The need for ESCP in the Plantation and Agriculture Sectors

Abd Jalil Hassan

Contents of presentation

- Problem statement
- Action plan / Proposed solution
- Recommendation

Case Studies

- Sg Kemaman Basin - IRBM
- Sg Kelantan Basin - IRBM
- Sg Pahang Basin - EIA

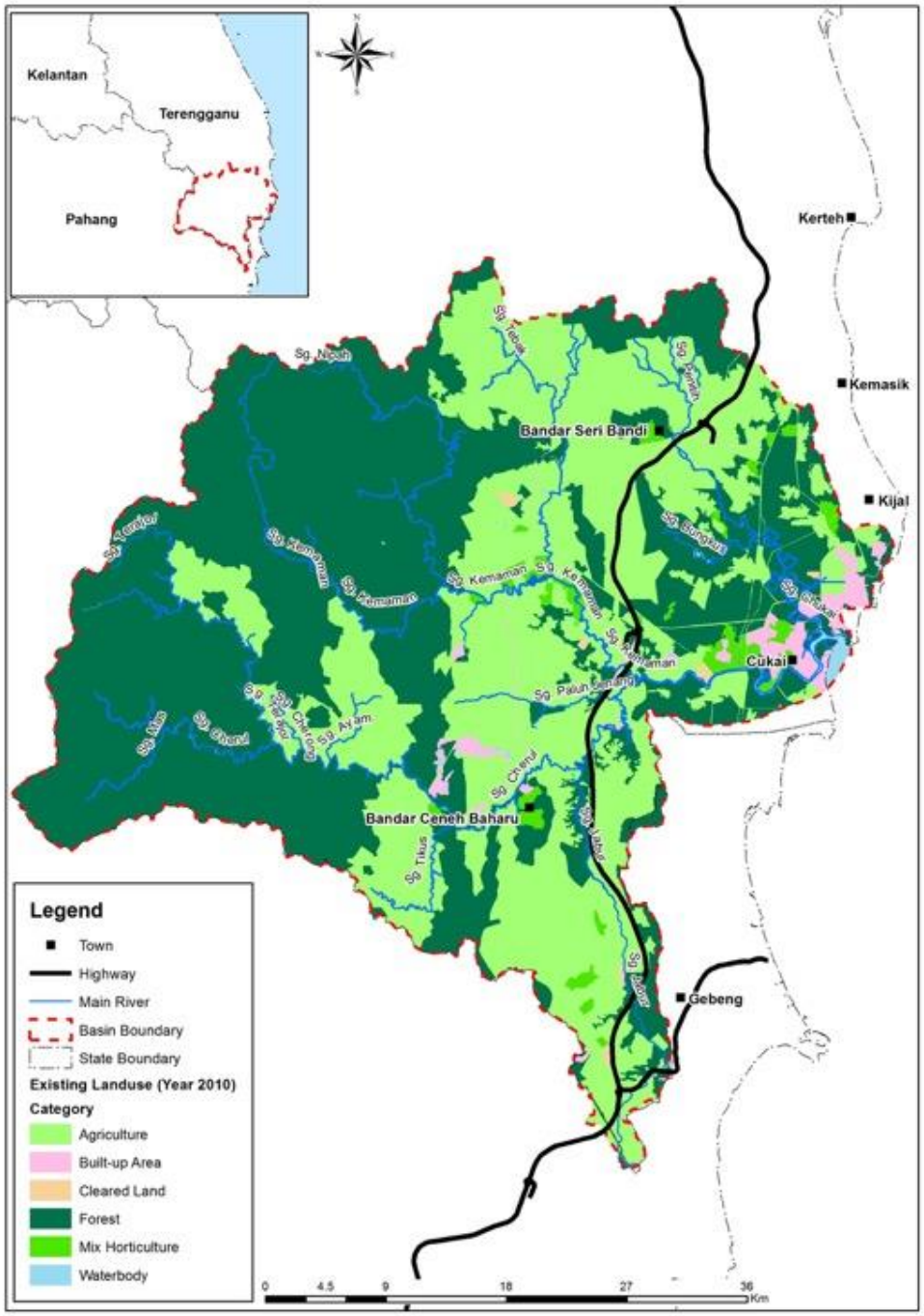
Environmental Quality (Prescribed Activities) EIA Order 1987

- Agriculture
  - ✓ Land development schemes covering an area 500 hectares or more to bring forest into agriculture production
  - ✓ Agriculture programs necessitating the resettlement of 100 families or more
  - ✓ Development of agriculture estates covering an area of 500 hectares or more involving changes in type of agriculture use
- Irrigation
  - ✓ Irrigation schemes covering an area of 5,000 hectares or more
- Housing / Infrastructure
  - ✓ Housing development covering an area of 50 hectares or more

Land clearing for oil palm plantation

Oil Palm growth stages

Sg Kemaman Basin



Land Use Category	Area (ha)	Percentage (%)
Agriculture	89904.6	41.1
Built-up Area	5573.3	2.5
Cleared Land	2075.4	0.9
Forest	113912.6	52.1
Mix Horticulture	4538.1	2.1
Waterbody	2759.7	1.3
Grand Total	218763.6	100.0

Erosion estimation

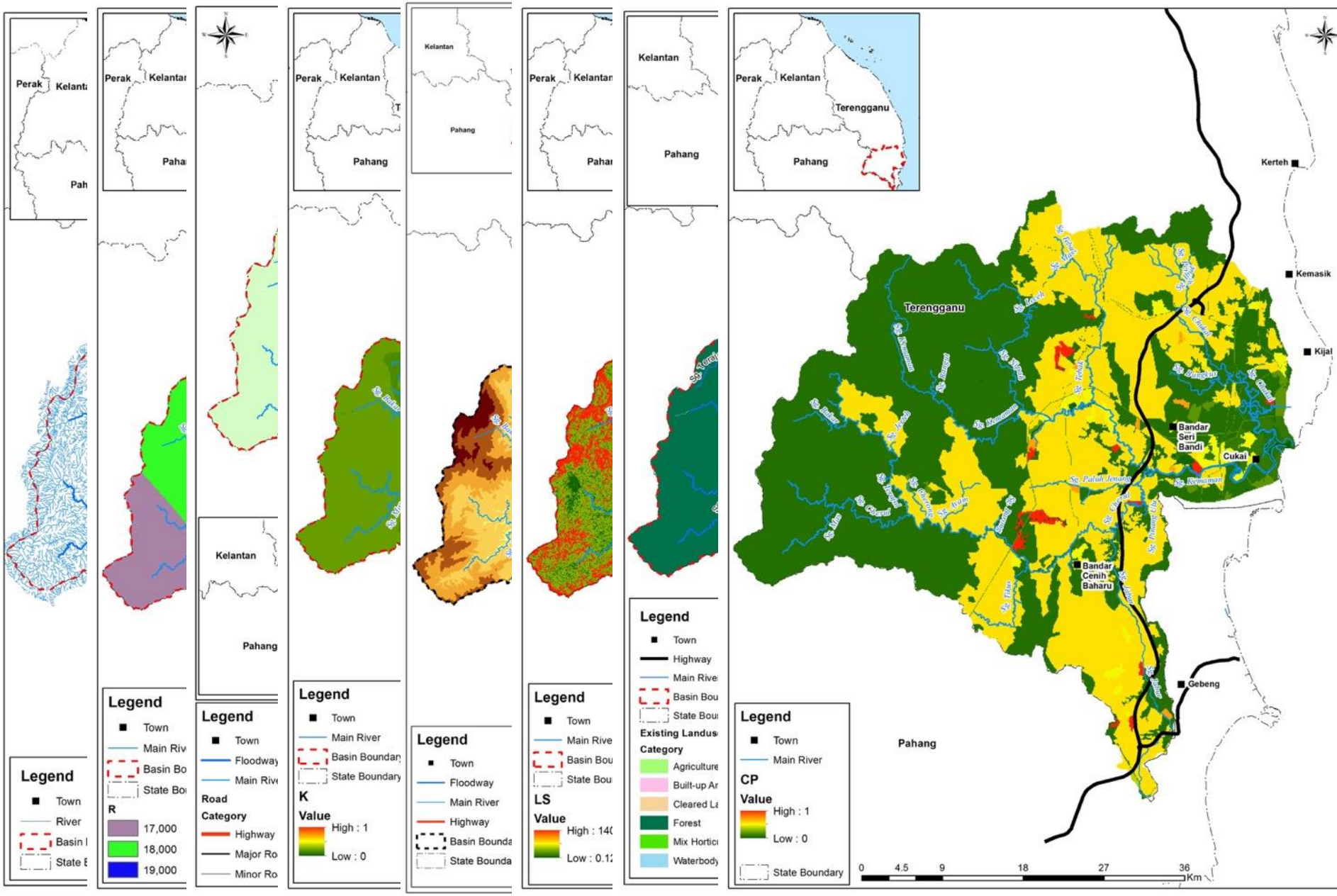
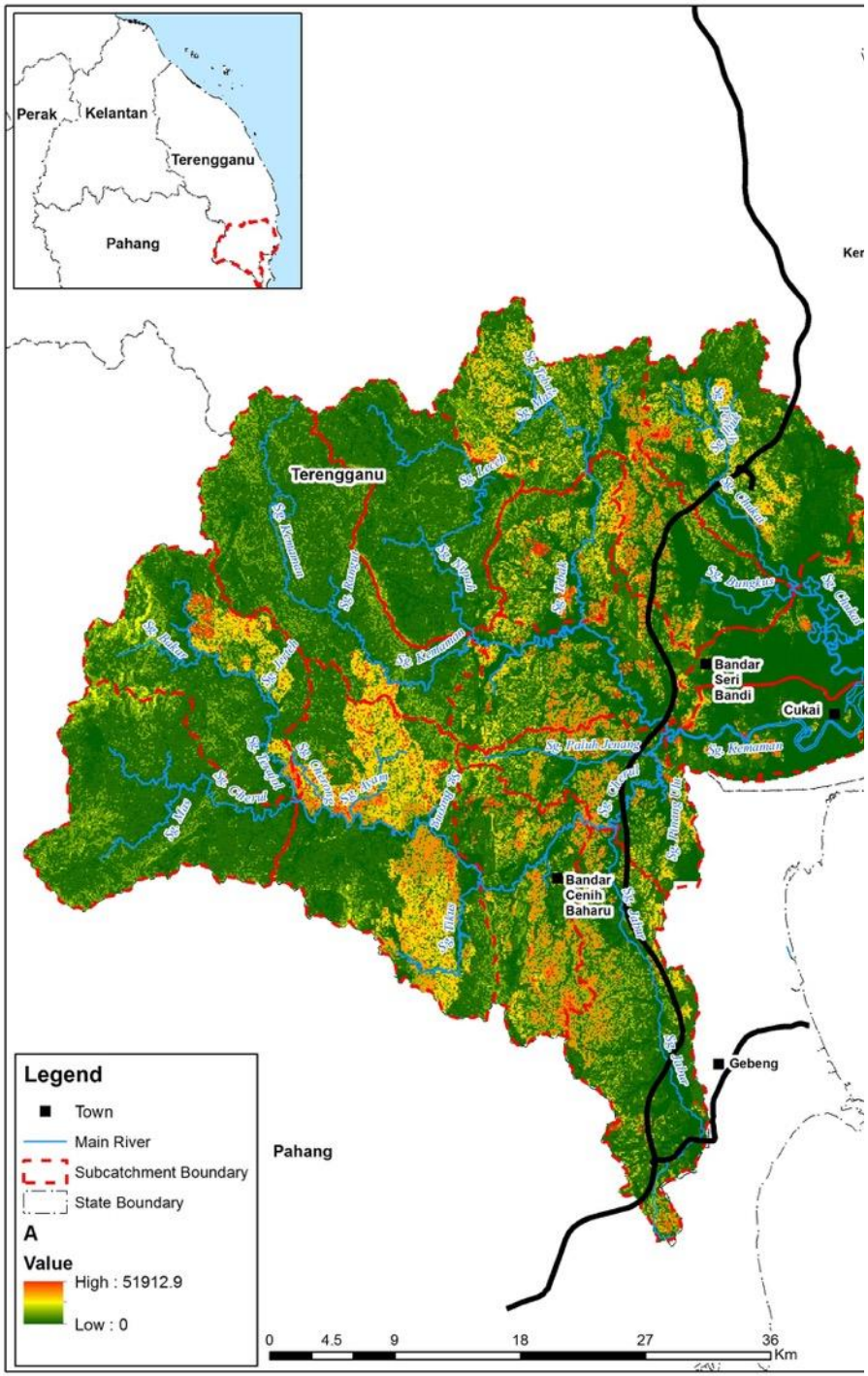
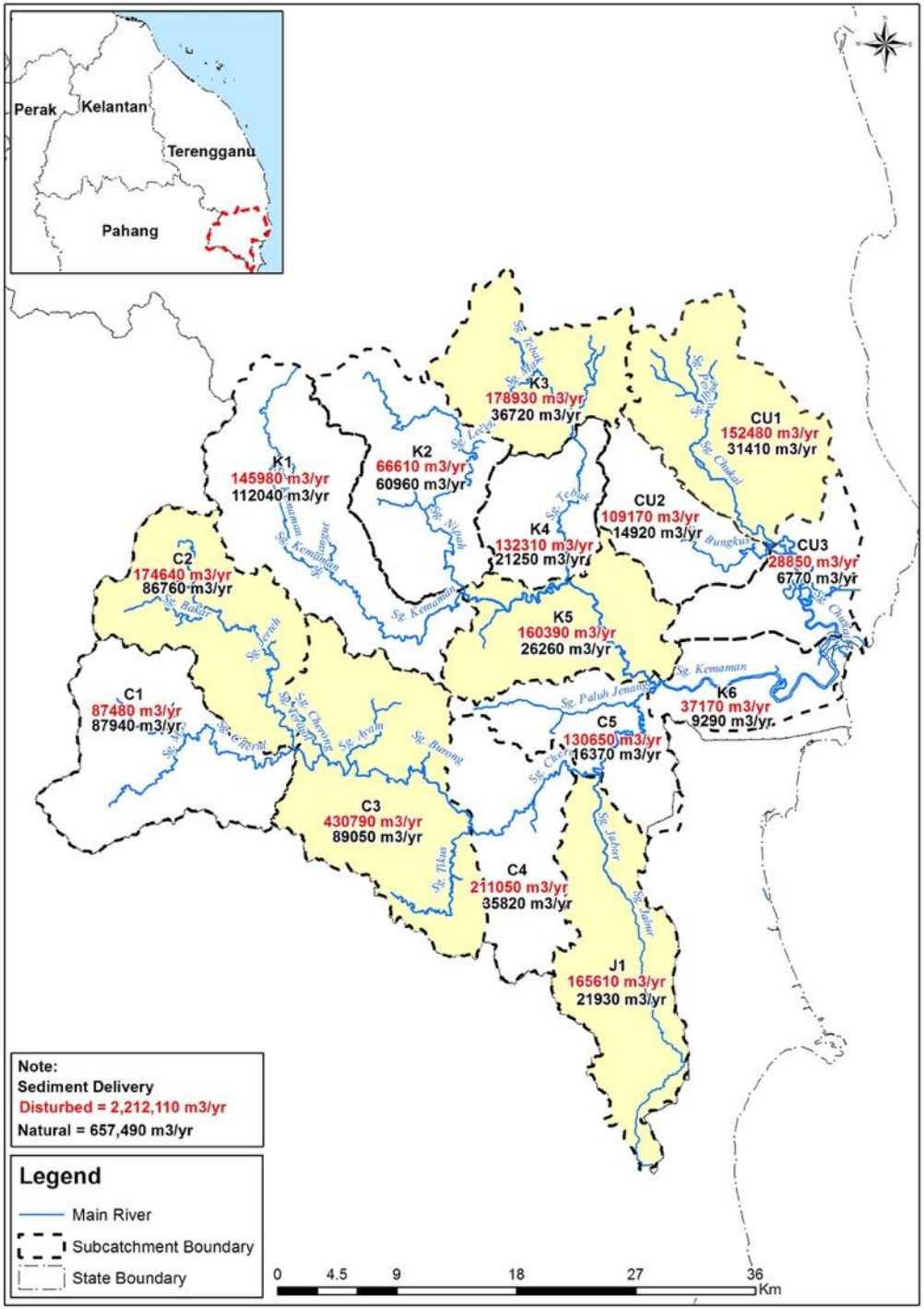


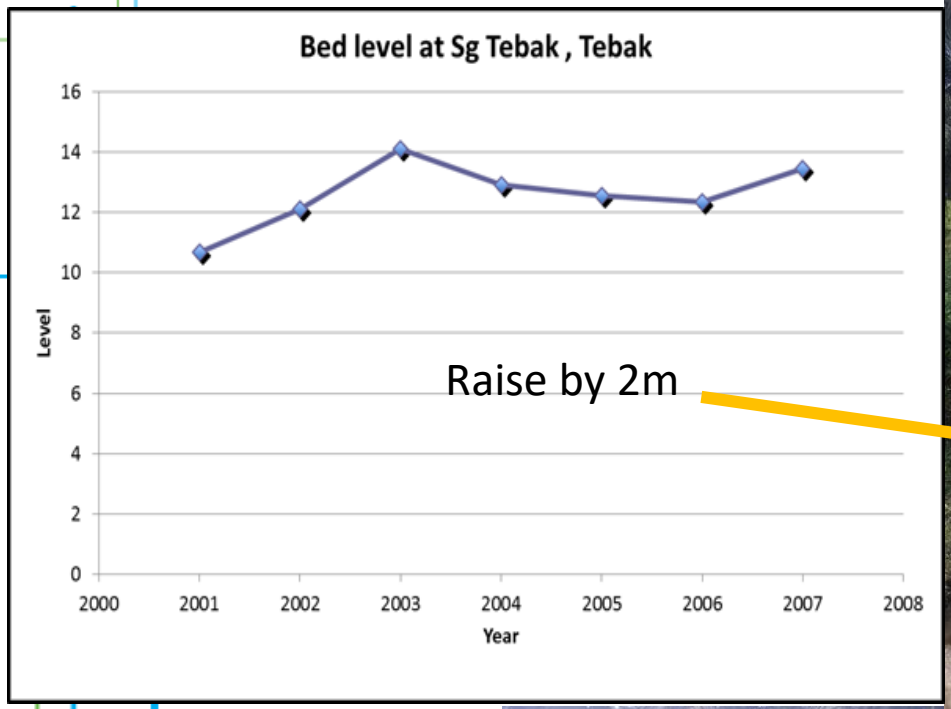
Table 5.2 Land Use and Soil Loss Ratio (1973)

Land Use Category	Soil Loss Ratio	S. Pahang Catchment at Temerloh		S. Lipis Catchment at Benta	
		Area (ha)	Area x Ratio ($\times 10^3$)	Area (ha)	Area x Ratio ($\times 10^3$)
Plantation 0 – 1 years	50	14 200	710	530	26.5
1 – 2	16	13 700	219	530	8.5
2 – 3	14	8 100	113	530	7.4
3 – 4	12	4 600	55	530	6.4
4 – 5	11	5 900	65	530	5.8
5 – 10	8	24 700	198	2 700	21.6
10 – 15	5	20 000	100	2 700	13.5
15 – 20	4	20 000	80	2 700	10.8
> 20	3	55 000	165	7 300	21.9
Logging Forest	5	57 000	285	5 700	28.5
Padi	5	15 000	75	1 550	7.8
Other Cultivation	25	14 700	368	1 770	44.3
Forest, scrub, grassland and swamp	1	1 830 000	1 830	141 000	141.0
Mining	100	800	80	–	–
Roads	100	400	40	80	8.0
Land Slips	500	770	385	–	–
Total			**4 768**		**352.0**

River Net Consulting Sdn Bhd

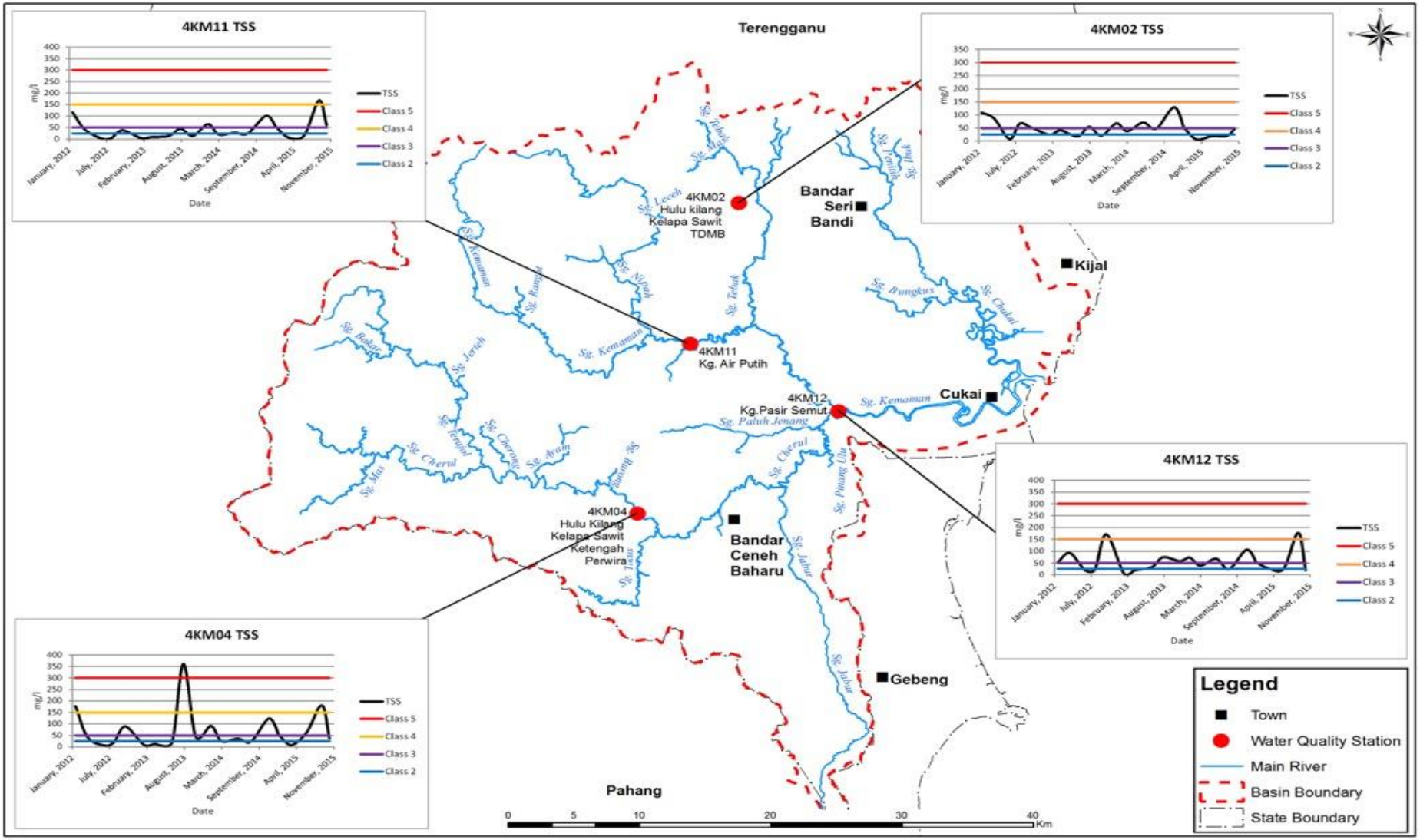

Perak
Kelantan
Terengganu
Pahang
Terengganu
Bandar Seri Bandi
Cukai
Bandar Cenih Baharu
Gebeng
Pahang
Legend
Town
Main River
Subcatchment Boundary
State Boundary
A
Value
High : 51912.9
Low : 0
0 4.5 9 18 27 36 Km


Perak
Kelantan
Terengganu
Pahang
K1
145980 m3/yr
112040 m3/yr
K2
66610 m3/yr
60960 m3/yr
K3
178930 m3/yr
36720 m3/yr
K4
132310 m3/yr
21250 m3/yr
K5
160390 m3/yr
26260 m3/yr
K6
37170 m3/yr
9290 m3/yr.
C1
87480 m3/yr
87940 m3/yr
C2
174640 m3/yr
86760 m3/yr
C3
430790 m3/yr
89050 m3/yr
C4
211050 m3/yr
35820 m3/yr
C5
130650 m3/yr
16370 m3/yr
CU1
152480 m3/yr
31410 m3/yr
CU2
109170 m3/yr
14920 m3/yr
CU3
28850 m3/yr
6770 m3/yr
J1
165610 m3/yr
21930 m3/yr
Note:
Sediment Delivery
Disturbed = 2,212,110 m3/yr
Natural = 657,490 m3/yr
Legend
Main River
Subcatchment Boundary
State Boundary
0 4.5 9 18 27 36 Km

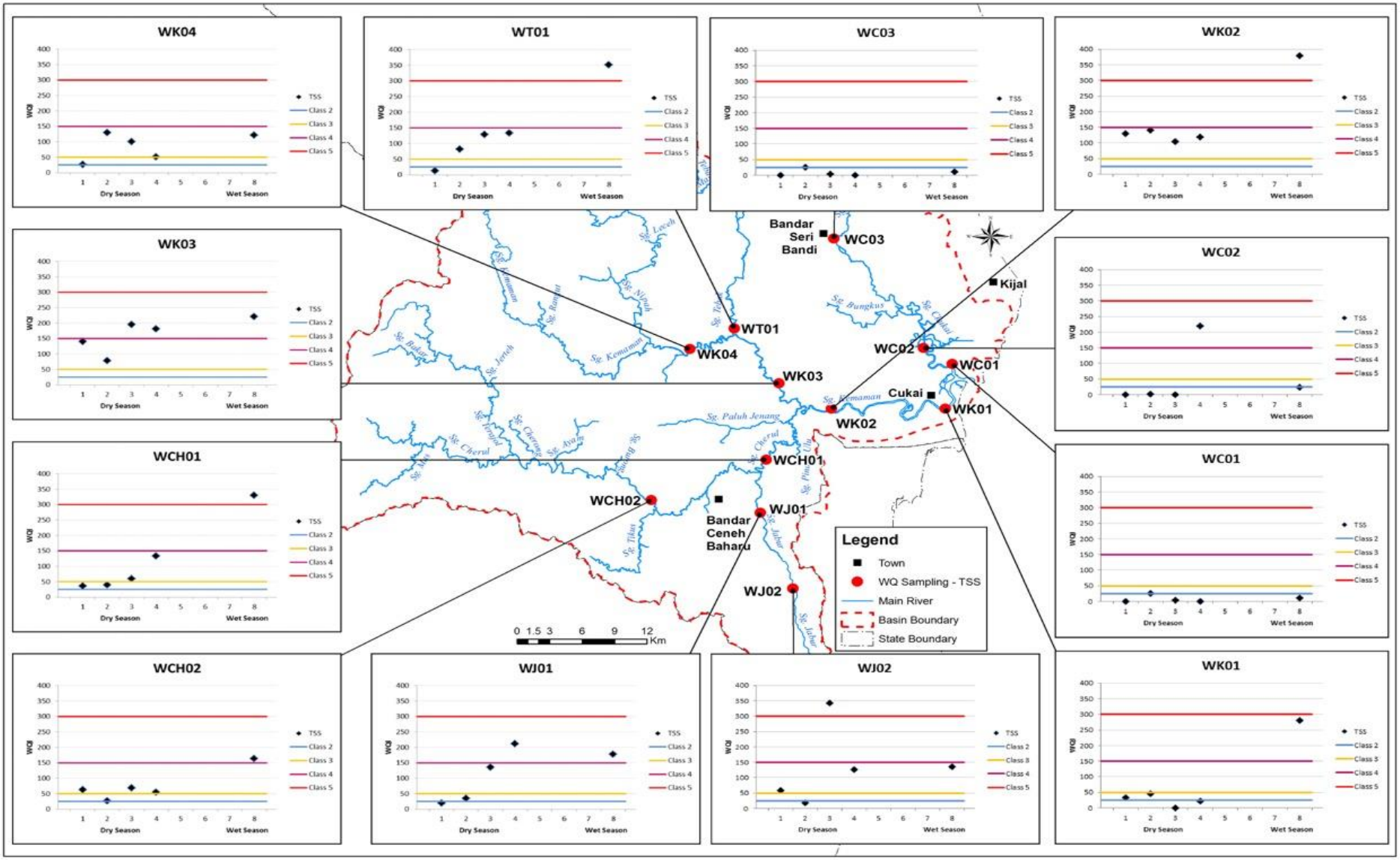

Bed level at Sg Tebak , Tebak
16
14
12
10
8
6
4
2
0
Level
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

Raise by 2m

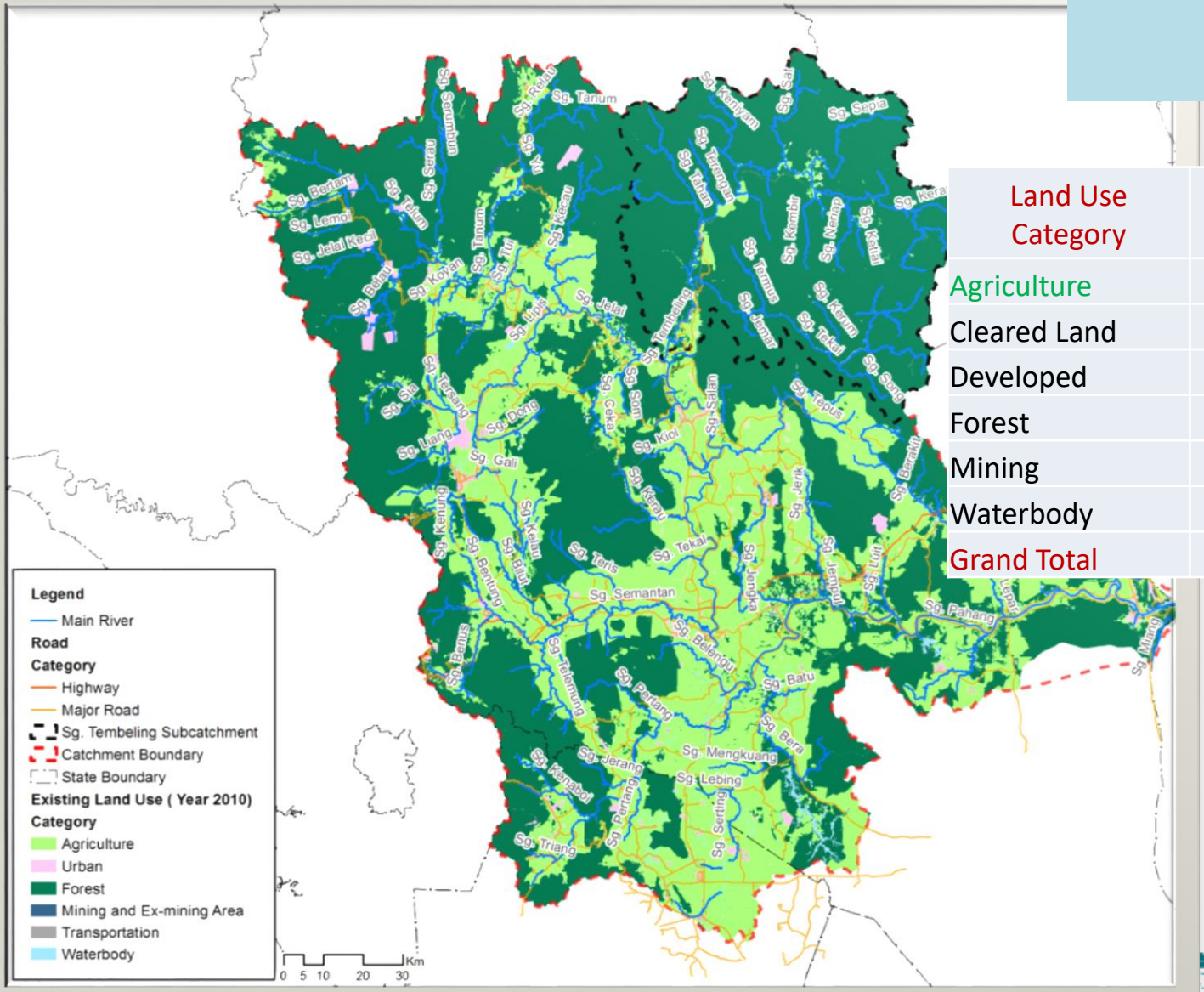
TSS - ASMA


4KM11 TSS
4KM02 TSS
4KM12 TSS
4KM04 TSS
mg/l
Date
TSS
Class 5
Class 4
Class 3
Class 2
Terengganu
4KM02
Hulu kilang
Kelapa Sawit
TDMB
Bandar
Seri
Bandi
Kijal
4KM11
Kg. Air Putih
4KM12
Kg.Pasir Semut
Cukai
4KM04
Hulu Kilang
Kelapa Sawit
Ketengah
Perwira
Bandar
Ceneh
Baharu
Gebeng
Pahang
Sg. Kemaman
Sg. Paluh Jenang
Sg. Cherul
Sg. Bungkus
Sg. Chalal
Sg. Tebak
Sg. Jabur
Legend
Town
Water Quality Station
Main River
Basin Boundary
State Boundary
0
5
10
20
30
40
Km

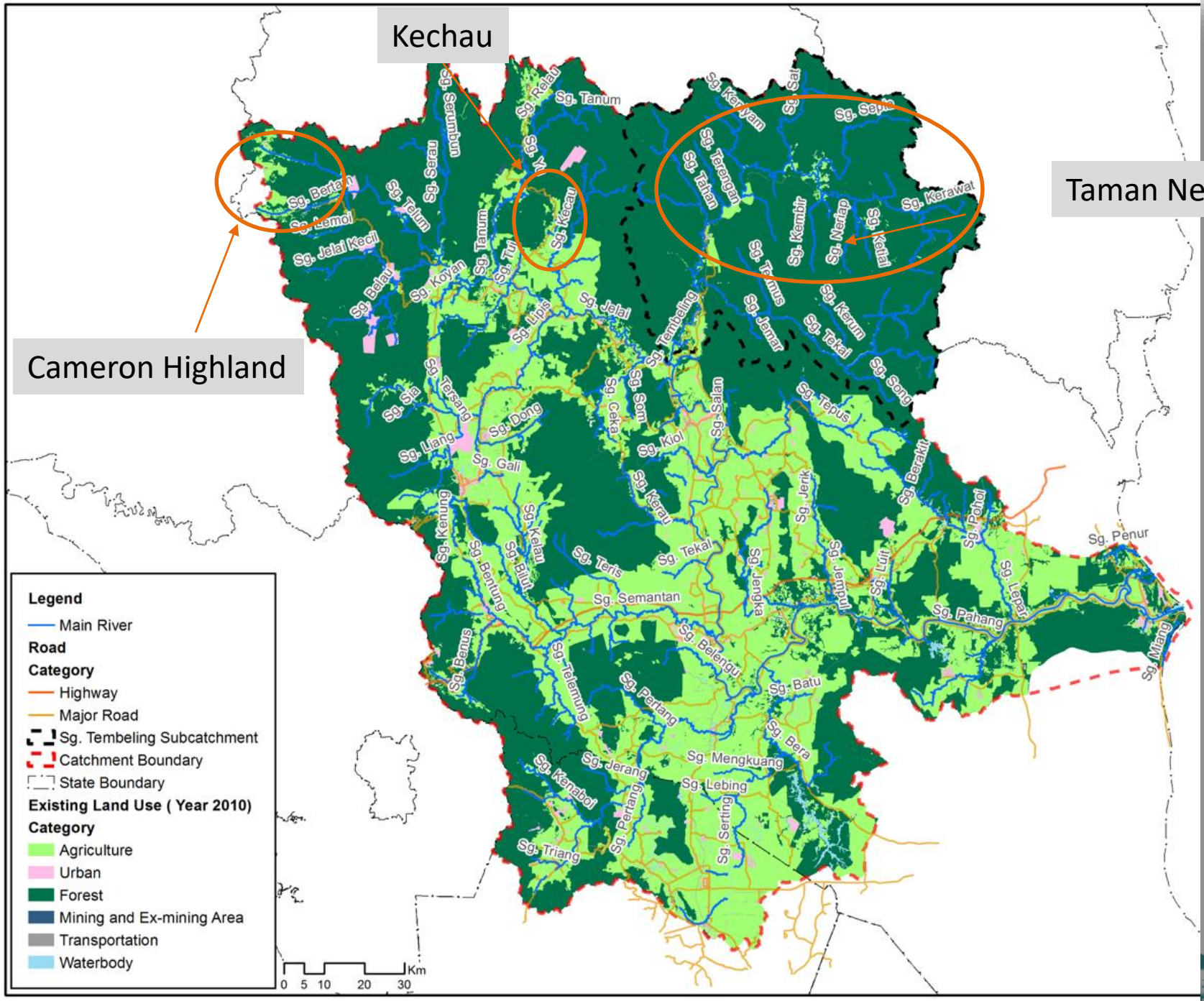
TSS –IRBM Study



Sg Pahang basin



Land Use Category	Area (ha)	Percentage (%)
Agriculture	967579.4	33.5
Cleared Land	39051.7	1.4
Developed	69150.6	2.4
Forest	1716800.0	59.5
Mining	1417.4	0.05
Waterbody	93440.5	3.2
Grand Total	2887439.6	100.0

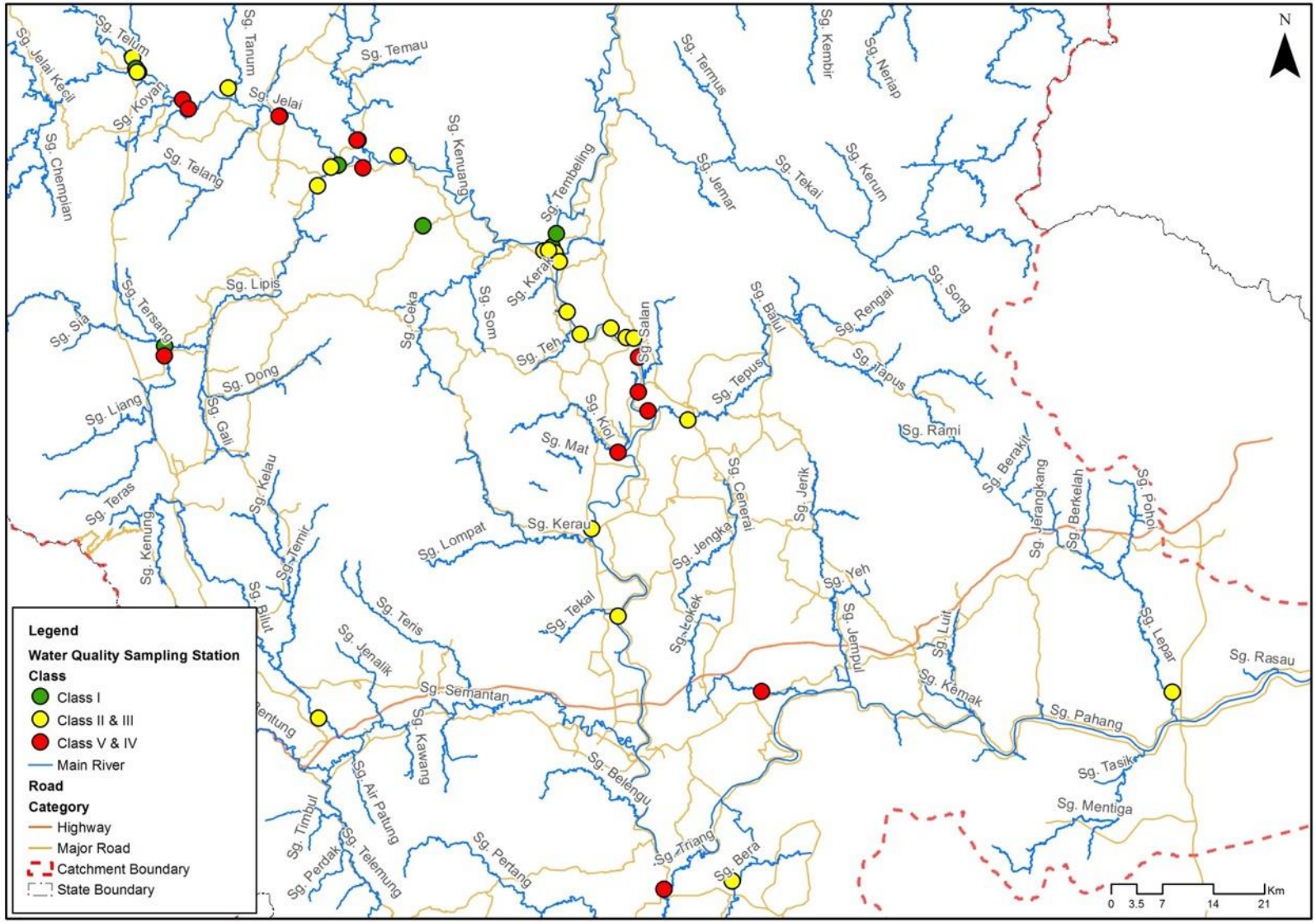

Kechau
Taman Negara
Cameron Highland
Legend
Main River
Road
Category
Highway
Major Road
Sg. Tembeling Subcatchment
Catchment Boundary
State Boundary
Existing Land Use (Year 2010)
Category
Agriculture
Urban
Forest
Mining and Ex-mining Area
Transportation
Waterbody
0 5 10 20 30
Km
Sg. Penur
Sg. Pahang
Sg. Mang
Sg. Tembeling
Sg. Tahan
Sg. Terengan
Sg. Kembir
Sg. Nerap
Sg. Kenal
Sg. Kerawat
Sg. Tamus
Sg. Jemar
Sg. Tekai
Sg. Kerum
Sg. Song
Sg. Tepus
Sg. Berakit
Sg. Pohol
Sg. Lenar
Sg. Luit
Sg. Jempul
Sg. Jerik
Sg. Jenka
Sg. Tekal
Sg. Teris
Sg. Semantan
Sg. Belengu
Sg. Batu
Sg. Bera
Sg. Mengkuang
Sg. Lebing
Sg. Sering
Sg. Pertang
Sg. Jerang
Sg. Kenaboi
Sg. Triang
Sg. Telemung
Sg. Pertang
Sg. Benus
Sg. Bentung
Sg. Bilut
Sg. Kelau
Sg. Kenung
Sg. Liang
Sg. Gali
Sg. Dong
Sg. Tersang
Sg. Sia
Sg. Ceka
Sg. Som
Sg. Kiol
Sg. Kerau
Sg. Salan
Sg. Jelai
Sg. Lapis
Sg. Tiri
Sg. Kecau
Sg. Tanum
Sg. Koyan
Sg. Belau
Sg. Jelai Kecil
Sg. Lemoi
Sg. Berta
Sg. Telum
Sg. Serau
Sg. Serumbun
Sg. Raiau
Sg. Tanum
Sg. Kenyam
Sg. Sar
Sg. Sepu

Water quality at Kuala Tembeling

Dry season

Wet season

TSS along Sg Pahang and it's tributaries



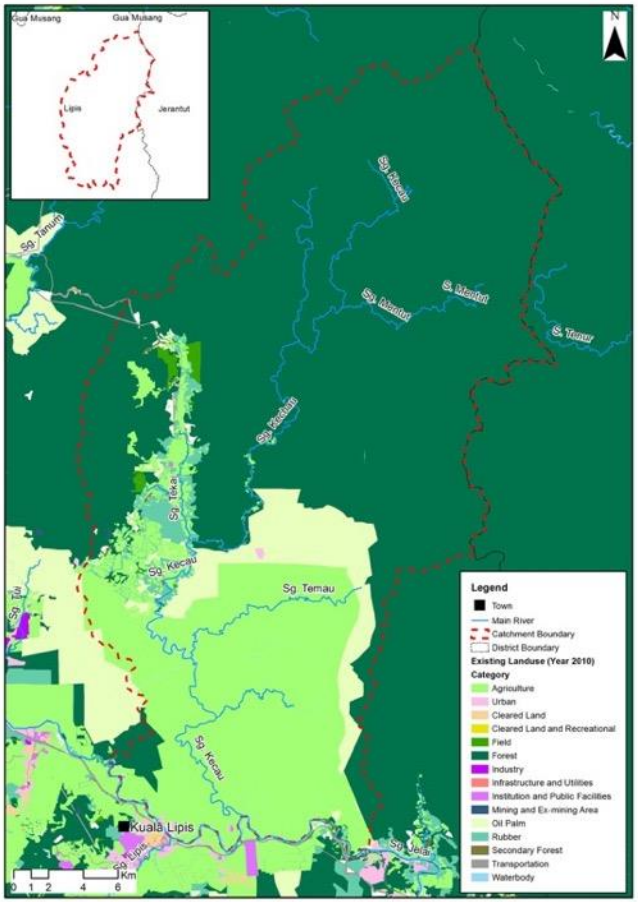
Sg Pahang rivermouth

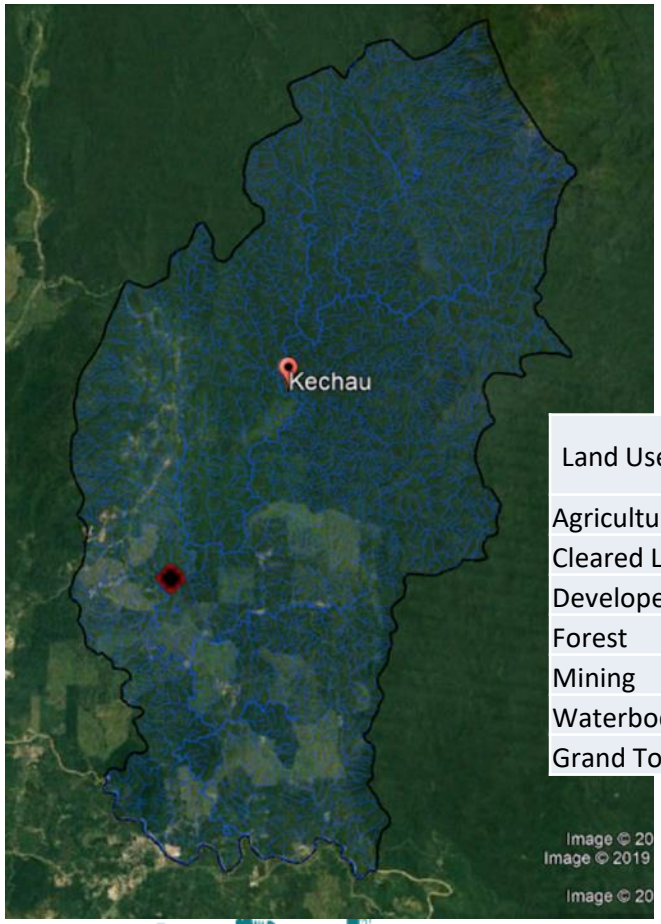
Sg Kechau / Pahang

Sg. Kechau during dry month

Sg. Kechau during wet month

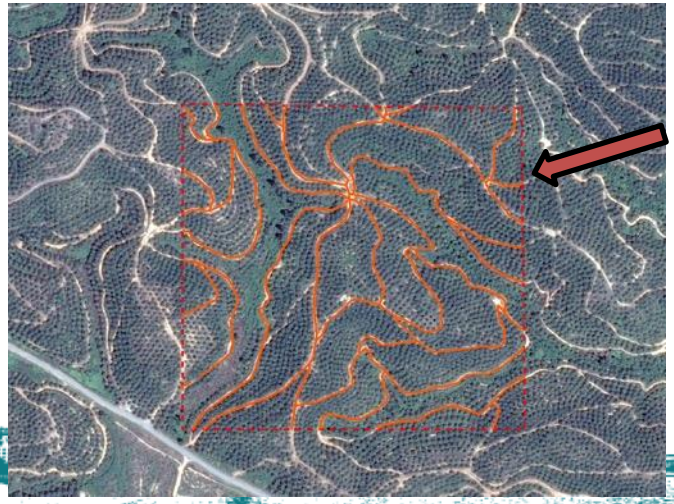
Sg Kechau land use





Land Use Category	Area (ha)	Percentage (%)
Agriculture	26764.6	34.1
Cleared Land	378.5	0.5
Developed	762.8	1.0
Forest	50152.7	63.8
Mining	10.1	0.01
Waterbody	494.2	0.6
Grand Total	78562.8	100.0

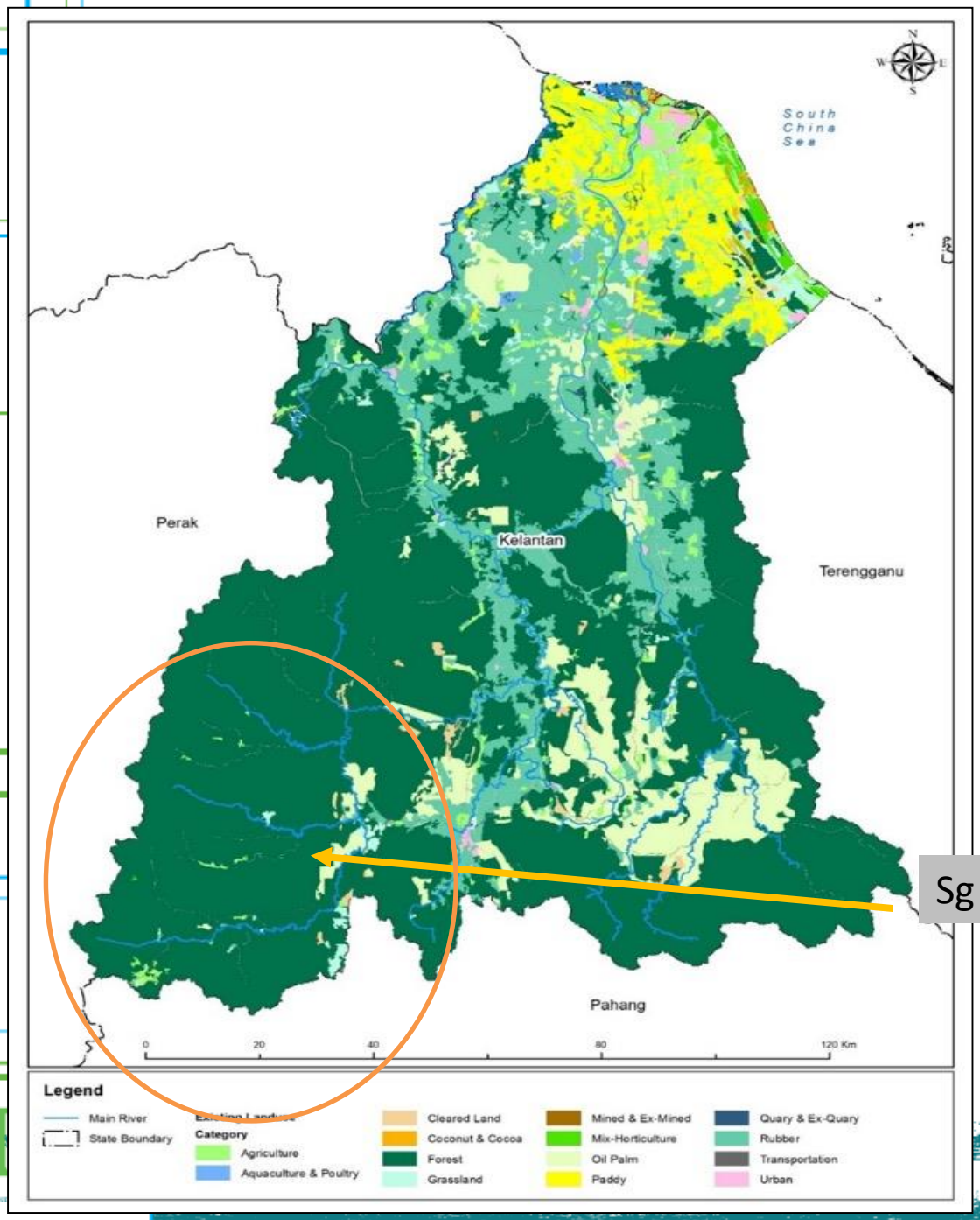
Oil Palm Plantations in Sg Kechau Catchment (Farm road contribution)



Farm Road covers 8-10% of the total area

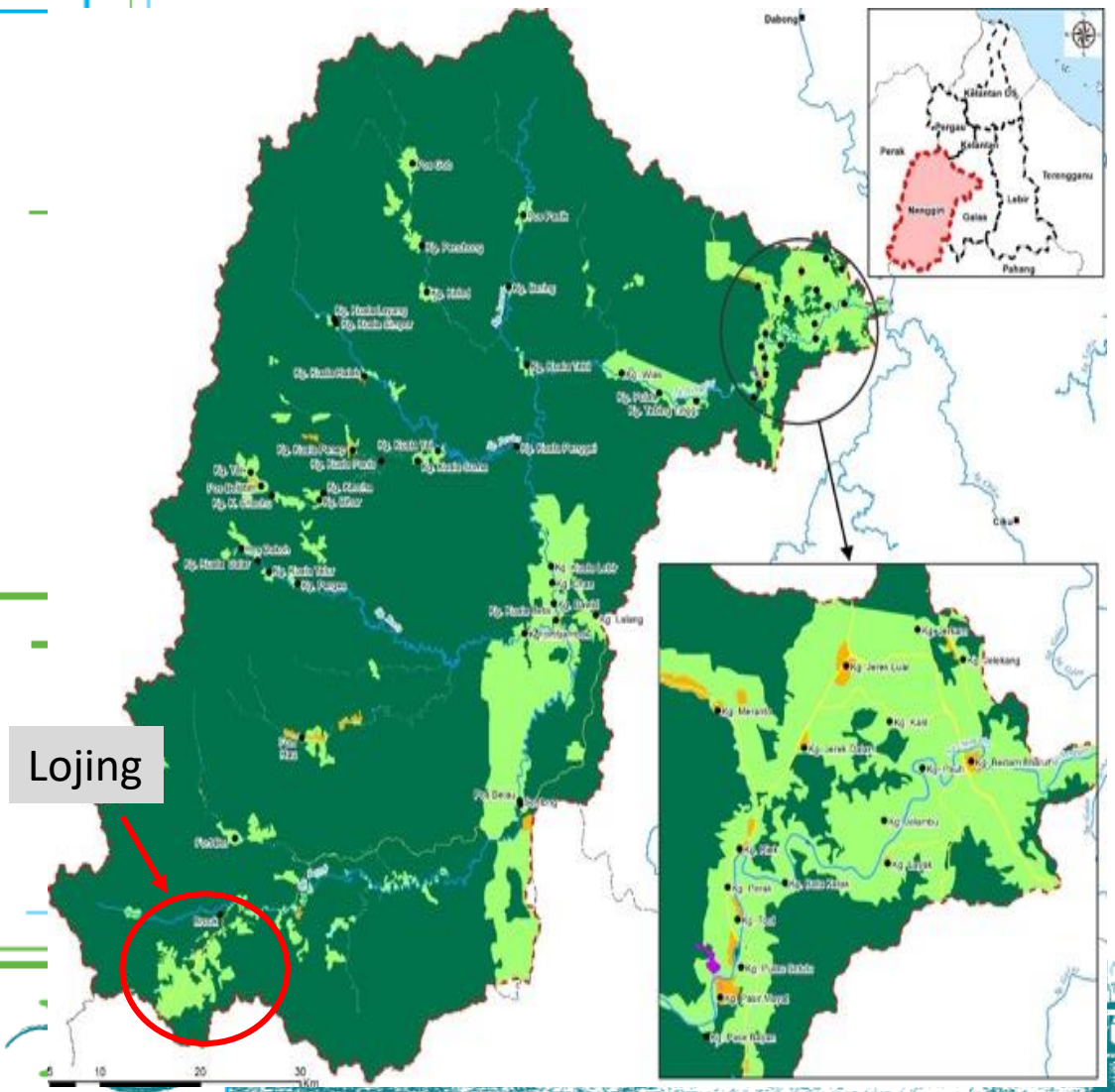
SG KELANTAN BASIN

Sg Kelantan Basin



Sg Nenggiri

Sg Nenggiri Basin



Land Use Category	Area (ha)	Percentage (%)
Agriculture	39335.3	10.04
Cleared Land	76.5	0.02
Cleared Land and Recreational	3.3	0.00
Forest	348072.6	88.84
Grassland	72.6	0.02
Industry	27.9	0.01
Institutions and Public Facilities	27.0	0.01
Quary/Ex-Quary	10.5	0.00
Residential Area	1076.7	0.27
Transportation	935.4	0.24
Waterbody	2148.0	0.55
Grand Total	391785.7	100.00

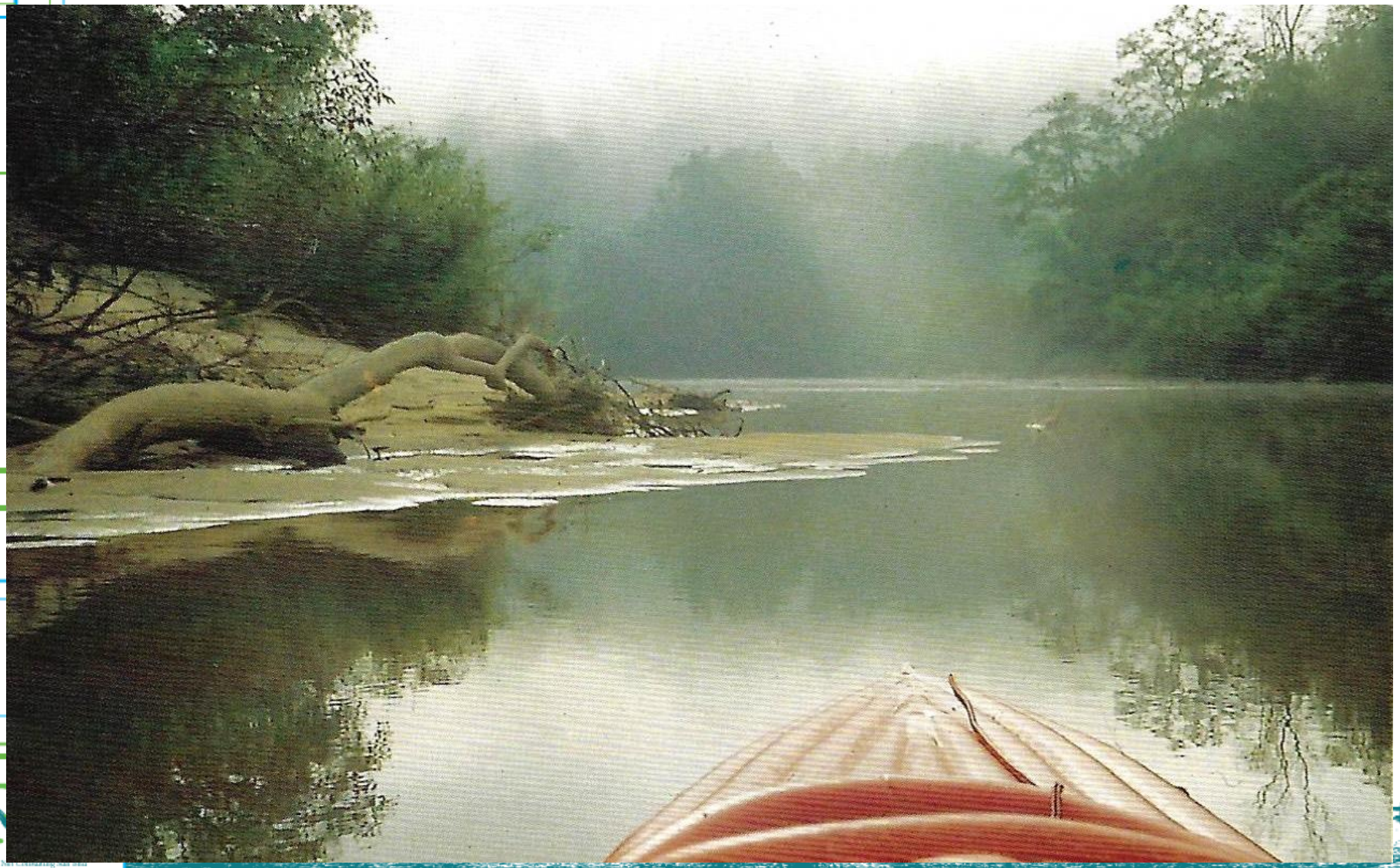
LOJING HIGHLANDS

VEGETABLES & FLORICULTURE IN LOJING

Protected Highway slope

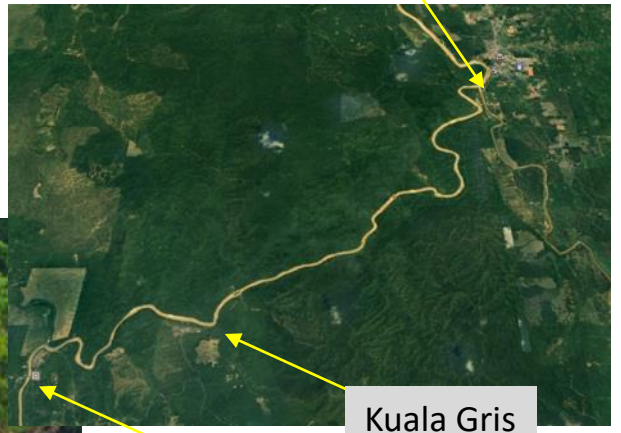
Heavy Sedimentation in Sg Belatop, tributary of Sg Nenggiri

Sg Nenggiri (Before 1996)



Sg Nenggiri and Sg Galas (Present)

Kuala Gris




2018

Sg Kelantan river mouth

River Net Consulting Sdn Bhd

Water Quality (DOE) Sg Kelantan

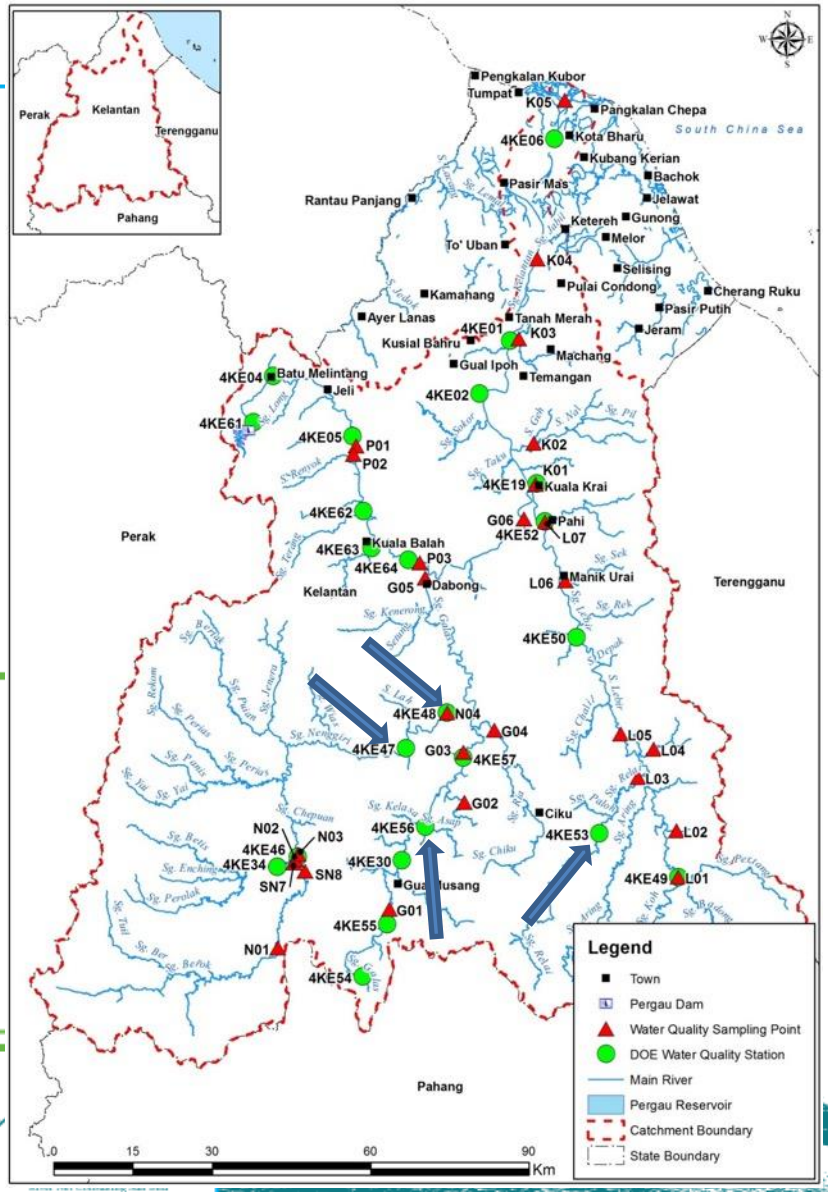


Table 7.13: Water Quality Data from DOE (Sunga

STATION	DATE	DO (mg/l)	BOD (mg/l)	COD (mg/l)	SS (mg/l)
4KE56	9-May-12	5.90	2	9	244
4KE56	19-Jul-12	6.89	5	18	400
4KE56	21-Sep-12	7.02	2	6	43
4KE56	14-Feb-13	7.07	2	5	92
4KE56	22-Mar-13	7.42	3	8	25
4KE56	20-May-13	7.24	6	19	150
4KE56	22-Sep-13	6.46	4	13	23
4KE56	29-Nov-13	6.05	3	10	14
4KE56	22-Jan-14	7.96	6	18	73
4KE56	20-Feb-14	7.39	5	14	24
4KE56	16-Mar-14	7.88	7	15	61
4KE56	22-Jul-14	7.40	3	9	31
4KE56	16-Nov-14	4.74	7	22	375
4KE56	21-Jan-15	7.07	8	23	15
4KE56	20-Mar-15	5.44	3	14	23
4KE56	15-May-15	4.81	2	8	47
4KE56	23-Jul-15	6.66	2	6	20
4KE56	17-Sep-15	4.67	7	16	45
4KE57	17-Feb-11	7.06	2	5	63
4KE57	18-Apr-11	5.07	7	22	970
4KE57	21-Jun-11	6.80	2	5	32
4KE57	22-Aug-11	7.37	6	26	194
4KE57	21-Oct-11	7.43	3	17	37
4KE57	15-Jan-12	7.57	6	26	142
4KE57	14-Mar-12	6.59	2	6	21
4KE57	9-May-12	5.38	2	8	393
4KE57	19-Jul-12	6.87	2	8	318
4KE57	21-Sep-12	6.84	2	6	46
4KE57	14-Feb-13	6.66	2	5	71

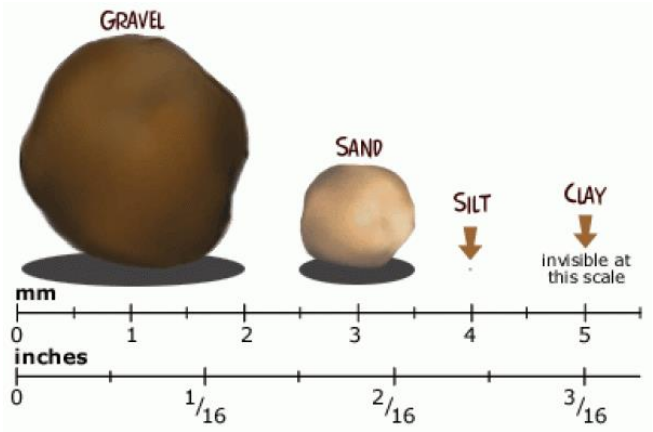
Summary
(Permanently exposed farm road)

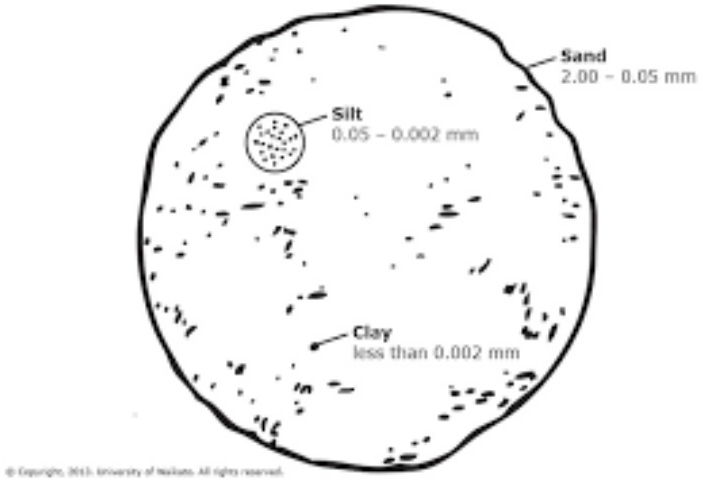
Basin	Agriculture area (ha)	Exposed Farm road (ha)	Equivalent to (x) no of 50 ha housing / Infrastructure schemes
Sg Kemaman	89,904	8,990	180
Sg Nenggiri	39,335	3,933	78
Sg Pahang	967,579	96,757	1935

Note : All value is estimated only

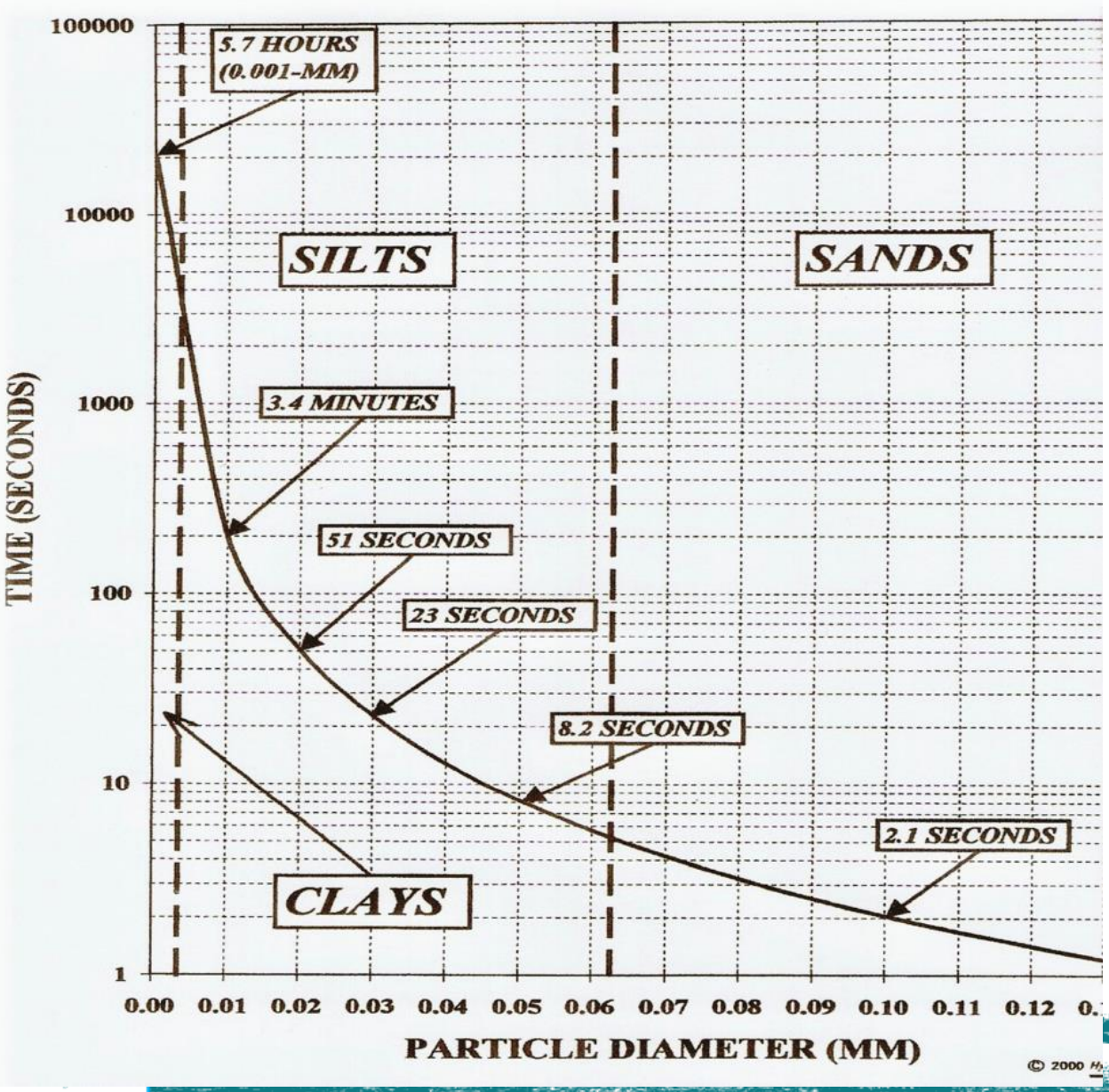
SOIL PHYSICAL PROPERTIES

Separate	Diameter (mm)	Comparison	Feel
Very coarse sand	2.00-1.00	36"	Grains easily seen, sharp, gritty
Coarse sand	1.00-0.50	18"	
Medium sand	0.50-0.25	9"	
Fine sand	0.25-0.10	4 1/2"	Gritty, each grain barely visible
Very fine sand	0.10-0.05	1 3/4"	
Silt	0.05-0.002	7/16"	Grains invisible to eye, silky to touch
Clay	<0.002	1/32"	Sticky when wet, dry pellets hard, harsh





TIME FOR SUSPENDED PARTICLES TO FALL ONE CENTIMETER IN WATER AT ZERO DEGREES CELCIUS



Note:
Clay particles require an extremely long time to settle,
- 5.7 hrs to settle 1 cm .

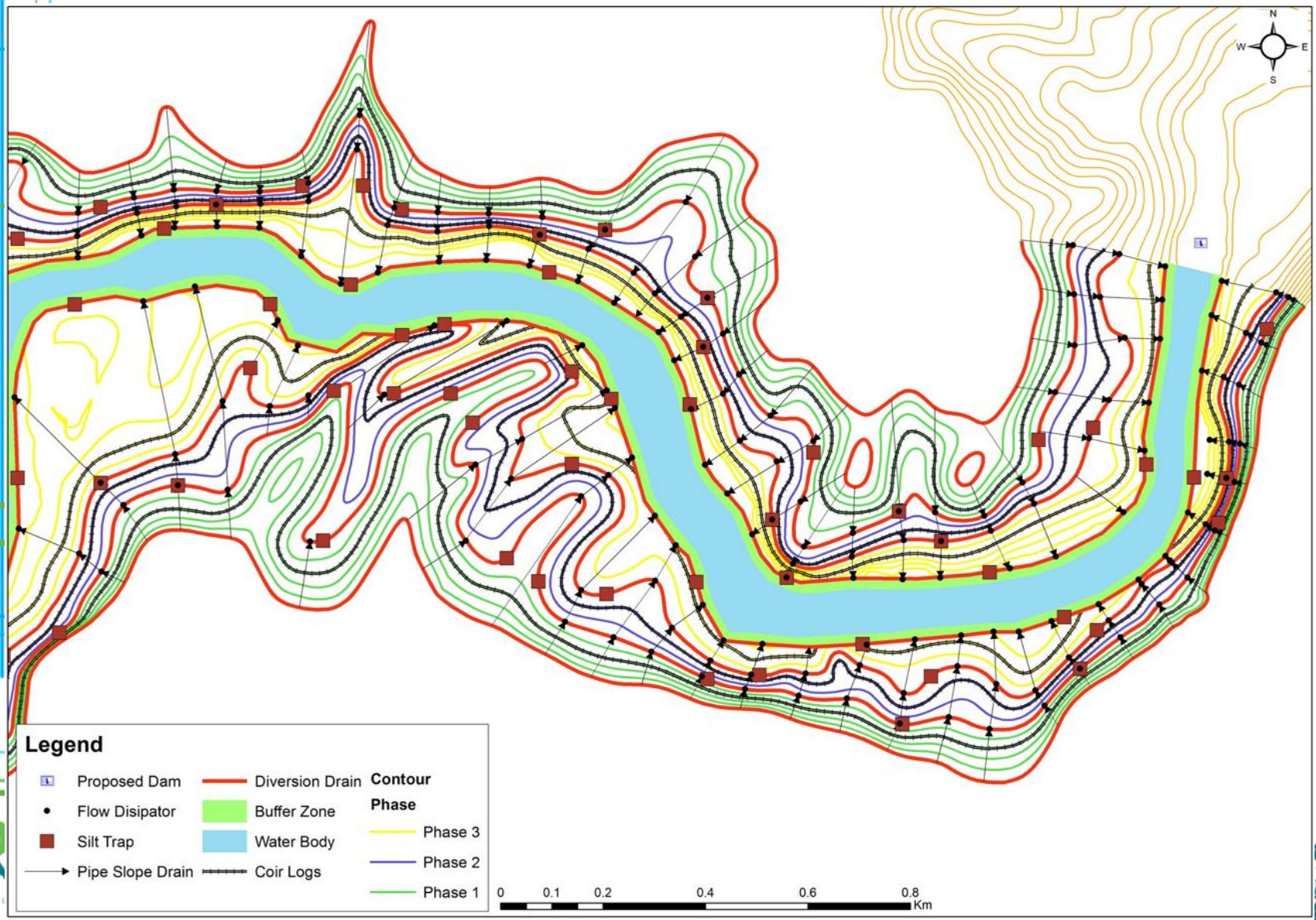
O.1 mm takes 2 sec
0.01 mm takes 200 sec
0.001 takes 20,000 sec.

ACTION PLAN

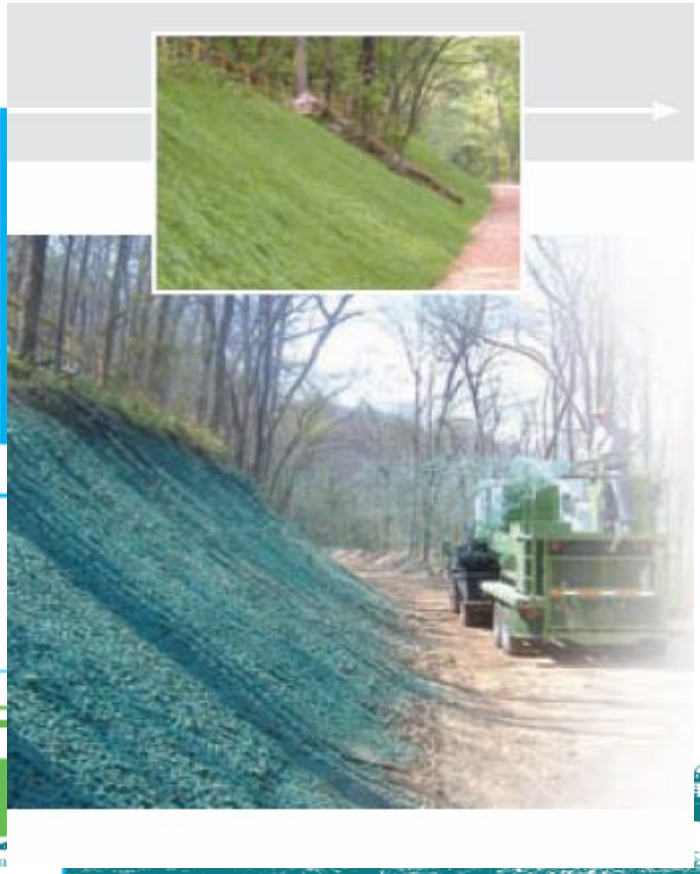
Policy

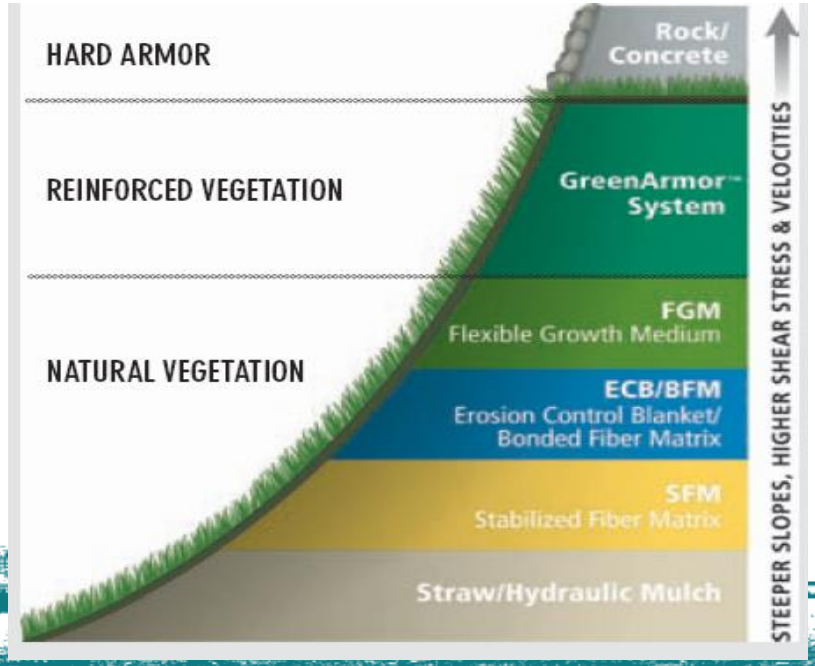
- ✓ Land development schemes covering an area 500 hectares or more to bring forest into agriculture production
  - ➢ Need to be reviewed / impose ESCP
  - ➢ Area should be decreased
  - ➢ Agriculture contribution should be imposed
  - ➢ DOA should take lead / with officers should be trained on ESCP
- ✓ Development of agriculture estates covering an area of 500 hectares or more involving changes in type of agriculture
  - ➢ Need to be reviewed
- ✓ Replanting of need to have ESCP

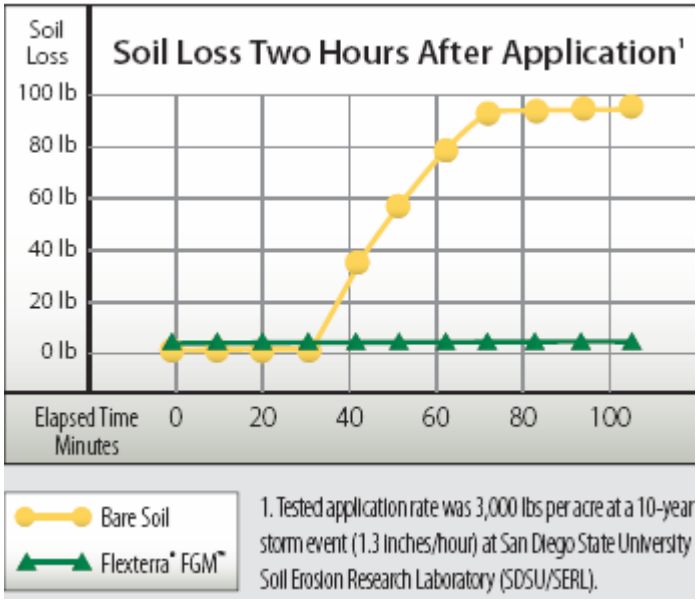
Sample of ESCP during forest clearing

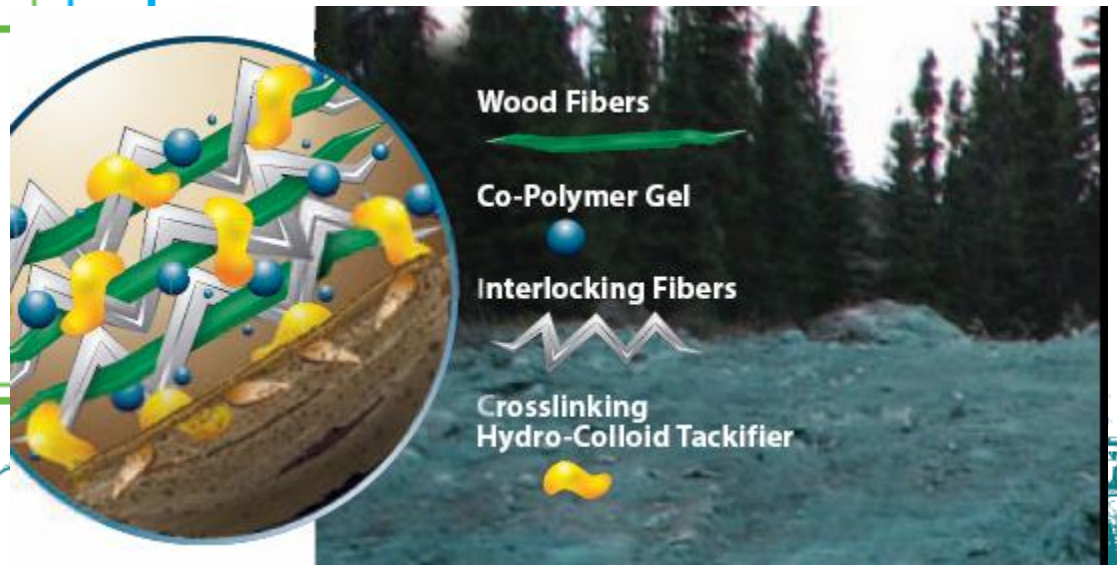


NEW TECHNOLOGY
eg Hydromulching









HydroMulching/ FGM

- Easy to install
- Costs less
- Saves Time
- Thick vegetative protection
- No slope preparation needed

Soil Conditioner and Erosion Control Polymer

Application in Agriculture

Reduces soil loss 80% - 98%

First commercial use in the US of polyacrylamides in 1995, approximately 50,000 acres were treated and one million tons of soil were saved (Sojka and Lentz, 1996). By 2001, approximately two million acres were being treated.

Conclusions

- Plantation and Agriculture Sectors urgently need ESCP
- Agriculture officers need strengthening of ESC expertise
- Consultants need to be employed for large Agriculture areas to prepare ESCP both for:
  - New land clearing stage
  - Replanting stage

Acknowledgment

(Dato Ahmad Fuad Embi for sharing some of the slides)

Thank You