy	19.482,94	4.870,73	14.612,20		
	Kota Bandung	Cikapundung	77.341,19	19.335,30	58.005,89		
	Kab.Bandung	Ciwidey	8.282,60	2.070,65	6.211,95		
	Kota Cimahi	Cihaur	45.532,04	11.383,01	34.149,03		
2	Bandung Barat	Ciminyak	10.929,27	5.464,64	5.464,64	53.225,76	12,35
	Bandung Barat	Cimeta	10.076,68	5.038,34	5.038,34		
	Kab.Cianjur	Cisokan	32.219,81	16.109,91	16.109,91		
3	Kab.Cianjur	Cikundul	7.803,99	3.901,99	3.901,99	25.553,31	5,93
	Purwakarta	DTA Jatiluhur	17.749,33	8.874,66	8.874,66		
4	Purwakarta	Cikao	13.985,97	3.496,49	10.489,48	133.533,17	30,98
	Kab.Bogor,Kab.Karawang	Cibeet	39.452,75	9.863,19	29.589,56		
	Kab.Karawang, Kab.Bekasi	Citrarum Hilir	80.094,45	20.023,61	60.070,84		
			430.996,09	127.443,79	303.552,30	430.996,09	100,00

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Contribution of Pollution Sources in Citarum Watershed



Contribution of Pollution Sources in Citarum Watershed

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Contribution of Pollution Sources in Citarum Watershed for each Regency

Regency	Domestic (kg BOD /day)	Livestock (kg BOD/day)	Industry (kg BOD/day)	Aquacultue (kg BOD/day)	Non Point Source (NPS) (kg BOD/day)	Total ((kg BOD/day)
Kab Bandung	70.275,89	7.865,25	17.957,87	142,93	5.319,83	101.561,78
Kab Sumedang	4.705,60	341,11	2.756,04	0,00	267,61	8.070,36
Kota Bandung	82.559,76	763,90	3.932,24	0,00	424,91	87.680,80
Kota Cimahi	18.992,35	362,39	1.806,14	1,15	106,83	21.268,87
Kab Bandung Barat	25.562,27	10.145,16	1.622,34	1.787,67	4.553,03	43.670,48
Kab Cianjur	25.167,82	7.796,88	553,43	12.038,62	4.939,25	50.496,01
Kab Purwakarta	12.011,80	14.875,14	5.972,27	6.907,01	2.141,90	41.908,11
Kab Bogor	6.735,24	459,68	178,45	110,19	2.247,00	9.730,57
Kab Karawang	30.956,71	30.806,80	8.865,46	53,61	3.883,14	74.565,74
Kab Bekasi	24.100,95	1.759,15	13.722,18	0,00	5.843,68	45.425,97
Total	301.068,40	75.175,46	57.366,43	21.041,18	29.727,20	484.378,67
Percentage	62,16%	15,52%	11,84%	4,34%	6,14%	

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WASTE LOAD ALLOCATION IN CITARUM WATERSHED

Segment	Regency	Domestic (kg BOD /day)	Livestock (kg BOD/day)	Industry (kg BOD/day)	Aquacult ue (kg BOD/day)	Non Point Source (NPS) (kg BOD/day)	Regenc y
1	Kab.Bandung	Cirasea	13.599,30	1.522,53	976,13	27,67	1.029,80
	Kab.Sumedang	Citarik	8.813,77	656,25	5.302,25	0,00	514,84
	Kota Bandung	Cikeruh	17.549,87	163,94	786,25	0,00	91,19
	Kab.Bandung	Cisangkuy	11.583,26	1.296,82	831,42	23,57	877,13
	Kota Bandung	Cikapundun g	54.756,72	511,51	3.535,66	3,25	284,52
	Kab.Bandung	Ciwidey	4.924,28	551,31	353,46	10,02	372,89
	Kota Cimahi	Cihaur	31.284,99	602,89	2.081,50	1,91	177,73
2	Bandung Barat	Ciminyak	3.173,09	1.285,46	202,68	226,51	576,90
	Bandung Barat	Cimeta	2.925,56	1.185,18	186,87	208,84	531,89
	Kab.Cianjur	Cisokan	7.944,39	2.515,75	171,66	3.884,40	1.593,71
3	Kab.Cianjur	Cikundul	1.924,22	609,34	41,58	940,84	386,01
	Kab.Purwakarta	DTA Jatiluhur	2.505,17	3.170,32	1.270,59	1.472,08	456,50
4	Kab.Purwakarta	Cikao	2.961,00	3.747,18	1.501,79	1.739,94	539,56
	Kab.Bogor,Kab. Karawang	Cibeet	12.874,90	13.126,49	1.910,75	22,84	1.654,57
	Kab.Karawang, Kab.Bekasi	Citarum Hilir	36.067,47	2.681,02	12.416,33	0,00	8.906,02

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Citarum watershed Domestic WWTP Target On site - Off site, (projection in 2016)

No	Regency	Population /2016	Population in Watershed (person)/ 2016	Tingkat Cakupan Limbah Domestik dalam WatershedCitarum					Budget (WWTP=IDR 320 million)
				Populatio n without WWTP Acces	Prose ntage (%)	Number HH(1 HH= 5 person) wwithout WWTP Acces	Target of pollut ion load reduc tionfr om dome stic sourc e	Numbe r of WWTP (Capac itay of 50 HH)	
1	Kab. Bandung	4,699,422	3,454,566	1,561,464	45.2	312,293	100%	6,246	1,998,673 (jt)
2	Kota Bandung	2,605,814	2,605,814	620,184	23.8	124,037	100%	2,481	793,835 (jt)
3	Kota Cimahi	645,848	645,848	329,382	51.0	65,876	100%	1,318	421,609 (jt)
4	Kab. Bandung Barat	1,713,315	1,713,315	806,971	47.1	161,394	100%	3,228	1,032,923 (jt)
5	Kab. Sumedang	1,387,687	474,305	193,516	40.8	38,703	100%	774	247,700 (jt)
6	Kab. Bogor	5,387,976	609,607	304,194	49.9	60,839	100%	1,217	389,367 (jt)
7	Kab. Cianjur	3,343,795	2,687,267	1,593,550	59.3	318,710	100%	6,374	2,039,7439 (jt)
8	Kab. Purwakarta	1,043,457	966,200	338,170	35.0	67,634	100%	1,353	432,857 (jt)
9	Kab. Karawang	2,342,278	1,703,537	993,162	58.3	198,632	100%	3,973	1,271,247 (jt)
10	Kab. Bekasi	2,957,107	1,340,599	882,114	65.8	176,423	100%	3,528	1,129,105 (jt)
Total		26,126,699	16,201,058	7,622,707	47.6	1,524,541		30,491	9,757,065 (jt)

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Target of Pollution Load Reduction (kg BOD/day) in Citarum Watershed from Industry Source

Segment	Regency	Pollution Load Reduction (kg BOD /day)
1	Kab.Bandung	976,13
	Kab.Sumedang	5.302,25
	Kota Bandung	786,25
	Kab.Bandung	831,42
	Kota Bandung	3.535,66
	Kab.Bandung	353,46
	Kota Cimahi	2.081,50
2	Bandung Barat	202,68
	Bandung Barat	186,87
	Kab.Cianjur	171,66
3	Kab.Cianjur	41,58
	Kab.Purwakarta	1.270,59
4	Kab.Purwakarta	1.501,79
	Kab.Bogor,Kab.Karawang	1.910,75
	Kab.Karawang, Kab.Bekasi	12.416,33
Total		31.568,91

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Bandung Regency Industrial Area:

Number of industries 279, actual pollution load from industry= 5042 kg BOD/day, Targeted pollution load reduction from industry = 2161 kg BOD/day

Actual Pollution Load

Ideal Pollution Load

Number of Industries	Discharge rate (m3/day)	Concentration of BOD (mg/l)	Load of BOD (kg/day)
20	56	70	78,4
20	105	70	147
30	155	70	325,5
30	205	70	430,5
30	252	65	491,4
30	300	60	540
30	350	60	630
30	400	60	720
30	450	60	810
29	500	60	870



Number of Industries	Discharge rate (m3/day)	Concentration of BOD (mg/l)	Load of BOD (kg/day)
20	50	60	60
20	100	50	100
30	150	50	225
30	200	40	240
30	250	40	300
30	300	40	360
30	350	40	420
30	400	30	360
30	450	30	405
29	500	30	435

Proposed Effluent Permit

Discharge rate 0-<100 m3/hr, Concentration of BOD Max 60 mg/l
 Discharge rate 100 - < 200 m3/day, Concentration of BOD Max 50 mg/l
 Discharge rate 200 - < 300 m3/day, Concentration of BOD Max 40 mg/l
 Discharge rate 300 – 500 m3/day, Concentration of BOD Max 30 mg/l
 Discharge rate > 500 m3/day, Concentration of BOD Max 20 mg/l

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LIVESTOCK POLLUTION CONTROL



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POLLUTION CONTROL PROGRAM FOR LIVESTOCK SOURCE

Segment	Regency	Sub Watershed	Targeted Pollutio Load Reduction	Number of Cattle	Unit Number Bio-digester	Budget
			(kg BOD/day)		1 unit= 4 head of cattle	1 unit = IDR 20 million
1	Kab.Bandung	Cirasea	1.523	5.214	1.304	26.070.762.606
	Kab.Sumedang	Citarik	656	2.247	562	11.237.151.105
	Kota Bandung	Cikeruh	164	561	140	2.807.245.018
	Kab.Bandung	Cisangkuy	1.297	4.441	1.110	22.205.868.815
	Kota Bandung	Cikapundung	512	1.752	438	8.758.782.153
	Kab.Bandung	Ciwidey	551	1.888	472	9.440.173.384
	Kota Cimahi	Cihaur	603	2.065	516	10.323.544.021
2	Bandung Barat	Ciminyak	1.285	4.402	1.101	22.011.268.188
	Bandung Barat	Cimeta	1.185	4.059	1.015	20.294.165.415
	Kab.Cianjur	Cisokan	2.516	8.616	2.154	43.077.946.981
3	Kab.Cianjur	Cikundul	609	2.087	522	10.433.944.152
	Kab.Purwakarta	DTA Jatiluhur	3.170	10.857	2.714	54.286.246.301
4	Kab.Purwakarta	Cikao	3.747	12.833	3.208	64.164.053.630
	Kab.Bogor,Kab.Karawang	Cibeet	13.126	44.954	11.238	224.768.704.078
	Kab.Karawang, Kab.Bekasi	Citrarum Hilir	2.681	9.182	2.295	45.907.866.626
Total			33.626	115.158	28.789	575.787.722.473

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QUICK WINS

Criteria of quick wins :

- Measureable progress in short/medium term
- “Real effect” according to public perception

Proposed quick wins :

1. River clean-up integrated program in selected segment of Citarim, Ciliwung and Cisadane Rivers
2. River/watershed ecosystem restoration/rehabilitation

THANK YOU VERY MUCH