

表一1 インドの標準地質層序

時代	地層	岩石	分布地域
第四紀	ラテライト層		各地
第三紀	{ 始新世層 貨幣石層		Cutch地方 SuratとBroah地方
デカン玄武岩類	上部トラップ (Upper Traps)	不整合岩 (450m) 熔岩 火山灰 含化石陸成層	Bombay地方 Kathiawar地方
	中部トラップ (Middle Traps)	(100m) 熔岩 火山灰	Malwa地方 Madhya Bharat地方
	下部トラップ (Lower Traps)	熔岩 (160m) 火山灰層 含化石陸成層	Madhya Pradesh地方 Narbada地方 Berar地方
上部白亜紀	Lameta統 下部トラップ統 (Bagh 層)	不整合 石灰岩など	
先カンブリア紀	Dharwahr 統 Peninsula片麻岩	結晶片岩類 花崗片麻岩類	各地

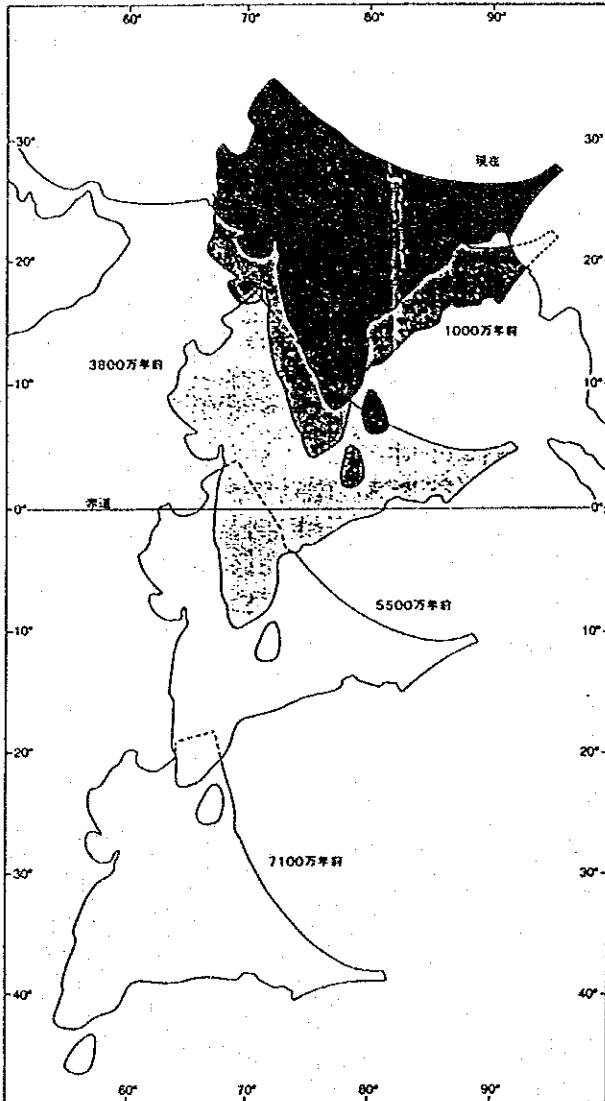


図-2 北上するインド  
(アジア大陸を現在の位置と仮定)

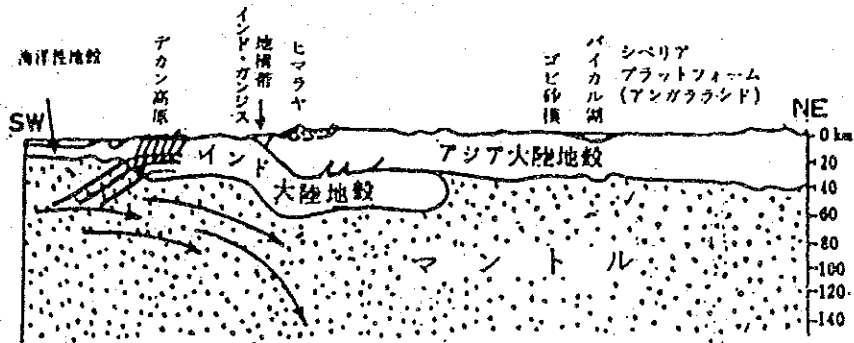
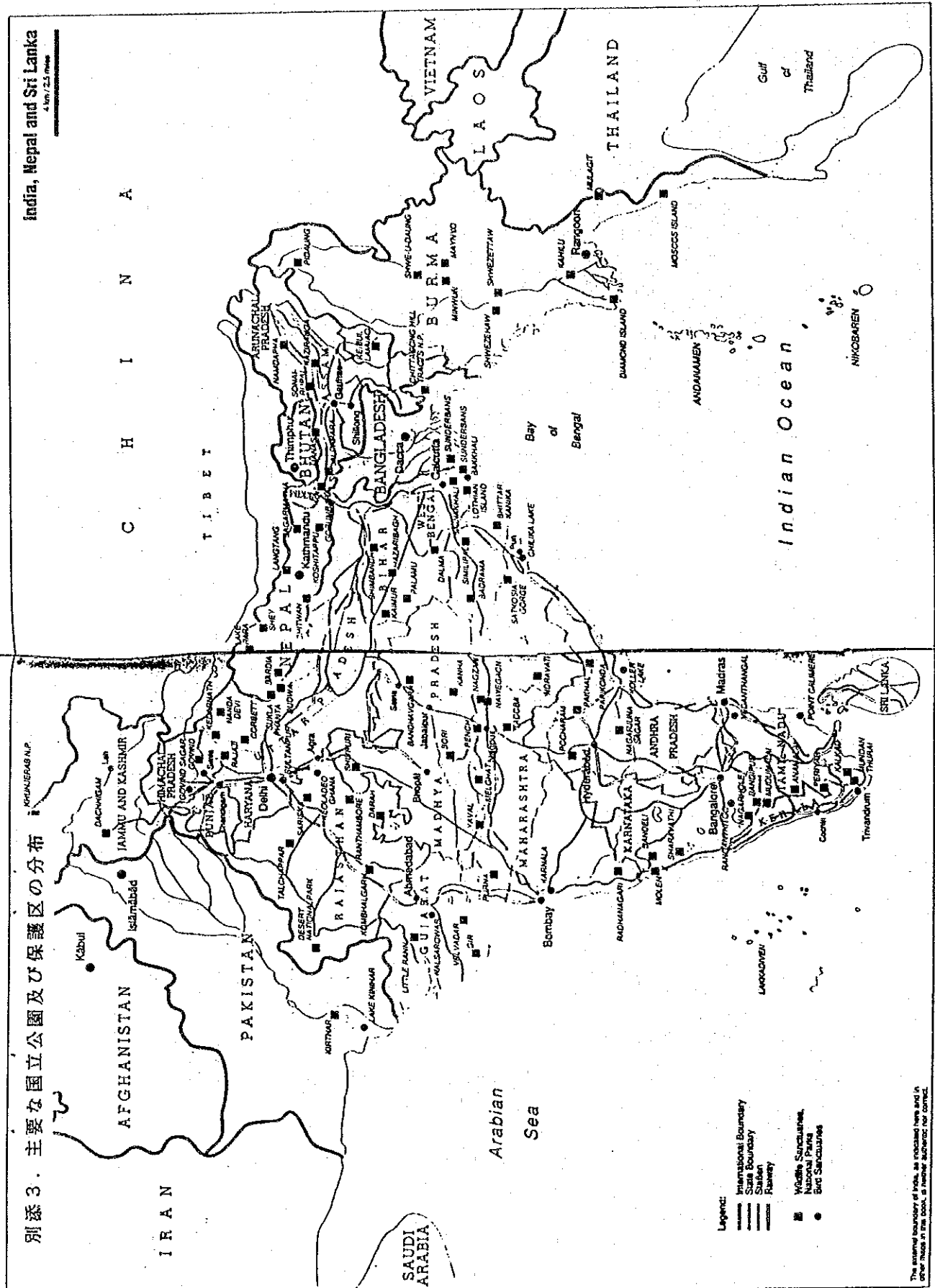


図-3 インド大陸とアジア大陸地域のモデル断面図



環境に関連する主要な法律

1. 環境（保全）法、1986年	Environment (Protection) Act, 1986
2. 大気汚染規制法、1981年	Air (Prevention and Control of Pollution) Act, 1981
3. 可燃物法、1952年	Inflammable Substances Act, 1952
4. 鉱山法、1952年	Mines Act, 1952
5. 産業（開発と規制）法、1951年	Industries (Development and Regulation) Act, 1951
6. 工場法1948年、改正1987年	Factories Act, 1948 Amendment, 1987
7. 自動車法、1938年	Motor Vehicles Act, 1938
8. インド・ボイラー法、1923年	Indian Boiler's Act, 1923
9. インド爆発物法、1908年	Indian Explosives Act, 1908
10. オリエンタル・ガス会社法、1857年	Oriental Gas Company Act, 1957
11. 水質（汚濁規制）税法、1977年	Water (Prevention and Control of Pollution) Cess Act, 1977
12. 水質汚濁規制法、1974年	Water (Prevention and Control of Pollution) Act, 1977
13. 商船（改正）法、1970年	Merchant Shipping (Amendment) Act, 1970
14. 河川委員会法、1956年	River Boards Act, 1956
15. ダモダル溪谷開発社（水質保全）規制法、1948年	Damodar Valley Corporation (Prevention of Pollution of Water) Regulation Act, 1948
16. インド漁業法、1897年	Indian Fisheries Act, 1897
17. 航路妨害法、1881年	Obstruction of Fairways Act, 1881
18. 北インド運河・排水法、1837年	North India Canal and Drainage Act, 1837
19. 有害廃棄物（管理・取扱）規則、1989年	Hazardous Waste (Management and Handling) Rules, 1989
20. 殺虫剤法、1968年	Insecticides Act, 1968
21. 薬物規則、1964年	Drug Rules, 1964
22. 肥料政令、1961年	Fertilizer Order, 1961
23. 食品添加物規制法、1954年	Prevention of Food Adulteration Act,

添附資料 6-13

別添 4. 野生生物保護法で示された希少動物、絶滅に瀕している動物

(哺乳類 1)

和名	ラテン名	英語名
[インドイノシシ]	<i>Sus scrofa andamanesis</i>	Andaman Wild Pig
バーラル (ブル-シ-ブ)	<i>Pseudosis nayaur</i>	Bharal
ビントウロング (クマ科)	<i>Arctictis binturong</i>	Binturong
ブラックバック	<i>Antelope vervicapra</i>	Black buck
シロナガスクジラ	<i>Balaenoptera musculus</i>	Blue Whale
ターミンジカ	<i>Cervus eldi</i>	Brown-Antlered Deer
ホウラングール (霊長類)	<i>Presbytis pileatus</i>	Capped Langur
カラカル (ネコ科)	<i>Felis caracal</i>	Caracal
クジラ類		Cetacean Spp.
チーター	<i>Acinonyx jubatus</i>	Cheetah
ミミセンザンコウ	<i>Manis pentadactyla</i>	Chinese Pangolin
[インドガゼル]	<i>Gazella dorcas benetti</i>	Chinkara (Indian Gazelle)
ウンビョウ	<i>Neofflis nebulosa</i>	Clouded Leopard
カニクイザル	<i>Macaca fascicularis</i>	Crab-eating Macaque
ヨーロッパヤマネコ	<i>Felis silvestris</i>	Desert Cat
ジュゴン	<i>Dugong dugong</i>	Dugong
スナドリネコ	<i>Felis viverrina</i>	Fishing Cat
ヨツツノレイヨウ	<i>Tetraceros quadricorins</i>	Four Horned Antelope
ガンジスカワイルカ	<i>Plananista gangetica</i>	Dolphin (Gangetic)
オオアカムササビ	<i>Petaurista Petaurista</i>	Flying Squirrels
アジアカルデーンキヤット	<i>Felis temmincki</i>	Golden Cat
アイベックス (ヤギ属)	<i>Cervus ibex</i>	Himalayan Ibex
ヒマラヤタール (ウツ科)	<i>Hemitragus jelahicus</i>	Himalayan Tahr
アラゲウサギ	<i>Caprolagus hispidus</i>	Hispid Hare
ブタバナアナグマ	<i>Arctonix collaris</i>	Hog Badger
フーロックテナガザル	<i>Hylobates hoolock</i>	Hoolock Gibbon
ザトウクジラ	<i>Magaptera novaeangliae</i>	Hump-backed Whale
インドゾウ	<i>Elephas maximus bengalen</i>	Indian Elephant
インドライオン	<i>Panthera leo persica</i>	Indian Lion
[インドノロバ]	<i>Equus (asinus) hemionus</i>	Indian Wild Ass
[不明]	<i>Canis lupus pallipes</i>	Indian Wolf

## (哺乳類2)

和名	ラテン名	英語名
カシミールアカシカ	<i>Cervus elaphus hanglu</i>	Kashmir Stag
リーフモンキー類	<i>Prebystis phayrei</i>	Leaf Monkey
ヒョウ	<i>Panthera pardus</i>	Leopard
ベンガルヤマネコ	<i>Felis bengalensis</i>	Leopard Cat
レッサーパンダ	<i>Ailurus fulgens</i>	Lesser Panda
シシオザル	<i>Macaca silenius</i>	Lion-tailed Macaque
ホソロリス	<i>Loris tardigardus</i>	Loris
リンクス (オオネコ)	<i>Felis lynx</i>	Lynx
ビルマジャコウネコ	<i>Viverra megaspila</i>	Malabar Civet
マレーグマ	<i>Helarctos malayanus</i>	Malay Bear
マーブルキャット	<i>Felis marmorata</i>	Marbled Cat
マーコールヒツジ	<i>Capra falconeri</i>	Markhor
インドマメジカ	<i>Trangulus meminna</i>	Mouse Deer
ヒマラヤジャコウジカ	<i>Moschus sifanicus</i>	Musk Deer
ニルギリタール (ウシ科)	<i>Hemitragus hylocrius</i>	Nilgiri Tahr
アルガリ (ヒツジ属)	<i>Ovis ammon</i>	Ovis Ammon (Nyan)
マネルネコ	<i>Felis manul</i>	Pallas's Cat
コビトイノシシ	<i>Sus salvanius</i>	Pygmy Hog
ラーテル (食肉目)	<i>Mellivora capensis</i>	Ratel
インドサイ	<i>Rhinoceros unicornis</i>	Rhinoceros
サビイロネコ	<i>Felis rubiginosa</i>	Rusty-Spotted Cat
スマトラカモシカ	<i>Capricornis sumatraensis</i>	Serow
ナマケグマ	<i>Melursus ursinus</i>	Sloth Bear
スローロリス	<i>Nycticebus coucang</i>	Slow Loris
インドハネオオモモンガ	<i>Petinomys fuscocapillus</i>	Small Flying Squirrel
ユキヒョウ	<i>Panthera uncia</i>	Snow Leopard
ブチリンサン (ジャコウネコ科)	<i>Prionodon pardicolor</i>	Spotted Linsang
バラシンガジカ (ヌズカ)	<i>Cervus duvauceli</i>	Swamp Deer
ターキン (シカ科)	<i>Budorcas taxicolor</i>	Takin
チルー (シカ科)	<i>Pantholops hodgsoni</i>	Tibetan Antelope (Chiru)
チベットガゼル	<i>Procapra picticaudata</i>	Tibetan Gazelle
キャン (アシアシカ科の一種)	<i>Asinus kiang</i>	Tibetan Wild Ass
トラ	<i>Panthera tigris</i>	Tiger
ウリアル (アシアシカ科)	<i>Ovis orientalis</i>	Urial (Shapu)
スイギュウ (野生種)	<i>Bubalus bubalis</i>	Wild Buffalo
ヤク (野生種)	<i>Bos grunniens</i>	Wild Yak

## (両生類・爬虫類)

和名	ラテン名	英語名
[アグラオオトカゲ]	<i>Varanus griseus</i>	Agra Monitor Lizard
[カメの一種]	---	Atlantic Ridley Turtle
キイロオオトカゲ	<i>Varanus flavescens</i>	Barred Monitor Lizard, Oval Monitor Lizard or Yellow Monitor Lizard
ヌマワニ類	<i>Loricata</i>	Crocodiles
インドガビアル	<i>Gauialis gangeticus</i>	Gharial
[ガンジススッポン]	<i>Trionyx gangeticus</i>	Ganges soft-shelled Turtle
アオウミガメ	<i>Chelonia Mydas</i>	Green Sea Turtle
タイマイ	<i>Eremochelys Imbricata</i>	Hawksbill Turtle
イボイモリ	<i>Tylotriton</i>	Himalayan Newt (Salamander)
インドタマゴスミ(蛇)	<i>Elachistodon westerman</i>	Indian egg-eating Snake
[インドスッポン]	<i>Lissemys punctata</i>	Indian soft-shelled Turtle
[カメの一種]	<i>Kchuga tecta tecta</i>	Indian Tent Turtle
ベンガルオオトカゲ	<i>Varanus bengalensis</i>	Large Bengal Monitor Lizard
オサガメ	<i>Dermochelys coriacea</i>	Leathery Turtle
アカウミガメ	<i>Caretta caretta</i>	Logger-head Turtle
オリーブヒメウミガメ	<i>Lepidochelys olivacea</i>	Olive-back logger head
[スッポンの一種]	<i>Trionyx hurum</i>	Peacock-marked soft-shelled Turtle
ニシキヘビ類	<i>Gienuis python</i>	Pythons
ミツウメヤマガメ	<i>Geomyda tricarinatia</i>	Three keeled Turtle
リクガメ類	<i>Chelonidae</i>	Tortoise
[ヒキガエル的一种]	<i>Nectophryne tuberculosa</i>	Viviparous Toad
マレーオオトカゲ	<i>Varanus salvator</i>	Water Lizard

## (鳥類)

和名	ラテン名	英語名
[ハイイロコガモの一種]	<i>Anas gibberifrons</i> <i>albogularis</i>	Andaman Teal
[コジュケイの一種]	<i>Bambusicala thoracia</i>	Assam Bamboo Partridge
カッコウハヤブサ類	<i>Avuceda</i> spp.	Bazas
ベンガルショウノガン	<i>Eupodotis bengalensis</i>	Bengal Florican
オグロヅル	<i>Grus nigricollis</i>	Black-necked Crane
ベニキジ	<i>Ithaginis cruentus</i>	Blood pheasants
ユリカモメ	<i>Larus ridibundus</i>	Brown-headed Gull
カンムリキジ	<i>Catreus wallichii</i>	Cheer pheasant
コウノトリ	<i>Ciconia ciconia</i>	Eastern White Stork
モリコキンメフクロウ	<i>Athene blewitti</i>	Forest Spotted Owlet
インドオオノガン	<i>Ardeotis nigriceps</i>	Great Indian Bustard
タカ類	<i>Accipitae</i> app.	Hawks
ナベヅル	<i>Grus monacha</i>	Hooded Crane
サイチョウ類	<i>Bucerotidae</i> spp.	Hornbills
[ノガンの一種]	---	Montana Bustard
[キジの一種]	<i>Syrnaticus humiae</i>	Humes bur-backed Pheasant
カタカササギサイチョウ	<i>Anthracoceros malabaricus</i>	Indian Pied Hornbill
クビワスナバシリ	<i>Rhinoptilus bitorquatus</i>	Jerdon's Courser
ヒゲワシ	<i>Gypaotus barbatus</i>	Lammergeier
ハヤブサ類	<i>Falconiae</i> spp.	Large Falcons
[コガモの一種]	<i>Anatidae</i>	Large Whistling Teal
ニジキジ	<i>Lophophorus impeyanus</i>	Monal Pheasants
ケバネウズラ	<i>Opnrysia superciliosa</i>	Mountain Quail
ヒメシワコブサイチョウ	<i>Acers narcondami</i>	Narcondam Hornbill
ツガツクリ	<i>Megapodius freycinet</i>	Nicobar Megapode
キンミノバト	<i>Caloenas nicobarica</i>	Nicobar Pigeon
ミサゴ	<i>Pandion haliaetus</i>	Osprey (Fish eating Eagle)
コクジャク	<i>Polyplecton bicalaratum</i>	Peacock Pheasant
インドクジャク	<i>Pavo cristatus</i>	Peafowl
バライロガモ	<i>Rhodessa caryophyllacea</i>	Pink-headed Duck
[キジシャコの一種]	<i>Lophophorus sclateri</i>	Scalaten's Monal
[シベリアシロヅル]	<i>Grus leucogeranus</i>	Siberian White Crane
ケツメシャコ	<i>Galliperdix</i> spp.	Spurfowl
チベットケッセイ	<i>Tetraogallus tibetanus</i>	Tibetan snow-cock
ジュケイ類	<i>Tragopan</i> spp.	Tragopan Pheasants
シロハラウミワシ	<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle
ハジロモリガモ	<i>Cairina scutulata</i>	White-winged Wood Duck





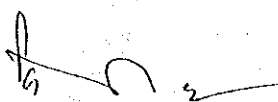
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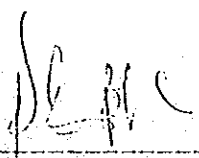
SCOPE OF WORK  
FOR  
MASTER PLAN STUDY  
ON  
PUMPED STORAGE HYDROELECTRIC  
POWER DEVELOPMENT  
IN  
MAHARASHTRA STATE, INDIA

AGREED UPON BETWEEN  
IRRIGATION DEPARTMENT GOVNT. OF MAHARASHTRA  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

FEB.11, 1994 BOMBAY

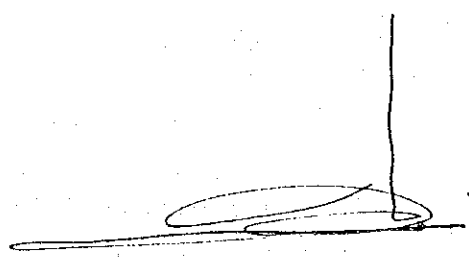


(V.K. DEWAN)  
JOINT SECRETARY  
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NEW DELH( INDIA)



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MR. S. E. BIHELKE  
SECRETARY (CAD),  
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MR. HAYAO ADACHI  
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JAPAN INTERNATIONAL  
COOPERATION AGENCY

## **I. Introduction**

In response to the request of the Government of INDIA (hereinafter referred to as "INDIA"), the Government of Japan decided to conduct the Master Plan Study on Pumped Storage Hydroelectric Power Development in Maharashtra State, INDIA (hereinafter referred to as "the Study"), in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the concerned authorities of INDIA.

INDIA has appointed the Irrigation Department, Government of Maharashtra (hereinafter referred to as "GOMID"), as the implementing agency.

The present document sets forth the scope of work with regard to the Study.

## **II. Objective of the Study**

The objective of the study is to formulate Master Plan Study on Pumped Storage Hydroelectric Power Development in Maharashtra, to conduct Pre-feasibility Studies to decide the optimum project site for future feasibility study, and to recommend power development plans for effective peak power supplies in western region.

## **III. Scope of the Study**

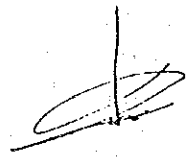
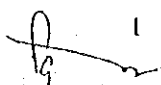
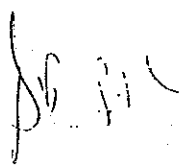
### **3-1 The Study shall be conducted in the following three stages:**

1. Master Plan Study Stage
2. Detailed Site Survey Stage
3. Pre-Feasibility Study Stage

### **3-2 Scope of Studies in Each Stage**

1. Master Plan Study Stage

(1) Collection and Review of Data



Collection and review of data and reports such as those on the existing electric power facilities, the electric power development projects (including power transmission and substation plans) which have been established or which are in progress, the power demand forecast and electric power development plans in the western region and Maharashtra State.

(2) Power Survey

The suitability of the development projects shall be studied by taking into account the particular characteristics of pumped storage development projects, the future forecast of daily load curves and the prospect of the pumping energies (the firm output of thermal and nuclear power plants), etc.

(3) Formulation of Outlines of Development Projects

The scale of development and commissioning date shall be studied.

(4) Environmental Survey

- a. The concerns in the environmental evaluation shall be identified for the electric power development projects which have been established or which are now in progress.
- b. Environmental impact assessment standards and legal procedures concerning environmental impact assessment shall be confirmed.
- c. Forest conservation law and legal procedures for clearance shall be confirmed.
- d. Laws and regulations on water rights and legal procedures for licensing of water rights shall be confirmed.

(5) Development of Primary Inventory

- a. The development scale shall be studied based on the existing 1/50,000 topographical maps, hydrological and meteorological data, and the possible development sites shall be identified taking into consideration approximate development cost and the environmental impact in addition to the above said data.

b. The candidate sites for site survey (4 to 5 sites) shall be identified.

(6) Site Survey

Site surveys shall be conducted with emphasis on the topography, geology, hydrology, meteorology, social impacts, environmental impacts and economic aspects.

(7) Development of Secondary Inventory

a. The Primary Inventory shall be reviewed based on the results of site surveys.

b. The preliminary plans of capacity of reservoirs and power plant operation, the conceptual designs of major structures, the installed capacity and the annual energy generation shall be studied, the availability of pumping energy shall be confirmed, the approximate construction cost shall be estimated, and the project economy, environmental impacts, etc. shall be evaluated on preliminary basis.

(8) Selection of Sites for Detailed Site Surveys

a. Based on the results of Secondary Inventory Development, several sites having superior characteristics shall be selected as the candidate sites for detailed site surveys.

b. The specifications of detailed site surveys and the site survey schedules shall be made.

(9) Project Identification

The peak power supply development programs for the western region shall be identified.

2. Detailed Site Survey Stage

(1) Issue of Order and Contract of Survey Works

Award and Contract of Survey Works

(2) Topographical Survey

Aerial survey works, photo-grammetric mapping and ground controls shall be conducted. The topographical maps shall be produced with 1/10,000 scale.

- (3) Geological Survey
  - a. Seismic prospecting
  - b. Drilling survey and permeability tests
  - c. Boring core observation, evaluation, and laboratory tests
  - d. Survey of construction materials
  - e. Geological and geo-technical study in the project areas
  - f. Preparation of geological map
- (4) Hydrological and Meteorological Survey
  - a. Installation of hydrological/meteorological observation instruments
  - b. Implementation of hydrological/meteorological observations
  - c. Meteorological/hydrological analyses
- (5) Environmental Impact Survey
  - a. Natural environment survey
  - b. Forest environmental survey
  - c. Social environment survey
- (6) Survey of Resettlement and Its Compensation
- (7) Surveys Concerning Licensing of Water Right

### 3. Pre-Feasibility Study

- (1) Formulation of Optimal Development Programs

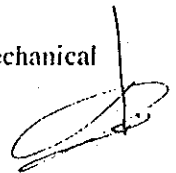
Determination of the optimal development scale, and formulation of reservoirs/power operation plans, calculation of annual energy generation and formulation of power transmission plan shall be conducted.

- (2) Preliminary Design of Major Structures

The preliminary designs for the civil structures and electro-mechanical equipment shall be developed.

*PLB*

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- (3) Formulation of Construction Schedule
- (4) Evaluation of Environmental Impact and Impact on Forest Environment
- (5) Analysis and Evaluation of Surveys on Resettlement and Compensation
- (6) Estimation of Project Cost
- (7) Economical/Financial Evaluation
- (8) Recommendation

Recommendations on the Feasibility to done in the future

#### **IV. Study Schedule**

The total period required for the Study will be approximately 23 months. A tentative time schedule is shown in Appendix I as attached hereto.

#### **V. Reports**

JICA shall prepare and submit the following reports in English to the GOMID in accordance with the tentative time schedule in Appendix I.

- |    |                    |           |
|----|--------------------|-----------|
| 1. | INCEPTION REPORT   | 30 copies |
| 2. | PROGRESS REPORT    | 20 copies |
| 3. | INTERIM REPORT     | 20 copies |
| 4. | Draft FINAL REPORT | 30 copies |

GOMID will submit their comments on the Draft FINAL REPORT to JICA within 30 days after the receipt

- |    |              |           |
|----|--------------|-----------|
| 5. | FINAL REPORT | 50 copies |
|----|--------------|-----------|

#### **VI. Division of Technical Undertaking**

The division of technical undertaking by GOMID and JICA is detailed in the Appendix II as attached hereto.

#### **VII. Undertaking of INDIA**

1. To facilitate smooth conduct of the Study, INDIA shall take necessary measures:

- (1) to secure the safety of the Japanese Study Team,
- (2) to permit the members of the Japanese Study Team to enter, leave and sojourn in INDIA for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,
- (3) to exempt the members of the Japanese Study Team from taxes, duty fees and other charges including pre-shipment inspection and importation fees on equipment, machinery and other materials brought into INDIA for the conduct of the Study,
- (4) to exempt the members of the Japanese Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese Study Team for their services in connection with the implementation of the Study,
- (5) to provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into INDIA from Japan in connection with the implementation of the Study.
- (6) to secure permission for entry into private properties or restricted area for the implementation of the Study,
- (7) to secure permission for the Japanese Study Team to take all data and documents including maps and photographs related to the Study out of INDIA to Japan,
- (8) to provide medical services as needed. These expenses will be chargeable on members of the Japanese Study Team.

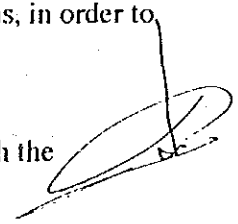
2. INDIA shall indemnify the members of the Japanese Study Team against any actions or claims resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the Japanese Study Team.

3. GOMID, as implementing agency for the project, shall coordinate the activities of other concerned governmental and non-government organizations, in order to ensure the smooth implementation of the Study.

4. GOMID shall, at its expense, provide the Japanese Study Team with the

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following, in cooperation with other concerned organizations:

- (1) available data and information related to the Study,
- (2) counterpart personnel,
- (3) suitable office space with necessary furniture in Bombay and Project sites,
- (4) credentials or identification cards,
- (5) appropriate number of vehicles with drivers,
- (6) and other communication facilities during the execution of the Study, such as telephone, telex, transceiver, etc.

#### **VIII. Undertaking of JICA**

For the implementation of the Study, JICA shall take the following measures:

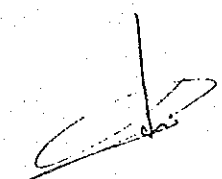
1. To dispatch, at its own expense, Study Teams to INDIA,
2. To pursue technical transfer to the INDIA counterpart personnel in the course of the Study.

#### **IX. Others**

JICA and GOMID shall consult with each other throughout the course of the Study in respect of any matter that may arise from or in connection with the Study.

*PLM*

*2 7*



APPENDIX I TENTATIVE TIME SCHEDULE (1/2)

	JICA Work in India												JICA Work in Japan												GOMID Work in India																							
	1994				1995				1996				1997				1998				1999				2000																							
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Monsoon Season																																																
1. Master Plan Study Stage																																																
(1) Collection and Review of Data	█												█												█												█											
(2) Power survey	█												█												█												█											
(3) Formulation of Outlines of Development Projects	█												█												█												█											
(4) Environmental Survey	█												█												█												█											
(5) Development of Primary Inventory	█												█												█												█											
(6) Site Survey	█												█												█												█											
(7) Development of Secondary Inventory	█												█												█												█											
(8) Selection of Sites for Detailed Site Surveys	█												█												█												█											
(9) Project Identification	█												█												█												█											
2. Detailed Site Survey Stage																																																
(1) Issue of Order and Contract of Survey Works	█												█												█												█											
(2) Topographical Survey	█												█												█												█											
(3) Geological Survey	█												█												█												█											
(4) Hydrological and Meteorological Survey	█												█												█												█											
(5) Environmental Impact Survey	█												█												█												█											
(6) Survey of Resettlement and Its Compensation	█												█												█												█											
(7) Surveys Concerning Licensing of Water Right	█												█												█												█											
3. Pre-Feasibility Study Stage																																																
(1) Formulation of Optimal Development Programs	█												█												█												█											
(2) Preliminary Design of Major Structures	█												█												█												█											
(3) Formulation of Construction Schedule	█												█												█												█											

APPENDIX I TENTATIVE TIME SCHEDULE (2/2)

	JICA Work in India												JICA Work in Japan												GOA/ID Work in India																				
	1994	1995	1996	1994	1995	1996	1994	1995	1996	1994	1995	1996																																	
Monsoon Season																																													
(4) Evaluation of Environmental Impact and Impact on Forest Environment																																													
(5) Analysis and Evaluation of Surveys on Resettleemnt and Compensation																																													
(6) Estimation of Project Cost																																													
(7) Economical/Financial Evaluation																																													
(8) Recommendation																																													
4. Report																																													
(1) Inception Report																																													
(2) Progress Report																																													
(3) Interim Report																																													
(4) Draft Final																																													
(5) Final																																													

APPENDIX II DIVISION OF TECHNICAL UNDERTAKING

Work Item	Contribution by GOMID	Contribution by JICA
1. Master Plan Study Stage (1) Collection and Review of Data (2) Power survey	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data and information</li> <li>. Provision of latest study reports, relevant data and information on future power demand forecast of daily load curves and the prospect of the pumping energies</li> <li>. Assignment of counterpart personnel</li> </ul>	<ul style="list-style-type: none"> <li>. Review and analysis</li> <li>. Review and analysis</li> </ul>
(3) Formulation of Outlines of Development Projects (4) Environmental Survey	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data and information</li> <li>. Collection of information on the electric power development projects</li> <li>. Identification of the concerns in the environmental evaluation</li> <li>. Provision of environmental impact assessment standards and legal procedures</li> <li>. Provision of forest conservation law and legal procedures</li> <li>. Provision of laws and regulations on water rights and legal procedures</li> <li>. Assignment of counterpart personnel</li> </ul>	<ul style="list-style-type: none"> <li>. Identification of outlines of development Projects</li> <li>. Review and analysis</li> </ul>

APPENDIX II DIVISION OF TECHNICAL UNDERTAKING

Work Item	Contribution by GOMID	Contribution by JICA
(5) Development of Primary Inventory	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data, maps and information</li> </ul>	<ul style="list-style-type: none"> <li>. Review of the projects previously studied</li> <li>. Formulation of the development scale</li> <li>. Identification of the development sites</li> <li>. Selection of the candidate sites</li> </ul>
(6) Site Survey	<ul style="list-style-type: none"> <li>. Assignment of counterpart personnel and guide</li> <li>. Necessary arrangement</li> <li>. Provision of labours</li> <li>. Provision of relevant reports, data and information</li> </ul>	<ul style="list-style-type: none"> <li>. Site survey</li> <li>. Review of topography, geology, hydrology, meteorology, social impacts, environment impacts and economic aspects</li> </ul>
(7) Development of Secondary Inventory	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data and information</li> </ul>	<ul style="list-style-type: none"> <li>. Review of the primary inventory</li> <li>. Formulation of the preliminary plans</li> </ul>
(8) Selection of Sites for Detailed Site Surveys	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data and information</li> </ul>	<ul style="list-style-type: none"> <li>. Selection of the candidate sites</li> <li>. Provision of the specification for detailed site surveys</li> </ul>
(9) Project Identification  2. Detailed Site Survey Stage  (1) Issue of Order and Contract of Survey Works	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data and information</li> <li>. Assistance in procurement</li> </ul>	<ul style="list-style-type: none"> <li>. Formulation of the peak power supply programs</li> <li>. Provision and issue of order and contract of survey works</li> </ul>

APPENDIX II DIVISION OF TECHNICAL UNDERTAKING

Work Item	Contribution by GOMID	Contribution by JICA
(2) Topographical Survey	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data and information as is available and permissible</li> <li>. Assignment of counterpart personnel and guide</li> <li>. Assistance in implementation</li> </ul>	<ul style="list-style-type: none"> <li>. Selection of Survey area</li> <li>. Carrying out :               <ul style="list-style-type: none"> <li>-aerial photographic survey</li> <li>-ground control and mapping for the selected candidate sites</li> </ul> </li> </ul>
(3) Geological Survey	<ul style="list-style-type: none"> <li>. Provision of relevant reports, data and information as is available</li> <li>. Assignment of counterpart personnel and guide</li> <li>. Assistance in implementation</li> </ul>	<ul style="list-style-type: none"> <li>. Selection of Survey area</li> <li>. Carrying out :               <ul style="list-style-type: none"> <li>-seismic prospecting</li> <li>-drilling survey and permeability test,</li> <li>-boring core observation and evaluation</li> <li>-laboratory tests</li> <li>-construction materials survey</li> <li>-assessment of results for the investigation</li> </ul> </li> </ul>
(4) Hydrological and Meteorological Survey	<ul style="list-style-type: none"> <li>. Installation of hydro-meteorological stations</li> <li>. observation of hydro-meteorology</li> </ul>	<ul style="list-style-type: none"> <li>. Provision of Specification</li> <li>. Supervision of hydro-meteorological observation</li> <li>. Review and analyses</li> </ul>
(5) Environmental Impact Survey	<ul style="list-style-type: none"> <li>. Carrying out :               <ul style="list-style-type: none"> <li>-Natural environment survey</li> <li>-Forest environmental survey</li> <li>-Social environment survey</li> </ul> </li> <li>as per guidelines of Environment Dept. of GOI</li> </ul>	<ul style="list-style-type: none"> <li>. Suggestion for implementation of program and technical specification</li> <li>. Review and study</li> </ul>
(6) Survey of Resettlement and Its Compensation	<ul style="list-style-type: none"> <li>. Collection of necessary data and field information as per Resettlement Act of GOM</li> </ul>	<ul style="list-style-type: none"> <li>. Suggestion for implementation of program and technical specification</li> <li>. Review and study</li> </ul>



APPENDIX II DIVISION OF TECHNICAL UNDERTAKING

Work Item	Contribution by GOMID	Contribution by JICA
(7) Surveys Concerning Licensing of Water Right	. Collection of necessary data and field information as per statutory provision	. Suggestion for implementation of program and technical specification . Review and study
3. Pre-Feasibility Study Stage (1) Formulation of Optimal Development Programs	. Provision of necessary data and information	. Determination of the optimal development scale . Formulation of reservoirs/power operation plans, calculation of annual energy generation . Formulation of power transmission plan
(2) Preliminary Design of Major Structures	. Provision of necessary data and information	. Design
(3) Formulation of Construction Schedule	. Provision of necessary data and information	. Programming for Construction Schedule
(4) Evaluation of Environmental Impact and Impact on Forest Environment	. Provision of necessary data and information . Study and evaluation	. Review and study
(5) Analysis and Evaluation of Surveys on Resettlement and Compensation	. Provision of necessary data and information . Study and analysis	. Review and study

APPENDIX II DIVISION OF TECHNICAL UNDERTAKING

Work Item	Contribution by GOMID	Contribution by JICA
(6) Estimation of Project Cost	. Provision of necessary data and information	. Cost Estimate
(7) Economical/Financial Evaluation	. Provision of necessary data and information	. Economic Analysis
(8) Recommendation	. Provision of necessary data and information	. Formulation of the recommendations for future works in the Feasibility study

MINUTES OF MEETING  
(Supplement to the Agreement)

ON

THE SCOPE OF WORK

FOR

MASTER PLAN STUDY

ON

PUMPED STORAGE HYDROELECTRIC POWER DEVELOPMENT  
IN  
MAHARASHTRA STATE, INDIA

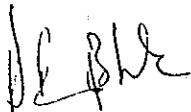
AGREED UPON BETWEEN

IRRIGATION DEPARTMENT, GOVERNMENT OF MAHARASHTRA  
AND  
JAPAN INTERNATIONAL COOPERATION AGENCY

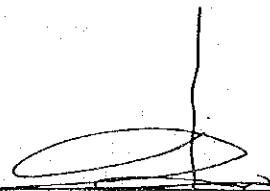


(V.K. DEWAN)  
JOINT SECRETARY  
TO THE GOVERNMENT OF INDIA  
MINISTRY OF POWER  
NEW DELH( INDIA)

FEBRUARY 11, 1994, BOMBAY



MR. S. E. BIELKE  
SECRETARY (CAD),  
GOVERNMENT OF MAHARASHTRA,  
IRRIGATION DEPARTMENT,  
BOMBAY (INDIA)



MR. HAYAO ADACHI  
LEADER OF  
PREPARATORY STUDY TEAM,  
JAPAN INTERNATIONAL  
COOPERATION AGENCY

1. The Preparatory Study Team (hereinafter referred to as "the JICA Mission"), organized by Japan International Cooperation Agency, visited INDIA from January 30 to February 15, 1994 to discuss with the Government of INDIA and relevant agencies on the Scope of Work for the Master Plan Study on Pumped Storage Hydroelectric Power Development in Maharashtra State, INDIA.

2. In the course of the discussions, a series of meetings were held between the INDIA side and the JICA Mission, as the list of attendees is attached in Appendix 1.

The Minutes of Meeting supplement the Scope of Work agreed upon between Mr.S.E.Bhelke, Secretary (CAD), Government of Maharashtra, Irrigation Department, (hereinafter referred to as "GOMID") and Mr.Hayao Adachi, Leader of the JICA Mission, as signed on February 11, 1994 in Bombay.

3. In accordance with Clause VII, 1. and 2. in the agreed Scope of Work, GOMID stated that the provision of the clause is subject to the concurrence of GOI.

4. In accordance with Clause VII, 1., (6) in the agreed Scope of Work, GOMID stated that permission for entry into private properties or restricted area will be subject to statutory provisions and procedures.

5. In accordance with the Clause VII, 4.,(1) in the agreed Scope of Work, GOMID agreed to proceed the necessary procedures to officially provide the relevant Topo-sheets (1/50,000 scale maps) to the JICA Study Team when the Study would be conducted by the Team. The permission shall involve for the use of aero-maps to be produced by the Study Team to be brought out to Japan for the Study.

6. In accordance with the Clause VII, 4.,(3) in the agreed Scope of Work, GOMID agreed to provide the suitable office space nearby Bombay and space at project sites as is available for the JICA Study Team. However, it was suggested by GOMID that the telecommunication facilities might be difficult to be provided on time because of line-shortage in the area.

7. Regarding the Clause VII, 4.,(5) in the agreed Scope of Work, GOMID explained the difficulties to provide the vehicles and drivers because of their shortage and budgetary limitation. The JICA Mission understood any

countermeasures to be taken by the Study Team.

8. Regarding the item 2., (2) of the Appendix II in the agreed Scope of Work, GOMID explained the country's situation that only one agency, Survey of India (hereinafter referred to as "SOI"), would be available and permissible in INDIA for the implementation of the aero-photo mapping.

The both parties agreed that the direct contract with SOI should be performed by the JICA Study Team through the GOMID's assistance so as to keep proper negotiation with SOI.

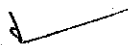
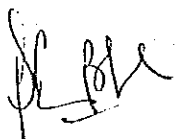
9. The both parties agreed that GOMID would establish any basic meteorological and hydrological gauging stations in advance of the commencement of the Study, at promising sites such as Joland, Ulhas, Savitri, Marleshwar, etc., based on the present GOMID's studies.

10. GOMID requested the technical training in Japan to be given to counterpart personnel for the Study.

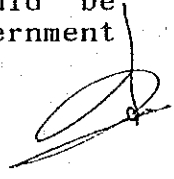
The JICA Mission replied that the request would be conveyed to the authorities concerned in the Government of Japan.

11. The both parties understood that, because of unusual topography for project sites with extremely steep slopes over 600 m height within a few km distance, the aero-map accuracy could not be expected without the reinforcement of SOI. In this view, GOMID requested for JICA to provide the high-sophiscated survey instruments as listed in Appendix 2. GOMID requested to Japanese side to donate the instruments after the completion of the Study.

The JICA Mission replied that the requests would be conveyed to the authorities concerned in the Government of Japan.



(END)



APPENDIX 1.

LIST OF ATTENDEES

THE JICA MISSION

Mr. Hayao ADACHI	Leader, JICA Staff
Mr. Takanori TANAKA	MITI Staff
Mr. Fumitaka INOUE	JICA Staff
Mr. Makoto OKADA	Geologist
Mr. Hiroyasu OHNUMA	Environmental Specialist

GOMID

Mr. S. E. BHELKE	Secretary (CAD)
Mr. R. G. KULKARNI	Chief Engineer, Irrigation Dept., Konkan Region, Bombay
Mr. D. S. TAWARE	Chief Engineer (E), Hydro Projects, Bombay
Mr. A. S. PATHAK	Assistant Chief Engineer, Irrigation Dept., Konkan Region, Bombay
Mr. S. S. HEDAHO	Executive Engineer H.E.P.I. Division No.1, Bhatsanagar, Distr. Thane

APPENDIX 2

NECESSARY SURVEY INSTRUMENT

- Distomat 2 Nos. (1 second with computerized digital reading) with accessories Wild TC-1010 or equivalent
- Accurate level 2 Nos. and accessories Wild the 1st level or equivalent

(END)

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*[Signature]*



## 収集資料リスト





## DATA AND INFORMATION COLLECTED

### REPORT FROM MID

1. Government of Maharashtra, Irrigation Department  
Master Net-Work of Raingauge and Rivergauge Station in  
Konkan Region  
October, 1984  
Thane Irrigation Circle, Thane
2. Government of Maharashtra and Government of Goa  
Tilali Interstate Project  
Catchment Area Treatment Action Plan Vol.II  
Konkan Irrigation Circle, Kuwarbao, Ratnagiri
3. Government of Maharashtra, Irrigation Department  
Tilali Interstate Project  
Tilali Head Works Division No.1, Konalkatta  
Compliance of Comments on Environmental Aspect  
January, 1991  
Konkan Irrigation Circle, Kuwarbay, Ratnagiri
4. Government of Maharashtra, Irrigation Department  
Tilali Irrigation Project  
Environmental Clearance Note on CAD Aspect Vol.I(C)  
April, 1991  
Konkan Irrigation Circle, Kuwarbao, Ratnagiri
5. Surya Project Division No.1  
Note on Environmental Clearance of Surya Major Irrigation  
Project
6. Environmental Impact Assessment of Middle Vaitarna Dam,  
Bombay  
Sponsor : Municipal Corporation of Greater Bombay  
National Environmental Engineering Research Institute,  
Nehru Marg, Nagpur  
May, 1992

## LAWS RELEVANT TO ENVIRONMENT

1. Environmental Protection Act, 1986 : Ministry of Law and Justice, Government of India
2. Water (Prevention and Control of Pollution) Act, 1974 : Ministry of Law, Justice and Company Affairs, Government of India
3. The Water and Air (Prevention and Control of Pollution) Act, 1974 : Law Publishers (India) Pvt. Ltd.
4. The Forest (Conservation) Act, 1980 : Ministry of Law, Justice and Company Affairs, Government of India
5. Indian Forest Act, 1927 : Ministry of Law, Justice and Company Affairs, Government of India
6. The Indian Forest Act, 1927 along with The Forest (Conservation) Act, 1980 : Law Publishers (India) Pvt. Ltd.
7. The Wild Life (Protection) Act, 1972 along with The Wild Life Protection (Amendment) Act, 1991 with Allied Rules : Law Publishers (India) Pvt. Ltd.
8. The Protection of Civil Rights Act, 1955 Formerly known as Untouchability (Offences) Act, 1955

## Others

1. Checklist for Ecological Aspects of River Valley Hydro Electric Projects,  
Department of Environment
2. Wildlife of India  
Editors : Jonathan Griffin and David Clive Price
3. Corporate Profile TCE : TATA Consulting Engineers

## Publications from National Museum of Natural History

1. Our Environment - Our Future  
Ministry of Environment and Forest, Government of India
2. A Brief Guide of National Museum of Natural History
3. Environment and Development  
Ministry of Environment and Forest, Government of India



JICA