

3.5 Situation of environmental quality

3.5.1 Accepted standard

The standard for surface water adopted by BANCA is CPCB, see Table 3.5-1. The implementation standard of ambient air quality is that maximum limit of PM_{10} 24 hours averagely is $70 \mu\text{g}/\text{m}^3$, and maximum limit of SO_2 24 hours averagely is $125 \mu\text{g}/\text{m}^3$; See the

table3.5-2 for the limit of noise standard.

Table 3.5-1 limit list of water quality indicators of CPCB			
No.	Pamameter	Unit	Standard limits of inland surface water
1	pH		5.5-9.0
2	Temperature	°C	< 40
3	TSS	mg/l max	100
4	petroleum	mg/l	10.0
5	nitrogen	mg/l	50.0
6	phosphorus	mg/l	5.0
7	BOD	mg/l	30.0
8	COD	mg/l	250
9	arsenic	mg/l	0.2
10	mercury	mg/l	0.01
11	chromium	mg/l	2.0
12	zinc	mg/l	5.0
13	nickel	mg/l	3.0
14	cyanide	mg/l	0.2
15	phenol	mg/l	1.0

Table 3.5-2 A list of limits of noise standard			
Applicable zone	Unit	Limits of noise standard	
		Daytime (07:00 - 22:00) -22.00)	Nighttime(22.00 -07.00)
Residence and education zone	dB	55	45
Industry and commerce zone and commerce zone	dB	70	70

3.5.2 Water environment

(1) Monitoring results of water quality

Commissioned by CPIYN, BANCA conducted water quality monitoring of the surface water of a total of 18 sections of the main streams and tributaries of the Ayeyawady River from January to May (low flow period) and from July to August (high flow period) in 2009. See Diagram 3.5-1 for the layout of water quality monitoring sections.

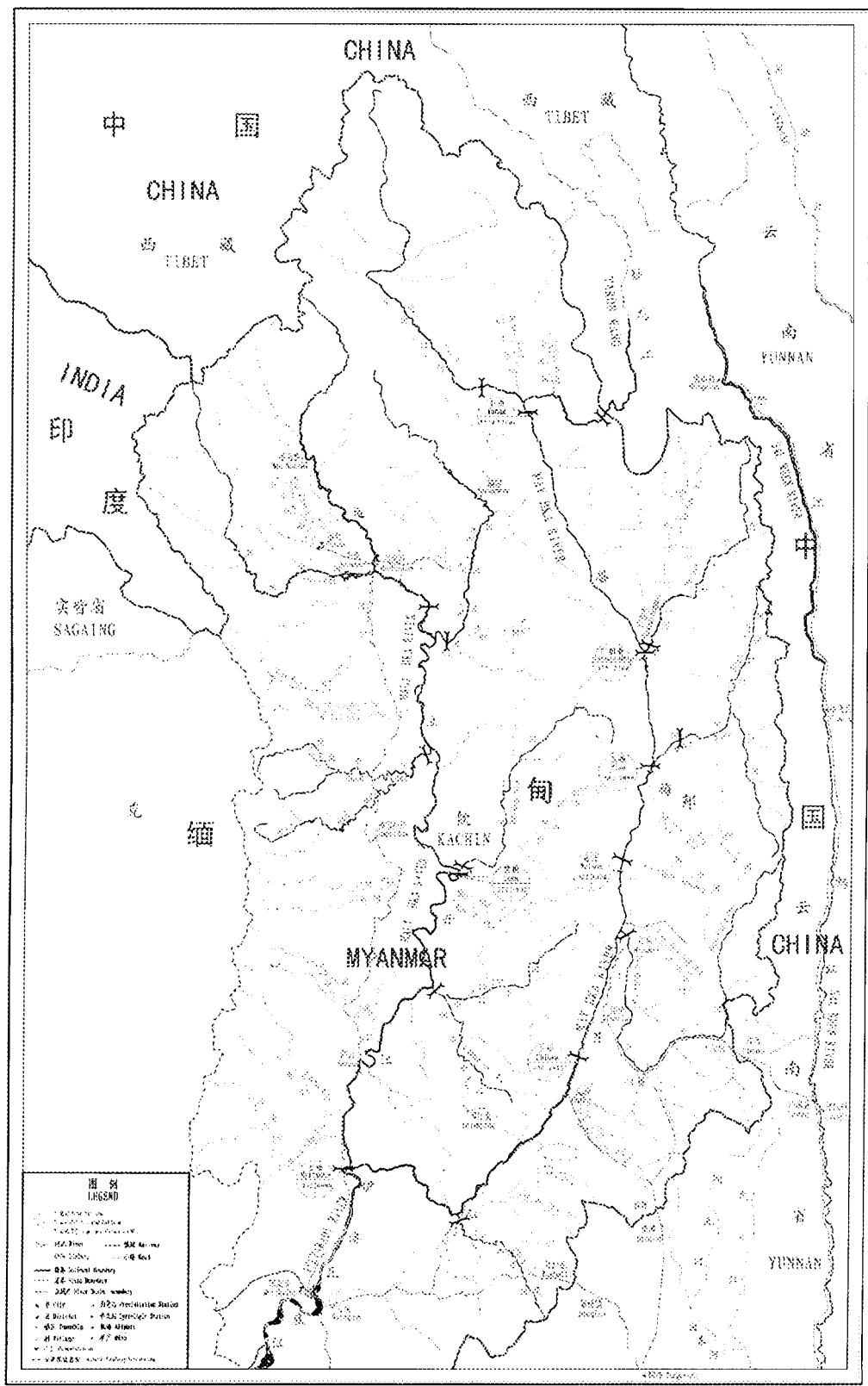


Diagram 3.5-1 layout of surface water monitoring sections

The index of surface water quality monitoring of the Upper Reaches of the Ayeyawady River include 15 items: water temperature, pH, BOD, COD, TSS, petroleum, phenol, cyanide, total nitrogen, total phosphorus, arsenic, chromium, mercury, nickel, and lead. Monitoring methods are subject to "Methods in Environmental Analysis Water, Soil and Air", see Table 3.5 -3 and Table 3.5-4 for monitoring results.



Malikha River



Nmaiha River

Table 3.5-3 list of surface water quality monitoring results of the Malikha River

Water quality indicators		Section name						
		the Malikha River	the Lamusang estuary	the Pangxinkasang estuary	the Laza dam site	the Ranka estuary	the Talaka estuary	the Myitsone dam site
pH	low flow period	7.51	7.6	7.56	7.49	7.53	7.5	7.88
	high flow period	7.38	6.64	7.21	7.15	7.14	7.34	7.04
BOD	low flow period	N.D	N.D	N.D	N.D	0.2	0.2	0.6
	high flow period	0.2	0.4	N.D	N.D	N.D	N.D	N.D
COD	low flow period	N.D	N.D	N.D	2	2	4	3.04
	high flow period	8.8	5.28	1.84	N.D	N.D	N.D	3.68
TSS	low flow period	< 5.00	< 5.00	5	5	< 5.00	< 5.0	13
	high flow period	60	20	15	5	105	5	550
petroleum	low flow period	1	8	3	10	2	0	2
	high flow period	3.03	2.3	1.7	3.5	3.45	1.97	1.92
phenol	low flow period	0	0	0	0	0	0	0
	high flow period	4.8	4.5	5.4	5.3	4.8	5	3.5
cyanide	low flow period	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10
	high flow period	< 0.10	< 0.1	< 0.1	< 0.10	< 0.10	< 0.10	< 0.10
TN	low flow period	31.4	20.4	16.8	19.6	33.6	28	22.4
	high flow period	17.64	63	48.38	30.24	24.19	27.2	33.2
TP	low flow period	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.05
	high flow period	< 0.50	< 0.5	7.5	2.5	< 0.50	2.5	2.5
arsenic	low flow period	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	high flow period	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
chromium	low flow period	N.D	N.D	0.575	0.545	0.477	0.413	N.D
	high flow period	N.D	N.D	N.D	N.D	N.D	N.D	N.D
mercury	low flow period	0.0063	0	0	0.005	0.0047	0.0036	0.007
	high flow period	0.0021	0.0018	0	0	0.0047	0.0065	0.0065
nickel	low flow period	N.D	N.D	N.D	N.D	N.D	N.D	N.D
	high flow period	0.011	N.D	N.D	N.D	N.D	0.007	N.D
zinc	low flow period	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	high flow period	< 1.0	< 1.0	< 1.0	< 1.00	< 1.00	< 1.00	< 1.00

Table 3.5 -4

list of surface water quality monitoring results of the Nmai hka River

Water quality indicators		Section name										
		the Nantamai estuary	the Dulong River	the Yen an dam site	the akeyang estuary	the Kaunglanhpu dam site	the Mikerui estuary	the Pisa dam site	the Wutsok dam site	the Nuoqianka estuary	the Chibwe dam site	the Nanmuni estuary
pH	low flow period	7.53	7.52	7.43	7.54	7.6	7.65	7.54	7.54	7.56	7.53	7.61
	high flow period	7.18	6.53	7.04	7.2	7.1	7.5	7.51	7.36	7.24	7.46	7.52
BOD	low flow period	0.6	0.2	0.02	N.D	N.D	N.D	N.D	0.8	0.4	0.2	0.6
	high flow period	0.2	N.D	N.D	N.D	N.D	N.D	N.D	0.2	N.D	N.D	N.D
COD	low flow period	N.D	N.D	4	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
	high flow period	3.52	5.28	1.84	N.D	N.D	N.D	3.52	52.8	5.28	N.D	3.68
TSS	low flow period	< 5.00	< 5.00	< 5.00	5	5	15	20	< 5.00	250	< 5.00	< 5.00
	high flow period	300	10	15	400	100	80	120	200	170	430	100
petroleum	low flow period	5	3	2	1	3	3	2	6	4	3	4
	high flow period	4.19	4.5	2.2	11.13	3.43	4.57	6.19	16.6	3.9	3.13	3.4
phenol	low flow period	0	0	0	0	0	0	0	0	0	0	0
	high flow period	4.3	4.7	4.3	3.2	3.5	4.5	4.3	4.8	4.8	5.1	5.2
cyanide	low flow period	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	high flow period	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
TN	low flow period	14	22.6	19.6	19.6	16.8	19.6	16.8	36.4	22.4	19.6	33.6
	high flow period	45.36	42.84	15.12	32.76	69..00	30.2	25.2	40.32	7.75	21.16	42.12

Table 3.5 -4 continued

list of surface water quality monitoring results of the Nmaiha River

Water quality indicators		Section name										
		the Nantamai estuary	the Dulong River	the Yenai dam site	the akeyang estuary	the Kaunglanhpu dam site	the Mikerui estuary	the Pisa dam site	the Wutsok dam site	the Nuoqianka estuary	the Chibwe dam site	the Nanmuni estuary
TP	low flow period	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
	high flow period	< 0.50	< 0.50	< 0.50	< 0.50	2.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
arsenic	low flow period	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	high flow period	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
chromium	low flow period	0.549	0.572	0.547	0.56	0.588	0.585	0.585	0.508	0.565	0.542	0.548
	high flow period	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
mercury	low flow period	0.0057	0.0065	0.006	0.0047	0.005	0.0062	0.006	0.0055	0	0.0038	0.0044
	high flow period	0.0024	0.0028	0.0024	0	0	0.0057	0.0047	0.001	0.0059	0.0032	0.0038
nickel	low flow period	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
	high flow period	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
zinc	low flow period	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
	high flow period	< 1.00	< 1.0	< 1.00	< 1.00	< 1.00	< 1.0	< 1.00	< 1.00	< 1.00	< 1.00	< 1.0

(2) Analysis of water quality status

According to Table 3.5-3 and Table 3.5-4, the water quality status is analyzed from such aspects as pH, biochemical oxygen demand (BOD), organic chemical, organic pollutant, nutritive material and suspended solid.

1) pH

pH means acidity-alkalinity of water body. The monitoring results shows that pH of upstream water body of Ayeyawady River is 7.0~8.0 in dry season and 6.5~7.5 in wet season. Low pH in wet season may be the result of dilution of water body in rainy season. Whether in dry season or wet season, pH falls between 5.5 and 9.0 of the limit of CPCB standard.

2) BOD

The monitoring results shows that no BOD is monitored in the vast majority in wet season. BOD of Myitsone River, Rica River, Taraka River, Nantamai River, Drung River, Wutsok River, Nuoqianka River, Chibwe River and Nanmuni River falls between 0.2 and 0.8mg/l in dry season, and that of Yen-an River is very small. Whether in dry season or wet season, BOD is lower than the limit of CPCB standard.

COD of the vast majority of the sections is 2.0mg/l in dry season, and only COD of Wutsok River is less than 10mg/l, which may be the result of chemical reaction of the organic of the forest; however, such COD is too far lower than the standard limit, 250mg/l.

3) Organic chemical

The content of petroleum in water body in Wutsok River and Arkyin River is between 11.13 and 16.60mg/l, which is higher than the standard limit, 10.0mg/l. This may be the result of the diesel engine and gasoline engine applied by the gold dredgers in the upstream river.

In wet season, the content of phenol in all monitoring sections of water quality is between 2 and 5.4mg/l, higher than the standard limit, 0.5mg/l. This may be the result of some types of

higher plants in water, or the result of deciduous leaves of some trees and of the seeds of the forest in the watershed.

CN level of all monitoring sections of water quality is lower than 0.1mg/l, too far lower than the standard limit, 1.0mg/l.

4) Inorganic pollutant

Arsenic content in all monitoring sections of water quality is lower than 0.01mg/l, too far lower than the standard limit, 0.1mg/l, whether in dry season or in wet season.

Chrome is monitored in all monitoring sections of water quality in wet season, and chrome content is slightly higher than 0.5mg/l, which is still lower than the standard limit, 2.0mg/l.

Whether in dry season or in wet season, Hg, nickel and zinc content in all monitoring sections of water quality is lower than the standard limit.

5) Nutritive material

As no fertilizer is used in the area, but with relatively high nitrogen concentration in surface water, the nitrogen content in Guanglanhpu River, Lamusang River, Pangxinkasang River, Drung River, Wutsok River and Nanmuni is between 40.32 and 69.00mg/l. This may be the result of decomposition of animal faeces and plants.

The monitoring results show that the phosphor content in most monitoring sections of water quality does not exceed the standard limit, and only the phosphor content in Pangxinkasang River in wet season is higher than the standard limit, 5.0mg/l. This may be the result of decomposition of animal faeces and plants as well as rotation planting.

6) Suspended solid

The monitoring results of water quality status show that TSS of all monitoring sections of water quality in dry season is within the standard limit, 100mg/l; in wet season, however, TSS goes beyond the standard limit. Especially, TSS of the downstream Myitsone River reaches 550mg/l, which may be mainly the result of the flood water carrying a large quantity

of clays, silts, plant fibers and organisms in wet season accompanied by rainy season.

According to above analysis, in the 18 sections of the 7 cascade hydropower stations and their tributaries, in low flow period, all the water quality indicators are within the limits of CPCB (Central Pollution Control Board of India); in high flow period, the phosphorus of Kaunglanhpu section is higher than the limit, the nitrogen of the Pangxinka estuary is higher than the limit, the petroleum of the Wutsok dam site and the Akeyang estuary is higher than the limit, and the phenol of all sections is higher than the limit. Comprehensive analysis shows that the overall water quality of the hydropower development section of the Upper Reaches of the Ayeyawady River is good to meet the requirements of inland surface water standards and restrictions.

3.5.3 Ambient air

Commissioned by Yunnan International Power Investment Co., Ltd of China Power Investment Corporation, Myanmar’s Biodiversity and Nature Conservation Association (BANCA) established 15 monitoring stations in areas involved in the hydropower development of the Upper Reaches of the Ayeyawady River and conducted air environmental monitoring from January to May, 2009. For the layout of monitoring stations of atmospheric environment, see Diagram 3.5-2.

The atmospheric monitoring project in areas involved in the hydropower development of the Upper Reaches of the Ayeyawady River includes particulate matter (PM₁₀) and sulfur dioxide (SO₂).Monitoring methods are subject to "Methods in Environmental Analysis Water, Soil and Air", see Table 3.5-4 for monitoring results.

Table 3.5-4 shows that the concentration of SO₂ in all monitoring stations is between 0.06 and 0.79 µg/m³ which is substantially lower than the average 24-hour maximum limit of SO₂ of 125 µg/m³. Except Myitkyina monitoring station, the concentration of PM₁₀ in all other monitoring stations is between 0.03 to 2.08µg/m³ which is lower than the average 24-hour maximum limit of PM₁₀ of 70µg/m³.Comprehensive analysis shows that the quality of ambient air of hydropower development section of the Upper Reaches of the Ayeyawady

River is good.

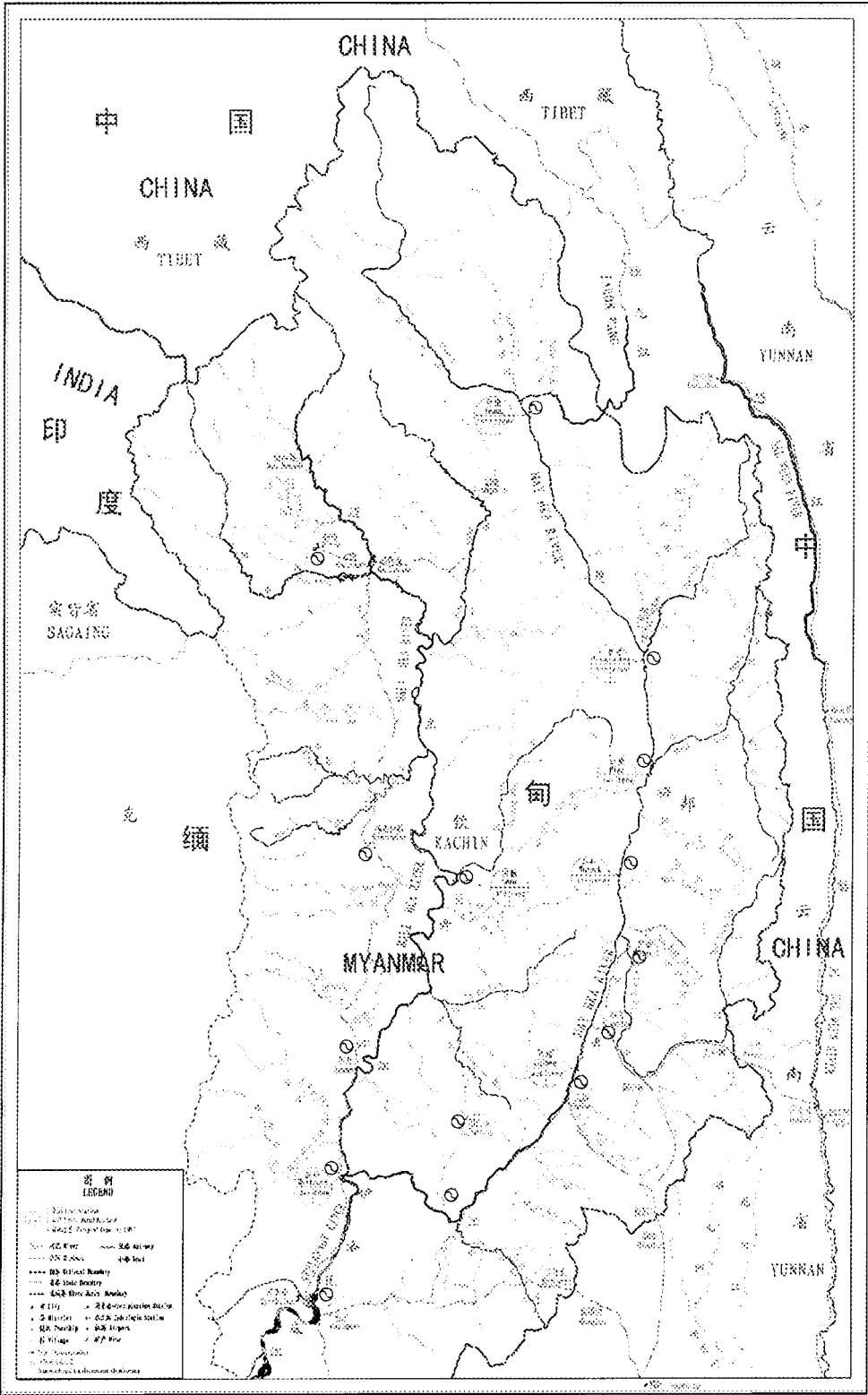


Diagram 3.5-2 layout of monitoring stations of atmospheric environment in areas of the Upper Reaches of the Ayeyawady River

**Table 3.5-4 list of atmospheric environment monitoring results in areas involved
in the hydropower development of the Upper Reaches of the Ayeyawady River**

No.	Monitoring stations	Unit	PM10	SO2
1	Myitsone	µg/m ³	2.08	0.33
2	Laza	µg/m ³	0.07	x
3	Chibwe	µg/m ³	0.23	0.13
4	Wutsok	µg/m ³	0.47	0.08
5	Pisa	µg/m ³	0.13	0.79
6	Sunbulabang	µg/m ³	1.53	0.06
7	Yenan	µg/m ³	x	x
8	Kaunglanhpu	µg/m ³	x	x
9	Mangkyi	µg/m ³	0.18	0.18
10	Tsawlaw	µg/m ³	x	x
11	Sawang	µg/m ³	x	x
12	Myitkyina—Chibwe	µg/m ³	x	x
13	Majiangyang	µg/m ³	0.46	0.53
14	Putao	µg/m ³	0.03	0.03
15	Myitkyina	µg/m ³	269.87	0.41

Note: "x" indicates that apart from a small amount of dust, the rest is in good condition.

3.5.4 Acoustic environment

Commissioned by Yunnan International Power Investment Co., Ltd of China Power Investment Corporation, Myanmar’s Biodiversity and Nature Conservation Association (BANCA) established 7 monitoring stations in areas involved in the hydropower development of the Upper Reaches of the Ayeyawady River and conducted monitoring of acoustic environment from January to May, 2009.For the layout of monitoring stations of acoustic environment, see Diagram 3.5-3.

The acoustic environment monitoring project in areas involved in the hydropower development of the Upper Reaches of the Ayeyawady River adopts equivalent sound level and uses TES sound level meter TES-1350A to measure, the monitoring results are shown in Table 3.5-5.

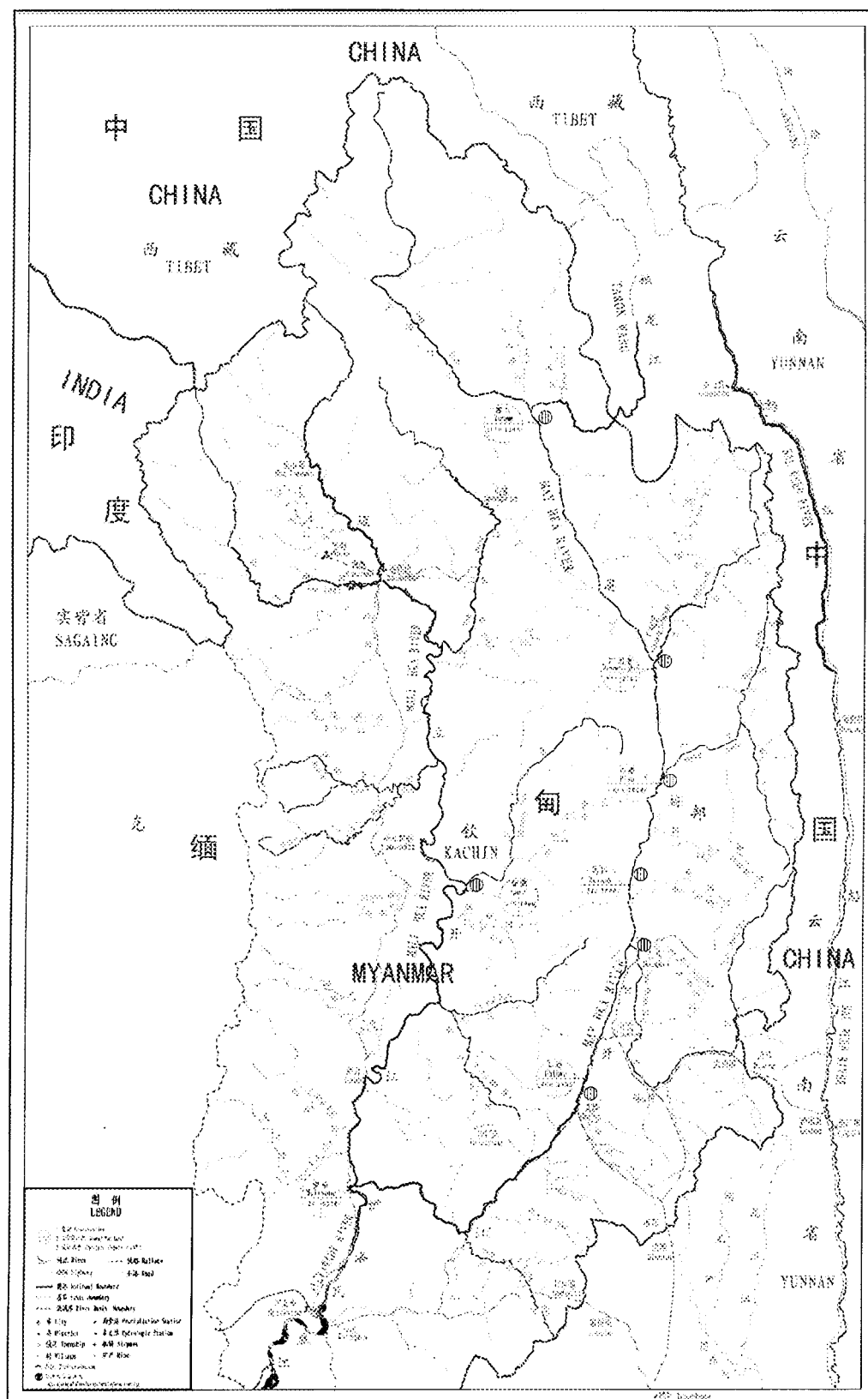


**Diagram 3.5-3 layout of monitoring stations of acoustic environment
in areas of the Upper Reaches of the Ayeyawady River**

**Table 3.5-5 list of acoustic environment monitoring results in areas involved
in the hydropower development of the Upper Reaches of the Ayeyawady River**

No.	Monitoring stations	equivalent sound level (A-sound level) dB (A)	
		Daytime (07:00 - 22:00)	Nighttime (22:00 - 07:00)
1	Laza	83.08	79.50
2	Chibwe	99.74	91.24
3	Wutsok	100.40	110.42
4	Pisa	55.16	-
5	Kaunglanhpu	45.1	-
6	Yenan	92.91	90.76
7	Mangkyi	113.14	96.70

Table 3.5-5 shows that only the sound level of Kaunglanhpu monitoring station and Pisa monitoring station is between 45.1 and 55.16 dB (A). All the sound levels of other monitoring stations are higher than the limits for residential and educational sites of 55 dB (A) at daytime and 45 dB (A) at nighttime, and limits for industrial and commercial sites of 70 dB (A) at daytime and 70 dB (A) at nighttime, and the noise generated by the rivers and waterfalls accounts for the sound levels which are higher than the limits.

3.6 Major environmental problems

(1) Rather severe man-made destruction of forest vegetation

Forest wood is a major source of income in northern Myanmar and Kachin State, so deforestation leads to rather severe man-made destruction of forest vegetation, and forest coverage rate has dropped significantly. In addition, local residents are accustomed to migration-style shifting cultivation which has caused the appearance of many clearings in the closed forest and damage to regional forest vegetation to a certain degree.

(2) Economic development and people's lives are to be improved.

Because of the remoteness of the Upper Reaches of the Ayeyawady River and the yet-to-be-developed infrastructure, and restricted by other conditions such as funding, the local superior resources and related industries have not been well developed, especially

the rich water resources have not been exploited and utilized. Together with the scattered inhabitation of local people, relative deficiency in economic ties and cultural exchange, regional economic development has been considerably limited, and the living standard of the majority of residents need to be improved.



timber-felling



slash-and-burn cultivation



The infrastructure is to be improved.



People's lives are to be improved.