

Table 7 PROTECTED SPECIES IN INDONESIA (1/3)

English Name	Latin Name	Indonesian Name	English Name	Latin Name	Indonesian Name	English Name	Latin Name	Indonesian Name
a. Mammal								
Spiny Anteater	<i>Zaglossus bruijini</i>	landak Irian/Nokdiak	Smaller Mouse Deer	<i>Tragulus javanicus</i>	Kancil/Pelanduk	Asiatic Sparrow Hawk	<i>Accipiter virgatus</i>	Alap-alap Burung
Wallaby	<i>Dorcopsis muelleri</i>	Kanguru Tanah	Large Mouse Deer	<i>Tragulus napu</i>	Napu	Crested Lizard Hawk	<i>Aviceda jerdoni</i>	Alap-alap Kadal Jambul
Ornata Tree Kangaroo	<i>Dendrolagus goodfellowi</i>	Kanguru Pohon	Banteng	<i>Bos javanicus</i>	Banteng	Cuckoo Falcon Hawk	<i>Aviceda subseriastata</i>	Alap-alap Kukuk
Unicolored Tree Kangaroo	<i>Debdrolagus dorianus</i>	Kanguru Pohon	Lowland Anoa	<i>Bubalus depressicornis</i>	Anoa Dataran Rendah	Gray Faced Buzzard	<i>Butastur indicus</i>	Elang Kelabu
Dustry Tree Kangaroo	<i>Dendrolagus ursinus</i>	Kanguru Pohon	Highland Anoa	<i>Bubalus quarlesi</i>	Anoa Pegunungan	Cinoamon Winged Buzzard	<i>Butastur liventer</i>	Elang Coklat
Grissed Tree Kangaroo	<i>Dendrolagus inustus</i>	Kanguru Pohon	Sumatran Serow	<i>Capricornis sumatrensis</i>	Kambing Sumatera	Western March Harrier	<i>Circus aeruginosus</i>	Elang Rawa
Red Legged padelemon	<i>Thylogale stigmatika</i>	Kanguru Tanah	Plumbocoeus Dolphin	<i>Sotalia plumbea</i>	Lumba-lumba Timah	Spotted Harrier	<i>Circus assimilis</i>	Elang Tutul
Dusky Padelemon	<i>Thylogalebruijini</i>	Kanguru Tanah	Indonesian White Dolphin	<i>Sotalia borneensi</i>	Lumba-lumba Borneo	Black Winged Kite	<i>Elanus caeruleus</i>	Elang Tikus
Flying Lemur	<i>Cynocephalus variegatus</i>	Kubung/Tando	Chinese White Dolphin	<i>Sotalia chinensis</i>	Lumba-lumba Cina	Pied Harrier	<i>Circus melanoleucus</i>	Elang China
Slow Loris	<i>Nicticebus coucang</i>	Malu-malu	Rough Toothed Dolphin	<i>Steno bredanensis</i>	Lumba-lumba Gigi Kasar	White bellied Sea Eagle	<i>Haliaetus leucogaster</i>	Elang Laut Perut Putih
Tarsier	<i>Tarsius bancanus</i>	Binatang Hantu/Singapuar	Malaya Dolphin	<i>Stenella malayana</i>	Lumba-lumba Malaya	Brahminy Kite	<i>Haliaetus indus</i>	Elang Bondol/Wulung
Orang Utan	<i>Pongo pygmaeus</i>	Orang Hutan/Mawas	Common Dolphin	<i>Delphinus delphis</i>	Lumba-lumba Delpis	English Name	Latin Name	Indonesian Name
Klose Gibbon	<i>Hylobates agilis</i>	Jenis-jenis	Red Fellied Dolphin	<i>Delphinus roseirostris</i>	Lumba-lumba Perut Merah	Whistling Kite	<i>Haliaetus penurus</i>	Elang Siul
Darsk handed Gibbon	<i>Hylobates agilis</i>	Ungko	Irrawady Dolphin	<i>Orcella brevirostris</i>	Lumba-lumba Irawadi	New Guinea Haspy Eagle	<i>Harpyopsis novaeguineae</i>	Elang Irian
Silvery Gibbon	<i>Hylobates moloch</i>	Owa	Bottle Nose Dolphin	<i>Trusiops spp.</i>	Lumba-lumba Botol	Hawk Eagle	<i>Henicopernis longicauda</i>	Elang
Grey Gibbon	<i>Hylobates muelleri</i>	Klampiau	Mahakam Dolphin	<i>Orcella sp.</i>	Pesut	Ruffous Bellied Eagle	<i>Hieractius kioneri</i>	Elang Kecil
White Handed Gibbon	<i>Hylobates lar</i>	Sarudung	Bottle Nosed Gramphus	<i>Gramphus griscus</i>	Lumba-lumba Gromphus	Little Eagle	<i>Hieractius morphodes</i>	Elang Kecil Australi
Proboscis Monkey	<i>Nasalis larvatus</i>	Kahau	Little Killer	<i>Peponocephala electra</i>	Lumba-lumba Pemangsa Kecil	Grey Headed Fishing Eagle	<i>Ichthyophaga ichthyactius</i>	Elang Laut Kelabu
Crested Velebes Macaque	<i>Macaca nigra</i>	Monyet Dihe	Curier's Whale	<i>Ziphius cavirostris</i>	paus paruh Angsa	Lesser Fishing Eagle	<i>Ichthyophaga nana</i>	Elang Laut Kecil
Booted Macaque	<i>Macaca bruscans</i>	Monyet Buntung	Black Finless Porpoise	<i>Neophocaena phocaenoides</i>	Lumba-lumba Tak Bersirip Pungpung	Black Eagle	<i>Ictinaetus malayensis</i>	Elang Jambul Hitam
Moor Macaque	<i>Macaca maura</i>	Monyet Dare	Blue Whale	<i>Balaenoptera musculus</i>	Paus Biru	Bat Hawk	<i>Machacramphus alcinus</i>	Alap-alap Kelelawar
Tonken Macaque	<i>Macaca tonkeana</i>	Monyet Digo	Fin/Razorback Whale	<i>Balaenoptera physalis</i>	Paus Bersirip	Doria' Goshwak	<i>Magatriorchis deriae</i>	Alap-alap Doria
Mentawai Pigtailed Macaque	<i>Macaca pegensis</i>	Bakko/Beruk Mentawai	Humpback Whale	<i>Megaptera novaeangliae</i>	Paus Bongkok	Black Kite	<i>Milvus migrans</i>	Alap-alap Malam
Mentawai langur	<i>Presbytis potenziari</i>	Jaya/Luntung Mentawai	Dugong	<i>Dugong dugon</i>	Duyung	Parrd Honey Buzzard	<i>Pernis celebensis</i>	Alap-alap Brilang
Marcon Leaf Monkey	<i>Presbytis rubicunda</i>	Lutung Merah	Whale's (all species)	<i>Cetacea</i>	Paus	Asiatic Honey Buzzard	<i>Pernis ptilorhynchus</i>	Alap-alap Madu
Banded Leaf Monkey	<i>Presbytis thomasi</i>	Rungka/Kedih	Celeves Crested Macaque	<i>Cynopithecus niger</i>	Manyet Hitam Sulawesi	Crested Serpent Eagle	<i>Spilornis cheela</i>	Elang Ular
Javan Leaf Monkey	<i>Presbytis frontata</i>	Lutung Surili				Celebes Serpent Eagle	<i>Spilornis rufipactus</i>	Bido Sulawesi
White Fronted leaf Monkey	<i>Presbytis frontata</i>	Lutung Dahi Putih				Andaman Serpent Eagle	<i>Spilornis elgini</i>	Bido Andaman
Pigtailed Langur	<i>Simias concolor</i>	Simakobu/Simpai/Mentawai	b. Bird			Java Hawk Eagle	<i>Spizaetus bartelsi</i>	Elang Jawa
Scaly Anteater/Pangolin	<i>Manis javanica</i>	Trenggiling	English Name	Latin Name	Indonesian Name	Changeable Hawk Eagle	<i>Spizaetus cirrhatus</i>	Elang Hitam
Three-striped Ground Squirrel	<i>Lariscus insignis</i>	Bajing Tanah/Tupai Tanah	Dwarf Cassowary	<i>Casuarus bennetti</i>	Kasuari Kerdil	Hawk Eagle	<i>Spizaetus gurneyi</i>	Elang Gurne
Black Giant Squirrel	<i>Ratufa bicolor</i>	Jelarang	Double Wattled Cassowary	<i>Casuarus casuaris</i>	Kasuari Gelambir Ganda	Hawk Eagle	<i>Spizaetus nipalensis</i>	Elang Sulawesi
Spotted Giant Flying Squirrel	<i>Petaurista elegans</i>	Cukbo/Bajing terbang	Single Wattled Cassowary	<i>Casuarus unappendiculatus</i>	Kasuari Gelambir Tunggal	Black and White Hawk Eagle	<i>Spizaetus alboniger</i>	Elang Hitam Putih
Red Tailed Flying Squirrel	<i>Lomys horsfieldii</i>	Bajing terbang/Ekor merah	Australia Pelican	<i>Pelecanus conspicillatus</i>	Undan Kacamata	Celebes Short-crested Hawk Eagle	<i>Spizaetus lanceolatus</i>	Elang Sulawesi Jambul
Sumatran Shorthead Rabbit	<i>Nasolagus nets heri</i>	Kelinci Liar Sumatera	Spot Billed Pelican	<i>Pelecanus onocrotalus</i>	Undan Putih	Wallace's Hawk Eagle	<i>Spizaetus nanus</i>	Elang Biliton/Elang Wallace
Four-striped Ground Squirrel	<i>Lariscus hoesi</i>	Bajing Tanah/Bergaris Empat	Abbott's Booby	<i>Sula abbotti</i>	Undan Paruh Botol	Wedge Tailed Eagle	<i>Aquila audax</i>	Garuda Australia
Spotted Cuscus	<i>Phalanger maculatus</i>	Kuskus	Blue Faced Booby	<i>Sula dactylatra</i>	Gangsa Batu Muka Biru	Gurney's Eagle	<i>Aquila gurneyi</i>	Garuda Irian
Common Phalanger	<i>Phalanger orientalis</i>	Kuskus	Browed Booby	<i>Sula leucogaster</i>	Gangsa Batu Coklat	Osprey	<i>Pandion haliaetus</i>	Elang Ikan
Bear Phalanger	<i>Phalanger ursinus</i>	Kuskus	Red Footed Booby	<i>Sula sula</i>	Gangsa Batu kaki Merah	Peregrine Falcon	<i>Falcio peregrinus</i>	Sikap Elang
Celeves Phalanger	<i>Phalanger celebensis</i>	Kuskus	Oriental Darter	<i>Anhinga melanogaster</i>	Pecuk Ular	Oriental Bobby	<i>Falcio severus</i>	Alap-alap Macan
Black Spotted Phalanger	<i>Phalanger atrimaculatus</i>	Kuskus	Christmas Island Frigate Bird	<i>Fregata andrewsi</i>	Bintayang P.Chiristmas	Common Kestrel	<i>Falcio tinnunculus</i>	Alap-alap
Gray Phalanger	<i>Phalanger gymnotis</i>	Kuskus	Greater Egret	<i>Egretta alba</i>	Kuntul Besar	Little Falcon	<i>Falcio lengipennis</i>	Alap-alap Kecil
Porcupine	<i>Hystrix brachyura</i>	Landak	Lesser Egret	<i>Egretta intermedia</i>	Kuntul Sedang	nanken Kestrel	<i>Falcio cenchroides</i>	Alap-alap Irian
Malay Stink Badger	<i>Mydaus javanensis</i>	Sigung/Toledu	Little Egret	<i>Egretta garzetta</i>	Kuntul Kecil	Spotted Kestrel	<i>Falcio nolvecensis</i>	Alap-alap Menara
Hognose Badger	<i>Arctonyx collaris</i>	Puluan	Chinese Egret	<i>Egretta culophotes</i>	Kuntul China	Black Legged Falconnet	<i>Microhierax fringillarius</i>	Elang Belalang
Malayan Sun Bear	<i>Helarctos malayanus</i>	Berung madu	Pacific Reef Egret	<i>Egretta sacra</i>	Kuntul Karang	Bornean Falcon	<i>Microhierax latifrons</i>	Elang Kecil Borneo
Otter Civet	<i>Cynogale bennetti</i>	Musang Air	Cattle Egret	<i>Bubulcus ibis</i>	Kuntul Kerbau	Malco	<i>Macrocephalon malco</i>	Malco
Banded Linsang	<i>Prionodon linsang</i>	Musang Congkok	Rufous Night Heron	<i>Nycticorax caledonicus</i>	Kowak merah	Incubator Bird	<i>Megapodius freycinet</i>	Burung Goson
Celebes Palm Civet	<i>Macrogaleidea musschenbrockii</i>	Musang Sulawesi	Wooly Necked Stork	<i>Ciconia episcopus</i>	Bangau Hitam	Waffled Brush/Incubator Bird	<i>Megapodius arfakianus</i>	Burung Goson
Binturong	<i>Arctictis binturong</i>		Milky Stork	<i>Ibis cinerus</i>	Bluwok Putih	Bryn's Brush/Incubator Bird	<i>Megapodius bruijini</i>	Burung Goson
Javan Tiger	<i>Panthera tigris sondaica</i>	Harimau Jawa	Lesser Adjutant Stork	<i>Leptoptiles javanicus</i>	Bangau Tongtong	Mollucan Scrub Hem	<i>Eulipoa wallacci</i>	Burung Goson
Sumatran Tiger	<i>Panthera tigris sumatrae</i>	Marimau Sumatera	Painted Stork	<i>Ibis leucocephalus</i>	Bluwok Berwarna	Incubator Bird	<i>Megapodius freycian affinis</i>	Gosong
Leopard Panther	<i>Panthera pardus</i>	Macan Kumbang/Macan Tutul	Black Headed Ibis	<i>Threskiornismelanocceph</i>	Ibis Putih Kepala Hitam	Incubator Bird	<i>Megapodius nicobarensis</i>	Gosong
Clouded Leopard	<i>Neofelis nebulosa</i>	Harimau Dahan	White Shouldered Ibis	<i>Pseudibis davisoni</i>	Ibis Bahu Putih	Incubator Bird	<i>Megapodius tenimberensis</i>	Sogong
Leopard Cat	<i>Felis bengalensis</i>	Kucing Huta/Meong Congklot	Glossy Ibis	<i>Plegadis falcinollus</i>	Roko-roko Ibis Hitam	Black Billed Brush	<i>Teloggalla fuscescens</i>	kamur
Marble Cat	<i>Felis marmorata</i>	Luwak	Shikra Goshwak	<i>Accipiter badius</i>	Alap-alap	Brown Collared Brush Turkey	<i>Teloggalla jobiensis</i>	Umgran
Bornean Bay Cat	<i>Felis badia</i>	Kucing Merah	Maluccan Sparrow Hawks	<i>Accipiter erythreuchen</i>	Alap-alap Berkalong	Great Argus Pheasant	<i>Argusianus argus</i>	Kuao
Golden Cat	<i>Felis temminchii</i>	Kucing Emas	Maluccan Sparrow Hawks	<i>Accipiter erythreuchen</i>	Alap-alap Maluku	Green Peafowl	<i>Pavo muticus</i>	Merak
Flat headed Cat	<i>Felis planiceps</i>	Kucing Dampak	Brown Goshwak	<i>Accipiter fasciatus</i>	Alap-alap Coklet	Bulwer's Wattled Pheasant	<i>Polyplectron malacense</i>	Merak Kerdil
Fishing Cat	<i>Felis viverrinus</i>	Kucing Bakau	Celebes Crested Goshwak	<i>Accipiter griseiceps</i>	Alap-alap Sulawesi	Sarus Crane	<i>Grus satigone</i>	Jenjang
Asiatic Wild Dog	<i>Cuon alpinus</i>	Ajag	White Headed Sparrow Hawk	<i>Accipiter henicogramus</i>	Alap-alap Kepala Putih	Celebes Rails	<i>Aramidopsis plateni</i>	Mandar Sulawesi
Asian Elephant	<i>Elephas maximus</i>	Gajah	Black Mantled Sparrow Hawk	<i>Accipiter melanochlamys</i>	Alap-alap Punggung Hitam	Javan Wattled Lapwing	<i>Venellus tricolor</i>	Trilei Jawa
Malay Tapir	<i>Tapirus incidius</i>	Tapir/Cipan/Tanuk	Meyer's Goshwak	<i>Accipiter meyerianus</i>	Alap-alap Meyer	Asia DOwitcher	<i>Limpodromus semipalmatus</i>	Blekek Asia
Sumatran Rhino	<i>Dicerorhinus sumatrensis</i>	Badak Sumatera	Celebes Little Sparrow Hawk	<i>Accipiter nanus</i>	Alap-alap Kenil Sulawesi	English Name	Latin Name	Indonesian Name
Babyrusa	<i>Babyrousa babyrussa</i>	Babi Rusa	White Goshwak	<i>Accipiter novaehollandiae</i>	Alap-alap Putih	Buraskan Curlew	<i>Numenius arguata</i>	Gegajahan Besar
Javan Rhino	<i>Rhinoceros sondaicus</i>	Badak Jawa	Grey Headed Sparrow Hawk	<i>Accipiter poliocephalus</i>	Alap-alap Kepala Kelabu	Wimbrel	<i>Numenius shcopus</i>	Gegajahan Sedang
Deer	<i>Cervus timorensis</i>	Rusa	Vinous Breasted Sparrow Hawk	<i>Accipiter rhodogaster</i>	Alap-alap Sulawesi	Curlew	<i>Nemenius madagascariensis</i>	Gegajahan Paruh Besar
Sambar	<i>Cervus unicolor</i>	Sambar	Chinese Goshwak	<i>Accipiter soleosis</i>	Alap-alap China	Little Curlew	<i>Numenius minutus</i>	Gegajahan Kecil
Bawean/Kuw's Deer	<i>Hylelaghus kuhlii</i>	Rusa Bawean	Crested Goshwak	<i>Accipiter trivngatus</i>	Alap-alap Jambul	Spotted Greenshak	<i>Tringa guttifer</i>	Trinil Asia
Barking Deer	<i>Muntiacus muntjak</i>	Kijang	Spot-tailed Sparrow Hawk	<i>Accipiter trinotatus</i>	Alap-alap Ekor Bintik			

Table 8 PROTECTED SPECIES IN INDONEASIA (2/3)

English Name	Latin Name	Indonesian Name	English Name	Latin Name	Indonesian Name	English Name	Latin Name	Indonesian Name
b. Bird			Red Kingfisher	<i>Halcyon coromanda</i>	Raja Udan Merah	Purple Naped Sunbird	<i>Nectarinia hypogramica</i>	Burung Madu Kuduk Ungu
Black Winged Stilt	<i>Himantopus himantopus</i>	Trulak Lidi	Javan Kingfisher	<i>Halcyon cyanoventris</i>	Raja Udan Biru Jawa	Purple Throated Sunbird	<i>Nectarinia sperata</i>	Burung Madu
Great Reef Thick Knee	<i>Esacus magnirostris</i>	Wili-wili	Forest Kingfisher	<i>Halcyon macleayi</i>	Raja Udan Hutan			Tenggrokan Ungu
Chinese Crested Tern	<i>Sterna zimmermani</i>	Dara Laut Berjambul	Mountain Yellow	<i>Halcyon megarhynchus</i>	Raja Udan Punggung Paruh Kuning	Copper Throated Sunbird	<i>Nectarinia chalcostetha</i>	Burung Madu Tenggrokan Pirang
Brown Noody	<i>Anous stolidus</i>	Camar Coklat	Bellied Kingfisher		Raja Udan	English Name	Latin Name	Indonesian Name
White Capped Noody	<i>Anous minutus</i>	Camar Kerudi Putih	Moluccan Kingfisher	<i>Halcyon monacha</i>	Raja Udan	Yellow Breasted Sunbird	<i>Nectarinia jugularis</i>	Burung Madu Kuning
Black Noody	<i>Anous tenuirostris</i>	Camar Hitam	Blue Black Kingfisher	<i>Halcyon nigricyanea</i>	Raja Udan Biru hutan	Black Sunbird	<i>Nectarinia sericea</i>	Burung Madu Hitam
Whishered Tern	<i>Chlidonias hybrida</i>	Dara Laut Kumis	Black Capped Kingfisher	<i>Halcyon pileata</i>	Raja Udan Kuduk hitam	Javan Grey Throated White Eye	<i>Lophozosterops javanicus</i>	Burung Kacamata Leher Abu-abu
Black Tern	<i>Chlidonias niger</i>	Dara Laut Sayap Hitam	White Throated Kingfisher	<i>Halcyon sanctus</i>	Raja Udan Leher Putih	Rufous Breasted Honey Eater	<i>Conophila albogularis</i>	Burung Madu Dada Coklat
White Winged Tern	<i>Chlidonias leucopterus</i>	Dara Laut Sayap Putih	Sacred Kingfisher	<i>Halcyon sanota</i>	Raja Udan	Blue Faced Honey Eater	<i>Entomizer eater</i>	Burung Madu Mata Biru
Gull Billed Tern	<i>Gelochelidon nilotica</i>	Dara Laut Paruh Hitam	White Headed Kingfisher	<i>Halcyon saurophaga</i>	Raja Udan Kepala Putih	White Eye Honey Eater	<i>Glycichaera fallax</i>	Burung Madu Mata Putih
White Tern	<i>Gygis alba</i>	Camar Putih Mata Cincin	Lesser Yellow Billed Kingfisher	<i>Halcyon torotoro</i>	Raja Udan Paruh Kuning Kecil	White Eared Honey Eater	<i>Lichmera albobouricularis</i>	Burung Madu Kuping Putih
Little Tern	<i>Sterna albifrons</i>	Dara Laut Kecil	Banded Kingfisher	<i>Lacedo pulchella</i>	Raja Udan Pita	Honey Eater	<i>Lichmera flavicans</i>	Burung Madu
Bridled Tern	<i>Sterna anacthetus</i>	Dara Laut Kendal	Hook Billed Kingfisher	<i>Melidora macrorhina</i>	Raja Udan Paruh Bengkok	Plain Olive Honey Eater	<i>Lichmera argentaurus</i>	Burung Madu Hijau
Lesser Crested Tern	<i>Sterna bengalensis</i>	Dara Laut Jambu Kenil	Stork Billed Kingfisher	<i>Pelargopsis capensis</i>	Raja Udan Paruh Bango	Honey Eater	<i>Lichmera deningeri</i>	Burung Madu
Greater Crested Tern	<i>Sterna bergii</i>	Dara Laut Jambu Besar	Black Bellied Kingfisher	<i>Plargopsis melanochyncha</i>	Raja Udan Perut Hitam	Brown Honey Eater	<i>Lichmera indistincta</i>	Burung Sedap Madu Coklat
Roseate Tern	<i>Sterna dougallii</i>	Dara Laut Dougalii	Numfor Paradise Kingfisher	<i>Tanyptera corollinae</i>	Raja Udan Numfor	Lombok Honey Eater	<i>Lichmera lombokia</i>	Burung Madu Dada Lombok
Sooty Tern	<i>Sterna uscata</i>	Dara Laut Hitam	Kofiau Paradise Kingfisher	<i>Tanyptera ellioti</i>	Raja Udan Kafiau	Honey Eater	<i>Lichmera monticola</i>	Burung Madu
Common Tern	<i>Sterna hirundo</i>	Dara Laut Hirunda	Common Paradise Kingfisher	<i>Tanyptera galatea</i>	Raja Udan Ekor Panjang	Honey Eater	<i>Lichmera notabilis</i>	Burung Madu
Black Naped Tern	<i>Sterna sumatrana</i>	Dara Laut Tengkuik Hitam	Aru Paradise Kingfisher	<i>Tanyptera hydrocharis</i>	Raja Udan Aru	Honey Eater	<i>Lichmera squamata</i>	Burung Madu
Nicobar Pigeon	<i>Caloenas nicobarica</i>	Junai Emas	Pint Breasted Paradise Kingfisher	<i>Tanyptera nympha</i>	Raja Udan Kemerah merahana	Belford's Honey Eater	<i>Melidectes beredi</i>	Burung Madu Belford
Grounded Pigeon	<i>Coura scheepmakeri</i>	Mambruk Skop Makeri	Biak paradise Kingfisher	<i>Tanyptera riedelli</i>	Raja Udan Bajak	Sooty Honey Eater	<i>Melidectes fuscus</i>	Burung Madu
Grounded Pigeon	<i>Goura cirstata</i>	Mambruk Biasa	White Tailed Paradise Kingfisher	<i>Tanyptera sylvia</i>	Raja Udan Ekor Putih	White Fronted Honey Eater	<i>Melidectes leucoatephes</i>	Burung Madu Muka Putih
Victoria Crowded Pigeon	<i>Goura victoria</i>	Mambruk Viktoria	Brown Backed Paradise Kingfisher	<i>Tanyptera danae</i>	Raja Udan Punggung Coklat	Mid Mountain Honey Eater	<i>Melidectes achromelas</i>	Burung Madu Gunung
Greater Sulphur	<i>Cacatua galerita</i>	Kakatua Putih Besar/	Hornbill	<i>Rhyticeros cassidix</i>	Rangkok Buton	Long Bearded Honey Eater	<i>Melidectes princeps</i>	Burung Madu Kumis
Crested Cockatoo		Jumbul Kuning	Hornbill	<i>Rhyticeros coronatus</i>	Kangkareng	Short Bearded Honey Eater	<i>Melidectes nouhysi</i>	Burung Madu Kumis
Eclectus Parrot	<i>Loris roratus</i>	Payap	Sumba Hornbill	<i>Rhyticeros everetti</i>	Rangkok Sumba	Linnamen Bearded Honey Eater	<i>Melidectes torquatus</i>	Burung Madu Dada Coklat
Celebes Spotted			Wrinkled Hornbill	<i>Rhyticeros leucocephalus</i>	Burung Tahun	Long Billed Honey Eater	<i>Melidectes megarhynchus</i>	Burung Madu
Hanging Parrot	<i>Loculus exilis</i>	Serindit Sulawesi	Blyth's Hornbill	<i>Rhyticeros plicatus</i>	Burung Lipat	White Marked Honey Eater	<i>Meliphaga albonotata</i>	Burung Madu Bercak Putih
Black Naped Lory	<i>Lorius domicellus</i>	Nuri Merah Kepala Hitam	Wicetted Hornbill	<i>Rhyticeros undulatus</i>	Enggang Musim	Memic Honey Eater	<i>Meliphaga analoga</i>	Burung Madu
Black Capped Lory	<i>Lorius lory</i>	Nuri Merah Kepala Hitam Dada Biru	White Crowned Hornbill	<i>Berenicomis comatus</i>	Enggang Jambul Putih	Puff Bathed Honey Eater	<i>Meliphaga aruensis</i>	Burung Madu
			Bushy Crested Hornbill	<i>Anonhinus guleritus</i>	Enggang Konde	Yellow Gadep Honey Eater	<i>Meliphaga flavivictus</i>	Burung Madu Kuning
Palm Cockatoo	<i>Probosciger aterrimus</i>	Kakatua Raja/Kakatua Hitam	Black Hornbill	<i>Anthraceroceros malayanus</i>	Enggang Hitam	Slender Billed Honey Eater	<i>Keliphaga gracilis</i>	Burung Madu Paruh Langsing
Peacquet's Parrot	<i>Pitttrichas fulgidus</i>	Kasturi Raja	Great Pied Hornbill	<i>Anthraceroceros malabaricus</i>	Rangkok Kecil	Large Spot Breasted Honey Eater	<i>Meliphaga mimikae</i>	Burung Madu Besar
Muller's Parrot	<i>Tanygnathus sumatranus</i>	Nuri Sulawesi	Rhinoceros Hornbill	<i>Buceros rhinoceros</i>	Rangkok Badak			
Orrate Lorikeet	<i>Trichoglossus ornatus</i>	Kasturi Sulawesi	Great Hornbill	<i>Buceros bicornis</i>	Rangkok Papan	White Eared Honey Eater	<i>Meliphaga montana</i>	Burung Madu Telinga Putih
Biak Scops Owl	<i>Otus manadensis beccarii</i>	Celepuk Biak	Helmeted Hornbill	<i>Rhinoplax vigil</i>	Enggnag Gading	Small Spot Breasted Honey Eater	<i>Meliphaga orientalis</i>	Burung Madu Dada Tutul
Diard's Trogon	<i>Harpactes diardii</i>	Kasumba	Papuan Hornbill	<i>Rhyticeros plicatus</i>	Rangkok Irian			
Scarlet Rumped Trogon	<i>Harpactes duvaucelli</i>	Kasumba Punggung Ungu	Celebes Hornbill	<i>Penelopides exarhatus</i>	Rangkok Sulawesi	Singing Honey Eater	<i>Meliphaga virescens</i>	Burung Madu
Red Head Trogon	<i>Harpactes erythrocephalus</i>	Kasumba kepala Merah	Brown Throated Barbet	<i>Magalaima corvina</i>	Maruku	Common Melipetes	<i>Meliphaga fumigatus</i>	Burung Madu
Red Naped Trogon	<i>Harpactes kasumba</i>	Kasumba Merah	java barbet	<i>Magalaima javensis</i>	Tulum Tumpuk	Arfak Melipetes	<i>Meliphaga gymnops</i>	Burung Madu Arfak
Orange Breasted Trogon	<i>Harpactes oreskios</i>	Kasumba Dada Oranye	Blue Crowned barbet	<i>Magalaima armillaris</i>	Cangkarang	Celebes Honey Eater	<i>Myza celebensis</i>	Burung Madu Sulawesi
Cinnamon Rumped Trogon	<i>Harpactes orotrophaeus</i>	Kasumba Tananggang Cinnamas	Blue Headed Pitta	<i>Pitta baudi</i>	Paok Kepala Biru	Honey Eater	<i>Myza sarasinorum</i>	Burung Madu
			Giant Pitta	<i>Pitta brachyura</i>	Paok Sayap Biru	Mountain Red Headed Honey Eater	<i>Mysomela adolphinae</i>	Burung Madu Gunung Merah
Blue Tailed Trogon	<i>Harpactes reinwardtii</i>	Kasumba Ekor Biru	Red Breasted Pitta	<i>Pitta caerulea</i>	Paok Besar Biru			
White Head's Trogon	<i>Harpactes white headi</i>	Kasumba kalimantan	Garnet Pitta	<i>Pitta erythrogaster</i>	Paok Dada Merah	Honey Eater	<i>Mysomela blassii</i>	Burung Madu
River Kingfisher	<i>Alcedo atthis</i>	Raja UdanSungai	Banded Pitta	<i>Pitta garnatina</i>	Paok Garnet	Red Honey Eater	<i>Myzomela cruentata</i>	Burung Madu Merah
Small Blue Kingfisher	<i>Alcedo coerulesceus</i>	Raja Udan Biru kecil	Greater Pitta	<i>Pitta maxima</i>	Paok Halmahera	Mangrove Red Headed Honey Eater	<i>Mysomela erythrocephala</i>	Burung Madu Rawa
Brond Zoned Kingfisher	<i>Alcedo euryzone</i>	Raja Udan Binti	Mokuccan Blue	<i>Pitta mollucensis</i>	Paok Maluku			
Malaysian Kingfisher	<i>Alcedo meninting</i>	Raja Udan Keninting	Schneide's Pitta	<i>Pitta schneideri</i>	Paok Schneideri	Red Spot Honey Eater	<i>Mysomela eques</i>	Burung Madu
Azure Kingfisher	<i>Ceyx azurea</i>	Raja Udan Biru	Hooded Pitta	<i>Pitta sordida</i>	Paok Topi	Honey Eater	<i>Mysomela kuehni</i>	Burung Madu
Indian Forest Kingfisher	<i>Ceyx eritharus</i>	Raja Udan Kuku Tiga	Blue Banded Pitta	<i>Pitta arcuata</i>	Paok Biru	Black Honey Eater	<i>Mysomela nigrita</i>	Burung Madu Hitam
Celebes Pygmy Kingfisher	<i>Ceyx fallax</i>	Raja Udan Kerdil Sulawesi	Hoisy pitta	<i>Pitta versicolor</i>	Paok	Dusty Honey Eater	<i>Mysomela obscura</i>	Burung Madu
Dwarf Kingfisher	<i>Ceyx lepidus</i>	Raja Udan Elok	Rueek's Blue Flycatcher	<i>Moscivapa rueeki</i>	Burung Kipas Biru	Black and Red Honey Eater	<i>Mysomela rosenbergii</i>	Burung Madu Hitam Merah
Little Kingfisher	<i>Ceyx pusillus</i>	Raja Udan Kechil	Pied Faintail	<i>Rhipidura javanica</i>	Burung Kipas	Honey Eater	<i>Mysomela sanguinolenta</i>	Burung Madu
Malay Forest Kingfisher	<i>Ceyx rufidorsus</i>	Raja Udan Hutan	Red Tailed Fantail	<i>Rhipidura phoenicura</i>	Burung Kipas Ekor Merah	Honey Eater	<i>Mysomela vulnerata</i>	Burung Madu
			White Bellied Fantail	<i>Rhipidura curvura</i>	Burung Kipas Gunung	Pigmy Honey Eater	<i>Oedistoma pygmae</i>	Burung Madu Pigmi
Celebes Blue Eared Kingfisher	<i>Cittura cyanotis</i>	Raja Udan Sulawesi	Pygmy Tit	<i>Psaltia exilis</i>	Gelatik Kecil	Honey Eater	<i>Oedistoma iliophum</i>	Burung Madu
			Duyrebode's Sunbird	<i>Aethopyga doyenrhodei</i>	Burung Madu Sagir	Orange Checked Honey Eater	<i>Oreocornis chrysogenys</i>	Burung Madu Pipi Merah
Shovel Billed Kingfisher	<i>Clytoceyx pex</i>	Raja Udan Paruh Sendok	Khul's Sunbird	<i>Aethopyga eximialis</i>	Burung Madu	Obscure Honey Eater	<i>Oreocornis abscurus</i>	Burung Madu
Red Bellied Gread Kingfisher	<i>Dacelo gaudichaudi</i>	Raja Udan Besar Paruh Merah	Scarlet Sunbird	<i>Aethopyga mystacalis</i>	Burung Madu Merah	Brass's Friar Bird	<i>Philemon brassi</i>	Burung Madu
Blue Winged Kookabura	<i>Dacelo leachii</i>	Raja Udan Irian Sayap Biru	Crimson Sunbird	<i>Aethopyga siparaja</i>	Burung Madu Merah Jingga	Nossy/Friar bird	<i>Philemon buccroides</i>	Burung Madu Hitam
Aru Giant Kingfisher	<i>Dacelo tyro</i>	Raja Udan Aru Besar	Brown Throated Sunbird	<i>Anthreptes malacensis</i>	Burung Madu	Yellow Throated Friar bird	<i>Philemon citreularis</i>	Burung Madu Besar/Cikus-kua
Kingfisher	<i>Halcyon australasia</i>	Raja Udang Timur	Red Checked Sunbird	<i>Anthreptes rhodolaema</i>	Burung Madu/jantungan	Friar Bird	<i>Philemon fuscipilus</i>	Burung Madu Besar Kerongkongan Kuning
Kingfisher	<i>Halcyon funebris</i>	Raja Udan	Ruby Checked Sunbird	<i>Anthreptes singalensis</i>	Burung Madu Pipi Merah			
Kingfisher	<i>Halcyon fulgidus</i>	Raja Udan	Grey Breasted Spiderhunter	<i>Arachnothera affinis</i>	Burung Jantung Kelabu	Grigolo Friar Bird	<i>Philemon gilolansis</i>	Burung Madu Besar
Kingfisher	<i>Halcyon princepa</i>	Raja Udan	Lesser Yellow Eared Spiderhunter	<i>Arachnothera chrysogenys</i>	Burung Jantung Kecil	Timor Friar Bird	<i>Philemon inomatus</i>	Burung Madu Besar
Kingfisher	<i>Halcyon laruli</i>	Raja Udan	Thick Billed Spiderhunter	<i>Arachnothera crassirostris</i>	Burung Jantung Paruh Tebal	Meyer's Friar Bird	<i>Philemon meyeri</i>	Burung Madu Besar
Kingfisher	<i>Tanyptera dane</i>	Raja Udan	Greater Yellow Cared Spiderhunter	<i>Arachnothera flavigaster</i>	Burung Jantung Besar	Moluccan Friar Bird	<i>Philemon molluccensis</i>	Burung Madu Besar Maluku
White Collared Kingfisher	<i>halcyon chloris</i>	Raja Udan Kalung Putih	Long Billed Spiderhunter	<i>Arachnothera robusta</i>	Burung Jantung Besar	New Guinea Friar Bird	<i>Philemon novaeguineae</i>	Burung Madu Besar Irian
Chestnut Collared Kingfisher	<i>Halcyon concreta</i>	Raja Udan Kalung Coklat	Little Spiderhunter	<i>Arachnothera longirostris</i>	Burung Madu	Seram Friar Bird	<i>Philemon subcorniculatus</i>	Burung Madu Besar Seram

Table 9 PROTECTED SPECIES IN INDONESIA (3/3)

English Name	Latin Name	Indonesian Name
b. Bird		
Honey Eater	Ptiloprora erythropleura	Burung Madu
Red Backed Honey Eater	Ptiloprora guisei	Burung Madu Punggung Merah
Meek's Stresked Honey Eater	Ptiloprora meekiana	Burung Madu Bergaris
Honey Eater	Ptiloprora perstriata	Burung Madu
Leaders Honey Eater	Philemon plumbea	Burung Madu
Grey Honey Eater	Pygnopogon cinereus	Burung Madu Kelabu
Brown Honey Eater	Pygnopogon ixoides	Burung Madu Coklat
Yellow Billed Honey Eater	Toxorhampus novaeguineae	Burung Madu Paruh
Slaty Chinned Long	Toxorhampus poliopterus	Burung Madu Pipi Kelabu
Streak Capped Honey Eater	Tygpygius stictocephalus	Burung Madu Kerudung Setrip
Grey Billed Long Bill	Toxorhampus iliolophus	Burung Madu Perut
Mountain Straight Billed	Timeliopsis flavigula	Burung Madu Gunung
Honey Eater		
Lowland Straight Billed	Timeliopsis griseigula	Burung Madu Paruh Lurus
Honey Eater		
Modest Honey Eater	Ramsayornis modestus	burung Madu Sederhana
Nias Talking Mynah	Gracula relligosa robusta	Beo Nias
Rothchild's Starling	Leucopsar rothschildi	Jalak Putih Bali
Black Winged Starling	Sturnus melanoptera	Jalak Putih
White Tared Cat Bird	Ailuroedus buccides	Burung Kucing Telinga Putih
Black Tared Cat Bird	Ailuroedus melanotis	Burung Kucing Telinga Hitam
Gardener Tared Bower Bird	Amblyornis inornatus	Burung Serambi
Yellow Fronted Golden	Amblyornis flavifrons	Burung Namdur Jambai
Bowed Bird		
Crested Gardener Tared	Amblyornis maegregoriae	Burung Namdur Jambul
Bower Bird		
Archbold's Bower Bird	Archboldia papuensis	Burung Namdur Hitam
Brown Broasted Bower Bird	Clamydera cerviniventris	Burung Namdur Coklat
Lauterback's Bower Bird	Clamydera lauterbachii	Burung Namdur Kuning Muda
Golden Bower Bird	Sericulus aurens	Burung Namdur Emas
Arfak Astrapris Bird of Paradise	Astrapia nigra	Burung Dewata Ekor Panjang
Splendid Astrapia Bird of	Astrapia splendissima	Burung Dewata
Paradise		
King Bird of Paradise	Cincinurus rufus	Burung Raja
Magnificent Bird of Paradise	Diphyllodes magnificus	Burung Dewata Raja Kecil
Waigeo Bird of Paradise	Diphyllodes republica	Burung Dewata Waigeo
Black Sickle Billed Bird of	Draparnis alberti	Burung Dewata Paruh Panjang
Paradise		
Black Sickle Billed Bird of	Epimachus fuscatus	Burung Dewata Paruh
Paradise		Sabit Hitam
White Sickle Billed Bird of	Drepanornis bryonii	Burung Dewata Paruh
Paradise		Sabit Putih
Brown Sickle Billed Bird of	Epimachus mayeri	Burung Dewata Paruh
Paradise		Sabit Coklat
Wattle Billed Bird of Paradise	Laboparadisae sericea	Burung Dewata Berpial
Superb Bird of Paradise	Lophorina superba	Burung Dewata Superba
Loria's Bird of Paradise	Loria lorae	Burung Dewata Loria
Paradise Crown	Lycocorax pyrrhopterus	Burung Gagak Surga
Macgregor's Bird of Paradise	Macgregoria pulchra	Burung Dewata Topeng
Jobi Manucode	Manucodia ater	Burung Dewata Jobi
Crinkled Collared Manucode	Manucodia chalybatus	Burung Dewata Hijau
Gloss Wattled Manucode	Manucodia ater	Burung Dewata
Long Tailed Paradigalla	Paradigalla carunculata	Cendrawasih Berpial
Short Tailed Paradigalla	Paradigalla brevicanda	Cendrawasih Berpial
		Ekor Pendek
Greater Bird of Paradise	Paradisea apoda	Cendrawasih Kuning Besar
Lesser Bird of Paradise	Paradisea minor	Cendrawasih Kuning Kecil
Red Bird of Paradise	Paradisea rubra	Cendrawasih Merah
Count Rangi's Bird of Paradise	Paradisea raggiana	Cendrawasih Jingga
Queen Carol's Siswaret Bird of	Paradisea corolea	Burung Dewata Bulu
Paradise		Enam Putih
Afrak Six Wired Bird of paradise	Parotia sefilate	Burung Dewata Bulu Enam
Enamneled Bird of Paradise	Pteridophora alberti	Burung Dewata Pembawa Pinji
Trumpet Bird	Phonygammus keraudrenii	Burung Dewata Trompet
Magnificent Rifle Bird	Ptiloris magnificus	Cendrawasih Memenjat
Twelve Wired Bird of Paradise	Seleucidis melanoleuca	B.D.Duabelas Kawat

English Name	Latin Name	Indonesian Name
Wallace's Standar Wing	Semioptera wallasei	Burung Plat
Faise Lobel Long Tail	Pseudastria lobata	Burung Dewata Ekor Panjang
Elliot's Bird of Paradise	Astrapimachus ellioti	Burung Dewata Elliot
Java Nun Babler	Alcippe pyrrhoptera	Brecet Wergan
Spotted Sibia	Crocias albonotatus	Burung Matahari
Red Fronted laughing Thrush	Garrulax rufifrons	Burung Kuda
White Brested Tree Babler	Stachyris grammiceps	Burung Tepus Dada
Pearl Cheek Tree Babler	Stachyris melanothorax	Burung Tepus Pipi Perak
White-winged Wood Duck	Cairina scutulata	Itik Liar
Rueck's Blue Flycatcher	Niltiva ruechi	Burung Kipas Biru
Milky Stork	Mycteria cinerea	Bangau Putih Susu/Bluwok
Javan Wattled Plover/	Vanellus macropterus	Trulek Jawa/Trulek Ekor Putih
Sunda Plover		
Imperial Pigeon	Ducula whartoni	Pergam Raja
Blak Cops Owl	Otus beccarii	Burung Hantu Blak
Painted Stork	Mycteria leucocephala	Bluwok Berwarna
Grey-throated White Eye	Lophozosterops javanica	Burung Kaca Mata
c. Reptile		
River Terrapin	Batagur baska	Tuntun
Aquatic Tortoise	Orlitia borneensis	Kura-kura
Irian Tortoise	Caretta chelys insculpta	Kura-kura Irian
New Guinea Snapper	Elseya novaeguineae	Kura-kura Irian Leher Pendek
Long Necked Tortoise	Chelodina nagaeguinea	Kura-kura Irian Leher Panjang
Leather Back Turtle	Dermochelys coriacea	Penyu Belimbing
Gray Olive Loggerhead	Lepidochelys olivacea	Penyu Ridel
Red Brown Loggerhead	Caretta caretta	Penyu Tempayan
Giant Fresh Water Turtle	Chitra indica	Labi-labi Besar
Siamese Crocodile	Crocodylus siamensis	Buaya Air Tawar Irian
New Guinea	Crocodylus novaeguineae	Buaya Muara
Fresh Water Crocodile		
Marsh Crocodile	Crocodylus porosus	Buaya Air Tawar Irian
Malayan Gavial/False Gavial	Tomistoma schlegelii	Nuaya Capit Senyu Long
Giant Chameleon	Gonyocephalus dilophus	Bunglon Sisir/Bunglon Raksasa
Fin-tailed Lizard	Hydrosaurus ambonensis	Soa-soa
Komodo Dragon	Varanus komodoensis	Biawak Komodo
Indian Water Monitor	Varanus indicus	Biawak Maluku
Togian Monitor	Varanus salvator togianus	Biawak Togian
Brown Monitor	Varanus gouldii	Biawak Coklat
Grey Monitor	Varanus bangalensis	Biawak Abu-abu
Green Monitor Lizard	Varanus parasinus	Biawak Hijau
Timor Lizard	Varanus timorensis	Biawak Timor
Cantarus Lizard	Varanus borneensis	Biawak Kalimantan
Collar Skin Flapped Lizard	Chlamydosaurus kingi	Soa Payung
Giant Skunk	Tiliqua gigas	Ular Kaki Empat
Rock Python	Python molurus	Sanca Bodo
Green Python	Chondropython viridis	Sanca Hijau
Timor Python	Python timorensis	Sanca Timor
d. Insect		
Birdwing Butterfly	Omithoptera goliath	
Birdwing Butterfly	Omithoptera paradisca	
Birdwing Butterfly	Omithoptera chimacra	
Birdwing Butterfly	Troides miranda	
Birdwing Butterfly	Troides hypolitus	
Birdwing Butterfly	Troides haliphonon	
Birdwing Butterfly	Troides rhadamantus	
Birdwing Butterfly	Troides andromane	
Birdwing Butterfly	Troides amparysus	
Birdwing Butterfly	Troides plato	
Birdwing Butterfly	Troides reideli	
Birdwing Butterfly	Troides helena	
Birdwing Butterfly	Troides vadepolli	
Birdwing Butterfly	Troides meoris	
Birdwing Butterfly	Troides oriton	
Trogon Butterfly	Trogonotera brookiana	
Nympha Butterfly	Cethosia myrina	
Birdwing Butterfly	Omithoptera rotschildi	
Birdwing Butterfly	Omithoptera tithonus	
Birdwing Butterfly	Omithoptera priamus	

English Name	Latin Name	Indonesian Name
e. Fish		
Asian Bonitangue	Schlerophages formosus	Payang Malaya
Dawson River Salmon	Schlerophages leichardti	Payang Irian
Sentani Shark	Pristis sp.	Pari Sentani
Maninjau Loach	Homaloptera gymnogaster	Selusur Maninjau
Maninjau Loach	Puntius microps	Wader Goa
Maninjau Loach	Notopterus sp.	Balida Jawa
f. Coral		
Black Coral	Antipathes sp.	Akar Bahar/Koral Hitam
Giant Clam	Tridacna gigas	Kima Raksasa
Shorten Giant Clam	Tridacna derasa	Kima Selatan
Cina Clam	Hippopus porcellanus	Kima Cina
Saffron Coloured/Boring Clam	Tridacna corocoea	Kima Kuning/Lunang
Scaly Clam	Tridacna squamosa	Kima Sisik
Small Giant Clam	Tridacna maxima	Kima Besar
Horse Hoof	Hippopus hippopus	Kima Telapak Kuda
Triton Trumpet	Cheronia tritonis	Triton Terompet
Coconut Crab	Birgus latro	Ketam Kelapa
Horse Shoe Crab	Tachypleus gigas	Ketam Telapak Kuda
Giant Helmet Shell	Cassis cornuta	Kepala Kambing
Mother of Pearl	Trochus niloticus	Troka/Susu Bundar
Green Snail	Turbo marmoratus	Batu Laga/Sipuy Hijau
Pearly/Chambered Nautilus	Nautilus pompilius	Nautilus Berongga
King Crab	Tachypleus tridentatus	Mimi
g. Flora		
English Name	Latin Name	Indonesian Name
Palmae (Family)	Palmae (Family)	Sarai Raja (& others)
Black Orchid	Orchidaceae (Family)	Anggrek Hitam (& others)
Larat Orchid/	Orchidaceae (Family)	Anggrek Larat (& others)
Java's Slipper Orchid	Orchidaceae (Family)	Anggrek Basut Berbulu/ (& others)
-----	Araceae (Family)	Bunga Bangkai Jangkung/ & others
-----	Apocynaceae (Family)	Pulau pandak
Rafflesia	Rafflesia spp.	Rafflesia/Bunga Padma
Balanophora	Balanophora spp.	Balanofora
Rhisanthes	Thisanthes sippelii	Risantes

Table 10 ADMINISTRATIVE AREAS AND THE POPULATION AFFECTED BY THE PROJECT

a. Karian Dam

a. Karian Dan						
Kabupaten	Kecamatan	Desa	Kampung	H/Holds	Intvd.	
Lebak	Sajira	Sajira	Lebak Picung	45	15	
			Sajira	70	17	
			Sajira Mekar	50	-	
			Sukarame	Somang Pipir	100	25
			Sukajaya	Somang	36	17
				Taganjing	166	10
				Bondol	30	8
			Pajagan	Seupang	90	11
				Genteng	87	9
				Sinday	110	8
			Makarsari	Lebak Maja	60	28
			Calungbungur	Nanggela	78	6
				Karian	180	7
				Cimenteng	28	11
				Susukan	190	10
	Cimarga			Bolang	72	2
				Panunggangan	128	8
			Sangiang Jaya	-	50	25
			Tambak	Pasir Eurih	63	5
				Nunggul	38	2
				Balahayang	22	6
				Baketruk	171	10
				Kadulhur	36	6
				Polad	35	4
				Nganceng	115	3
				Pambalukan	5	-
				Total	2.055	253

c. Tanjung Dam

Kabupaten	Kecamatan	Desa	Kampung	H/holds	Intvd.
Bogor	Jasinga	Pangaur	Pangaur	95	6
			Pemalang	6	6
			Maribaya	55	6
			Panyan Dungan	33	-
			Sampiran	39	-
			Sukamanah	18	-
			Samprok	37	6
			Nanggaleng	70	6
	Tenjo	Bojong	Tanjung Karoya	67	6
			Tanjung Lebak	73	3
			Bojong	34	6
			Pasir Limus	84	6
			Sakelat	145	3
			Hariupni	87	3
			Trogong 1	56	2
			Trogong 2	43	4
			Pasir Bitung	207	2
			Pasir Jati	184	-
			Janglapa	134	-
	Lebak	Maja	Mayak	166	11
			Kabagusan	57	5
			Gobang	157	14
			Leuwisicun	102	18
			Lebak Pinang	225	12
			Rokok	48	4
			Pasir Cepak	40	3
		Cilangkap	Parung Pung	64	10
			Sampora	143	13
			Total	2,469	155

e. River Improvement

Kabupaten	Kecamatan	Desa	Kampung	H/holds	Intvd.
Serang	Pamarayan	Kamoening	Tipar	2	1
			Ranjang	4	-
			Jarpang Pasar	5	1
			Brahni	1	-
			Jambok 2	12	3
			Leuwi banteng	2	-
			Jambol	6	2
			Kambang	13	-
			Ketamang	8	1
			Goengang	-	-
		Kekel	Pasir Tiri 1	4	4
			Pasir Tiri 2	6	1
			Singabangsa	3	3
			Pening	7	-
			Babakan	-	-
	Lebak	Rangkasbitung	Toengkoe	9	1
			Pasir jati	8	4
			Banjat Leutik	8	3
			Jijoro	8	3
			Total	98	24

Note : No. of household is the number of "Houses Expected to relocate and it is not necessarily the same as the number of houses in the entire village.

b. Cilawang Dam

Kabupaten	Kecamatan	Desa	Kampung	H/Holds	Intvd.			
Bogor	Jasinga	Tegalwangi	Lengkong	10	7			
			Nanggung	12	7			
			Cimanggu	20	8			
			Cokrak	21	8			
			Bagoang	79	6			
		Bagoang	Tarisi	84	7			
			Jolpot	36	5			
			Parungkembang	44	6			
			Pasirkandang	54	6			
			Lebak	Maja	Sekawangi	Cilawang 1	20	6
						Cilawang 2	56	6
						Leuwidulang	20	12
						Cokel	21	6
Curugpitung	Pasirnangka	100			-			
	Turus	62			-			
Paja	-	20	-					
			Total	639	90			

d. Karian-Serpong Conveyance System

d. Karian-Serpong Conveyance System					
Kabupaten	Kecamatan	Desa	Kampung	H/holds	Intvd.
Lebak	Maja	Maja	Cipondok	1	1
		Mekarsari	Pasirceri	3	1
			Cilayan	7	
		Pasir	Padasuka	2	2
		Lembang	Sakongge	3	1
Bogor	Tenjo		Rabab	1	3
		Singabraja	Lamunjaya	4	5
		Singabangsa	Baru	2	5
			Singabangsa	3	5
			Grobog	8	7
	Parung Panjang	Jagabita	Leles	6	12
			Jagabita	3	18
		Cibunak	Aparai Salek	4	14
		Parung Panjang	Lebak Talun	2	6
				4	5
Tangerang	Serpong	Serpong	Nambo	21	12
			Serpong Kidul	43	6
			Total	117	103

Table 11 AGE DISTRIBUTION OF POPULATION IN THE PROJECT AREA

a. Karian Dam							b. Cilawang Dam						
Age	Male	%	Female	%	Total	%	Age	Male	%	Female	%	Total	%
0 _ 4	89	5.9	94	6.3	183	12.2	0 _ 4	19	3.7	33	6.4	52	10.0
5 _ 9	118	7.9	116	7.8	234	15.6	5 _ 9	49	9.5	48	9.3	97	18.7
10 _ 14	123	8.2	91	6.1	214	14.3	10 _ 14	33	6.4	49	9.5	82	15.8
15 _ 19	91	6.1	93	6.2	184	12.3	15 _ 19	34	6.6	20	3.9	54	10.4
20 _ 24	54	3.6	61	4.1	115	7.7	20 _ 24	15	2.9	18	3.5	33	6.4
25 _ 29	42	2.8	89	5.9	131	8.8	25 _ 29	15	2.9	18	3.5	33	6.4
30 _ 34	42	2.8	41	2.7	83	5.5	30 _ 34	22	4.2	15	2.9	37	7.1
35 _ 39	44	2.9	41	2.7	85	5.7	35 _ 39	9	1.7	25	4.8	34	6.6
40 _ 44	43	2.9	47	3.1	90	6.0	40 _ 44	20	3.9	13	2.5	33	6.4
45 _ 49	23	1.5	22	1.5	45	3.0	45 _ 49	14	2.7	8	1.5	22	4.2
50 _ 54	34	2.3	19	1.3	53	3.5	50 _ 54	14	2.7	8	1.5	22	4.2
55 _ 59	18	1.2	7	0.5	25	1.7	55 _ 59	4	0.8	1	0.2	5	1.0
60 _ 64	23	1.5	8	0.5	31	2.1	60 _ 64	5	1.0	2	0.4	7	1.4
> 65	18	1.2	5	0.3	23	1.5	> 65	6	1.2	1	0.2	7	1.4
Total	762	50.9	734	49.1	1496	100.0	Total	259	50.0	259	50.0	518	100.0

Average Size of Family: 5.9 persons/family

Average Size of Family: 5.8 persons/family

c. Tanjung Dam							d. KSCS						
Age	Male	%	Female	%	Total	%	Age	Male	%	Female	%	Total	%
0 _ 4	47	5.0	58	6.1	105	11.1	0 _ 4	39	7.0	27	4.8	66	11.8
5 _ 9	82	8.6	52	5.5	134	14.1	5 _ 9	35	6.3	38	6.8	73	13.1
10 _ 14	49	5.2	90	9.5	139	14.6	10 _ 14	43	7.7	35	6.3	78	14.0
15 _ 19	64	6.7	54	5.7	118	12.4	15 _ 19	34	6.1	25	4.5	59	10.6
20 _ 24	44	4.6	32	3.4	76	8.0	20 _ 24	24	4.3	26	4.7	50	9.0
25 _ 29	31	3.3	35	3.7	66	7.0	25 _ 29	17	3.0	27	4.8	44	7.9
30 _ 34	35	3.7	33	3.5	68	7.2	30 _ 34	14	2.5	24	4.3	38	6.8
35 _ 39	27	2.8	31	3.3	58	6.1	35 _ 39	26	4.7	22	3.9	48	8.6
40 _ 44	26	2.7	28	3.0	54	5.7	40 _ 44	24	4.3	5	0.9	29	5.2
45 _ 49	24	2.5	16	1.7	40	4.2	45 _ 49	3	0.5	10	1.8	13	2.3
50 _ 54	23	2.4	18	1.9	41	4.3	50 _ 54	8	1.4	9	1.6	17	3.0
55 _ 59	12	1.3	5	0.5	17	1.8	55 _ 59	9	1.6	7	1.3	16	2.9
60 _ 64	14	1.5	5	0.5	19	2.0	60 _ 64	7	1.3	8	1.4	15	2.7
> 65	11	1.2	3	0.3	14	1.5	> 65	10	1.8	2	0.4	12	2.2
Total	489	51.5	460	48.5	949	100.0	Total	293	52.5	265	47.5	558	100.0

Average Size of Family: 6.1 persons/family

Average Size of Family: 5.4 persons/family

e. River Improvement						
Age	Male	%	Female	%	Total	%
0 _ 4	42	7.5	29	5.2	71	12.3
5 _ 9	39	7.0	37	6.6	76	13.2
10 _ 14	43	7.7	35	6.3	78	13.5
15 _ 19	36	6.5	26	4.7	62	10.7
20 _ 24	24	4.3	29	5.2	53	9.2
25 _ 29	17	3.0	25	4.5	42	7.3
30 _ 34	16	2.9	26	4.7	42	7.3
35 _ 39	26	4.7	25	4.5	51	8.8
40 _ 44	21	3.8	5	0.9	26	4.5
45 _ 49	3	0.5	9	1.6	12	2.1
50 _ 54	8	1.4	11	2.0	19	3.3
55 _ 59	9	1.6	9	1.6	18	3.1
60 _ 64	7	1.3	9	1.6	16	2.8
> 65	10	1.8	1	0.2	11	1.9
Total	301	53.9	276	49.5	577	100.0

Average Size of Family: 5.9 persons/family

Note : Total population means the total residents interviewed by the ANDAL.

Table 12 DISTRIBUTION OF OCCUPATION AND FAMILY SIZE/TYPE IN THE SURVEY AREA

a. Primary Occupation																				
Type of Occupation	Karian				Cilawang				Tanjung				KSCS				River Improvement			
	H/H	%	Wife	%	H/H	%	Wife	%	H/H	%	Wife	%	H/H	%	Wife	%	H/H	%	Wife	%
(1) Not employed	5	2.0	142	56.1	1	1.1	48	53.3	1	0.6	97	62.6	0	0.0	63	61.2	0	0.0	71	72.4
(2) Farmer	190	75.1	90	35.6	48	53.3	26	28.9	95	61.3	35	22.6	22	21.4	12	11.7	79	80.6	11	11.2
(3) Forest Worker	14	5.5	7	2.8	2	2.2	0	0.0	8	5.2	6	3.9	2	1.9	1	1.0	5	5.1	1	1.0
(4) Skilled Labour	6	2.4	2	0.8	15	16.7	0	0.0	11	7.1	1	0.6	11	10.7	4	3.9	0	0.0	1	1.0
(5) Trade/Entrepreneur	14	5.5	10	4.0	7	7.8	13	14.4	9	5.8	11	7.1	28	27.2	9	8.7	0	0.0	0	0.0
(6) Retailer	1	0.4	0	0.0	4	4.4	0	0.0	6	3.9	0	0.0	4	3.9	0	0.0	6	6.1	0	0.0
(7) Office Employee	4	1.6	0	0.0	4	4.4	0	0.0	1	0.6	0	0.0	12	11.7	2	1.9	3	3.1	2	2.0
(8) Government Employee	7	2.8	1	0.4	4	4.4	2	2.2	13	8.4	1	0.6	12	11.7	4	3.9	4	4.1	4	4.1
(9) Unskilled Labour	9	3.6	0	0.0	5	5.6	0	0.0	9	5.8	2	1.3	12	11.7	6	5.8	1	1.0	6	6.1
(10) No Answer	3	1.2	1	0.4	0	0.0	1	1.1	2	1.3	2	1.3	0	0.0	2	1.9	0	0.0	2	2.0
Total	253	100.0	253	100.0	90	100.0	90	100.0	155	100.0	155	100.0	103	100.0	103	100.0	98	100.0	98	100.0

b. Secondary Occupation																				
Type of Occupation	Karian				Cilawang				Tanjung				KSCS				River Improvement			
	H/H	%	Wife	%	H/H	%	Wife	%	H/H	%	Wife	%	H/H	%	Wife	%	H/H	%	Wife	%
(1) Not employed	157	62.1	238	94.1	45	50.0	84	93.3	79	51.0	147	94.8	66	64.1	101	98.1	73	74.5	94	95.9
(2) Farmer	20	7.9	4	1.6	15	16.7	0	0.0	27	17.4	3	1.9	23	22.3	0	0.0	12	12.2	0	0.0
(3) Forest Worker	10	4.0	1	0.4	15	16.7	3	3.3	3	1.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
(4) Skilled Labour	23	9.1	1	0.4	1	1.1	0	0.0	10	6.5	0	0.0	2	1.9	0	0.0	2	2.0	0	0.0
(5) Trade/Entrepreneur	23	9.1	6	2.4	10	11.1	2	2.2	18	11.6	3	1.9	4	3.9	0	0.0	3	3.1	0	0.0
(6) Retailer	0	0.0	0	0.0	4	4.4	0	0.0	5	3.2	0	0.0	2	1.9	0	0.0	2	2.0	0	0.0
(7) Office Employee	0	0.0	0	0.0	0	0.0	0	0.0	2	1.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
(8) Government Employee	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	1.9	0	0.0	2	2.0	0	0.0
(9) Unskilled Labour	17	6.7	2	0.8	0	0.0	0	0.0	9	5.8	0	0.0	4	3.9	0	0.0	4	4.1	0	0.0
(10) No Answer	3	1.2	1	0.4	0	0.0	1	1.1	2	1.3	2	1.3	0	0.0	2	1.9	0	0.0	4	4.1
Total	253	100.0	253	100.0	90	100.0	90	100.0	155	100.0	155	100.0	103	100.0	103	100.0	98	100.0	98	100.0

Note: H/H denotes "head of household".

c. Size of Family											
Size of Family	Karian		Cilawang		Tanjung		KSCS		River Improvement		
	No. of H/Hs	%	No. of H/Hs	%	No. of H/Hs	%	No. of H/Hs	%	No. of H/Hs	%	%
(1) 2 to 4	63	24.9	22	24.4	41	26.5	36	35.0	23	23.5	23.5
(2) 5 to 7	124	49.0	50	55.6	81	52.3	54	52.4	62	63.3	63.3
(3) > 8	66	26.1	18	20.0	33	21.3	13	12.6	13	13.3	13.3
Total	253	100.0	90	100.0	155	100.0	103	100.0	98	100.0	100.0

d. Type of Family											
Size of Family	Karian		Cilawang		Tanjung		KSCS		River Improvement		
	No. of H/Hs	%	No. of H/Hs	%	No. of H/Hs	%	No. of H/Hs	%	No. of H/Hs	%	%
(1) Nuclear Family	243	96.0	79	87.8	136	87.7	81	78.6	90	91.8	91.8
(2) Extended Family	10	4.0	11	12.2	19	12.3	22	21.4	8	8.2	8.2
Total	253	100.0	90	100.0	155	100.0	103	100.0	98	100.0	100.0

Table 13 IDENTIFICATION OF ENVIRONMENTAL IMPACTS TO BE INDUCED BY THE KARIAN DAM PROJECT

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
1. Pre-construction Period											
a. Natural Environment											
1) Climate							-				
2) Air Quality							-				
3) Geology							-				
4) Topography							-				
5) Hydrology							-				
6) Fauna							-				
7) Flora							-				
8) Ecological Area							-				
b. Social Environment											
1) Relocation	P										
2) Economic Activities											
i. Changes of Occupation											
Farmer											
Trader	P										
Retailer							P				
Factory Worker							P				
Office Worker							P				
ii. Land Use											
Farming Area								P			
Estate									T		
Forest								P			
Residential Area											
Industrial/Commercial											
iii. Transportation System											
iv. Economic Development											
v. Land Acquisition											
3) Standard of Living											
4) Public Health											
5) Religious Activity											
6) Cultural Activity											
7) Archaeology											
8) Aesthetic Value											
9) Psychology											
2. Construction Period											
a. Natural Environment											
1) Climate							-				
2) Air Quality							-				
3) Geology											
4) Topography											
5) Hydrology											
6) Fauna											
7) Flora											
8) Ecological Area											
b. Social Environment											
1) Relocation	P										
2) Economic Activities											
i. Occupation											
Farmer											
Trader											
Retailer											
Factory Worker											
Office Worker											
ii. Land Use											
Farming Area											
Estate											
Forest											
Residential Area											
Industrial/Commercial											
iii. Transportation System											
iv. Economic Development											
v. Land Acquisition											
2) Standard of Living											
3) Public Health											
4) Religious Activity											
5) Cultural Activity											
6) Archaeology											
7) Aesthetic Value											
8) Psychology											

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
b. Social Environment											
1) Relocation	P										
2) Economic Activities											
i. Changes of Occupation											
Farmer	P										
Trader							P				
Retailer							P				
Factory Worker								-			
Office Worker							P				
ii. Land Use											
Farming Area								P			
Estate									T		
Forest								P			
Residential Area											
Industrial/Commercial	P										
iii. Transportation System											
iv. Economic Development											
v. Land Acquisition											
3) Standard of Living											
4) Public Health											
5) Religious Activity											
6) Cultural Activity											
7) Archaeology											
8) Aesthetic Value											
9) Psychology											
3. Post-construction Period											
a. Natural Environment											
1) Climate											
2) Air Quality											
3) Geology											
4) Topography											
5) Hydrology											
6) Fauna											
7) Flora											
8) Ecological Area											
b. Social Environment											
1) Relocation	P										
2) Economic Activities											
i. Occupation											
Farmer											
Trader											
Retailer											
Factory Worker											
Office Worker											
ii. Land Use											
Farming Area											
Estate											
Forest											
Residential Area											
Industrial/Commercial											
iii. Transportation System											
iv. Economic Development											
v. Land Acquisition											
2) Standard of Living											
3) Public Health											
4) Religious Activity											
5) Cultural Activity											
6) Archaeology											
7) Aesthetic Value											
8) Psychology											

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
ii. Land Use											
Farming Area											
Estate											
Forest											
Residential Area	P										
Industrial/Commercial											
iii. Transportation System											
iv. Economic Development											
3) Standard of Living											
4) Public Health											
5) Religious Activity											
6) Cultural Activity											
7) Archaeology											
8) Aesthetic Value											
9) Psychology											
4. Receiving Area											
a. Natural Environment											
1) Climate											
2) Air Quality											
3) Geology											
4) Topography											
5) Hydrology											
6) Fauna											
7) Flora											
8) Ecological Area											
b. Social Environment											
1) Economic Activities											
i. Occupation											
Farmer											
Trader											
Retailer											
Factory Worker											
Office Worker											
ii. Land Use											
Farming Area											
Estate											
Forest											
Residential Area											
Industrial/Commercial											
iii. Transportation System											
iv. Economic Development											
v. Land Acquisition											
2) Standard of Living											
3) Public Health											
4) Religious Activity											
5) Cultural Activity											
6) Archaeology											
7) Aesthetic Value											
8) Psychology											

Note : - : Nil T: Temporary P: Permanent C: Cumulative P*: Subject to Monitoring (P): Potential Dual Effect

Table 14 IDENTIFICATION OF ENVIRONMENTAL IMPACTS TO BE INDUCED BY THE CILAWANG DAM PROJECT

Environmental Component	Magnitude										
	Negative						Positive				
	5	4	3	2	1	0	1	2	3	4	5
1. Pre-construction Period											
a. Natural Environment											
1) Climate							-				
2) Air Quality							-				
3) Geology							-				
4) Topography							-				
5) Hydrology							-				
6) Fauna							-				
7) Flora							-				
8) Ecological Area							-				
b. Social Environment											
1) Relocation			P								
2) Economic Activities											
i. Changes of Occupation											
Farmer											
Trader							P				
Retailer							P				
Factory Worker								-			
Office Worker							P				
ii. Land Use											
Farming Area							P				
Estate							P				
Forest								-			
Residential Area							P				
Industrial/Commercial								-			
iii. Transportation System									T		
iv. Economic Development											
v. Land Acquisition							P				
3) Standard of Living											
4) Public Health											
5) Religious Activity											
6) Cultural Activity											
7) Archaeology											
8) Aesthetic Value											
9) Psychology							T				
2. Construction Period											
a. Natural Environment											
1) Climate							-				
2) Air Quality							T				
3) Geology											
4) Topography							T				
5) Hydrology											
6) Fauna							T				
7) Flora							P				
8) Ecological Area							P				
b. Social Environment											
1) Relocation							P				
2) Economic Activities											
i. Occupation											
Farmer							P				
Trader											
Retailer							P				
Factory Worker							P				
Office Worker							P				
3. Post-construction Period											
a. Natural Environment											
1) Climate									P		
2) Air Quality											
3) Geology											
4) Topography							P				
5) Hydrology							P*				
6) Fauna							P				
7) Flora							P				
8) Ecological Area							P				
b. Social Environment											
1) Relocation							P				
2) Economic Activities											
i. Occupation											
Farmer							P				
Trader											
Retailer							P				
Factory Worker							P				
Office Worker							P				
4. Receiving Area											
a. Natural Environment											
1) Climate											
2) Air Quality											
3) Geology											
4) Topography											
5) Hydrology							P*				
6) Fauna											
7) Flora							P*				
8) Ecological Area											
b. Social Environment											
1) Economic Activities											
i. Occupation											
Farmer							P*				
Trader									P*		
Retailer									P*		
Factory Worker									P*		
Office Worker									P*		
ii. Land Use											
Farming Area							P		(P)		
Estate							P				
Forest											
Residential Area											
Industrial/Commercial											
iii. Transportation System									P		
iv. Economic Development										P	
c. Land Acquisition							P		(P)		
2) Standard of Living											
3) Public Health											
4) Religious Activity											
5) Cultural Activity											
6) Archaeology											
7) Aesthetic Value											
8) Psychology							T				

Note : - : Nil T: Temporary P: Permanent C: Cumulative P*: Subject to Monitoring (P): Potential Dual Effect

Table 15 IDENTIFICATION OF ENVIRONMENTAL IMPACTS TO BE INDUCED BY THE TANJUNG DAM PROJECT

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
1. Pre-construction Period											
a. Natural Environment											
1) Climate											
2) Air Quality											
3) Geology											
4) Topography											
5) Hydrology											
6) Fauna											
7) Flora											
8) Ecological Area											
b. Social Environment											
1) Relocation	P										
2) Economic Activities											
i. Changes of Occupation											
Farmer	P										
Trader			P								
Retailer				P							
Factory Worker											
Office Worker							P				
ii. Land Use											
Farming Area	P							P			
Estate											
Forest											
Residential Area	P										
Industrial/Commercial											
iii. Transportatioin System											
iv. Economic Development											
v. Land Acquisition											
3) Standard of Living											
4) Public Health											
5) Religious Activity											
6) Cultural Activity											
7) Archaeology											
8) Aesthetic Value											
9) Psychology											
3. Post-construction Period											
a. Natural Environment											
1) Climate											
2) Air Quality											
3) Geology											
4) Topography											
5) Hydrology											
6) Fauna											
7) Flora											
8) Ecological Area											
b. Social Environment											
1) Relocation	P										
2) Economic Activities											
i. Occupation											
Farmer	P										
Trader			P								
Retailer				P							
Factory Worker											
Office Worker											
ii. Land Use											
Farming Area											
Estate											
Forest											
Residential Area											
Industrial/Commercial											
iii. Transportatioin System											
iv. Economic Development											
e. Land Acquisition											
2) Standard of Living											
3) Public Health											
4) Religious Activity											
5) Cultural Activity											
6) Archaeology											
7) Aesthetic Value/Tourism											
8) Psychology											
4. Receiving Area											
a. Natural Environment											
1) Climate											
2) Air Quality											
3) Geology											
4) Topography											
5) Hydrology											
6) Fauna											
7) Flora											
8) Ecological Area											
b. Social Environment											
1) Economic Activities											
i. Occupation											
Farmer											
Trader											
Retailer											
Factory Worker											
Office Worker											
ii. Land Use											
Farming Area											
Estate											
Forest											
Residential Area											
Industrial/Commercial											
iii. Transportatioin System											
iv. Economic Development											
e. Land Acquisition											
2) Standard of Living											
3) Public Health											
4) Religious Activity											
5) Cultural Activity											
6) Archaeology											
7) Aesthetic Value/Tourism											
8) Psychology											

Note : - : Nil T: Temporary P: Permanent C: Cumulative P*: Subject to Monitoring (P): Potential Dual Effect

Table 16 IDENTIFICATION OF ENVIRONMENTAL IMPACTS TO BE INDUCED BY THE KARIAN-SERPONG CONVEYANCE SYSTEM

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
1. Pre-construction Period											
a. Natural Environment											
1) Climate						-					
2) Air Quality						-					
3) Geology						-					
4) Topography						-					
5) Hydrology						-					
6) Fauna						-					
7) Flora						-					
8) Ecological Area						-					
b. Social Environment											
1) Relocation					P						
2) Economic Activities											
i. Changes of Occupation											
Farmer					P						
Trader					P						
Retailer					P						
Factory Worker					P						
Office Worker					P						
ii. Land Use											
Farming Area						-					
Estate						-					
Forest						-					
Residential Area					P						
Industrial/Commercial					P						
iii. Transportation System						-					
iv. Economic Development						-					
v. Land Acquisition					P						
3) Standard of Living						-					
4) Public Health						-					
5) Religious Activity						-					
6) Cultural Activity						-					
7) Archaeology						-					
8) Aesthetic Value of Landscape						-					
9) Psychology					T						
2. Construction Period											
a. Natural Environment											
1) Climate						-					
2) Air Quality						-					
3) Geology						-					
4) Topography					P						
5) Hydrology						-					
6) Fauna						-					
7) Flora					P						
8) Ecological Area						-					

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
b. Social Environment											
1) Relocation					P						
2) Economic Activities											
i. Changes of Occupation											
Farmer					P						
Trader					P						
Retailer					P						
Factory Worker					P						
Office Worker					P						
ii. Land Use											
Farming Area					P						
Estate						-					
Forest						-					
Residential Area					P						
Industrial/Commercial						-					
iii. Transportation System						-					
iv. Economic Development						-					
v. Land Acquisition					P	(P*)					
3) Standard of Living						-					
4) Public Health						-					
5) Religious Activity						-					
6) Cultural Activity						-					
7) Archaeology						-					
8) Aesthetic Value/Tourism						-					
9) Psychology					T						
3. Post-construction Period											
a. Natural Environment											
1) Climate						-					
2) Air Quality						-					
3) Geology						-					
4) Topography					P						
5) Hydrology						-					
6) Fauna						-					
7) Flora					P						
8) Ecological Area						-					
b. Social Environment											
1) Relocation					P						
2) Economic Activities											
i. Occupation											
Farmer					P						
Trader					P						
Retailer					P						
Factory Worker					P						
Office Worker					P						

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
ii. Land Use											
Farming Area						P					
Estate						P					
Forest						-					
Residential Area						P					
Industrial/Commercial						P					
iii. Transportation System							P				
iv. Economic Development							-				
3) Standard of Living							-				
4) Public Health							-				
5) Religious Activity							-				
6) Cultural Activity							-				
7) Archaeology							-				
8) Aesthetic Value/Tourism							-				
9) Psychology							-				
4. Receiving Area											
a. Natural Environment											
1) Climate							-				
2) Air Quality							-				
3) Geology							-				
4) Topography							-				
5) Hydrology							-				
6) Fauna							-				
7) Flora							-				
8) Ecological Area							-				
b. Social Environment											
1) Economic Activities											
i. Occupation											
Farmer							-				
Trader							-				
Retailer							-				
Factory Worker							-				
Office Worker							-				
ii. Land Use											
Farming Area							-				
Estate							-				
Forest							-				
Residential Area							-				
Industrial/Commercial							-				
iii. Transportation System							-				
iv. Economic Development							-				
v. Land Acquisition							-				
2) Standard of Living							-				
3) Public Health							-				
4) Religious Activity							-				
5) Cultural Activity							-				
6) Archaeology							-				
7) Aesthetic Value/Tourism							-				
8) Psychology							-				

Note : - : Nil T: Temporary P: Permanent C: Cumulative P*: Subject to Monitoring (P): Potential Dual Effect

Table 17 IDENTIFICATION OF ENVIRONMENTAL IMPACTS TO BE INDUCED BY THE RIVER IMPROVEMENT WORKS

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
1. Pre-construction Period											
a. Natural Environment											
1) Climate						-					
2) Air Quality						-					
3) Geology						-					
4) Topography						-					
5) Hydrology						-					
6) Fauna						-					
7) Flora						-					
8) Ecological Area						-					
b. Social Environment											
1) Relocation						P					
2) Economic Activities											
i. Changes of Occupation											
Farmer						P					
Trader						P					
Retailer						P					
Factory Worker						P					
Office Worker						P					
ii. Land Use											
Farming Area						P					
Estate							-				
Forest							-				
Residential Area						P					
Industrial/Commercial						P					
iii. Transportatioin System							-				
iv. Economic Development							-				
v. Land Acquisition						P					
3) Standard of Living						-					
4) Public Health						-					
5) Religious Activity						-					
6) Cultural Activity						-					
7) Archaeology						-					
8) Aesthetic Value of Landscape						-					
9) Psychology						T					
2. Construction Period											
a. Natural Environment											
1) Climate						-					
2) Air Quality						-					
3) Geology						-					
4) Topography						P					
5) Hydrology						-					
6) Fauna						-					
7) Flora						P					
8) Ecological Area						-					
b. Social Environment											
1) Relocation						P					
2) Economic Activities											
i. Occupation											
Farmer						P					
Trader						P					
Retailer						P					
Factory Worker						P					
Office Worker						P					

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
b. Social Environment											
1) Relocation						P					
2) Economic Activities											
i. Changes of Occupation											
Farmer						P					
Trader						P					
Retailer						P					
Factory Worker						P					
Office Worker						P					
ii. Land Use											
Farming Area						P					
Estate							-				
Forest							-				
Residential Area						P					
Industrial/Commercial							-				
iii. Transportatioin System							-				
iv. Economic Development							-				
v. Land Acquisition						P					
3) Standard of Living						-					
4) Public Health						-					
5) Religious Activity						-					
6) Cultural Activity						-					
7) Archaeology						-					
8) Aesthetic Value/Tourism						-					
9) Psychology						T					
3. Post-construction Period											
a. Natural Environment											
1) Climate						-					
2) Air Quality						-					
3) Geology						-					
4) Topography						P					
5) Hydrology						-					
6) Fauna						-					
7) Flora						P					
8) Ecological Area						-					
b. Social Environment											
1) Relocation						P					
2) Economic Activities											
i. Occupation											
Farmer						P					
Trader						P					
Retailer						P					
Factory Worker						P					
Office Worker						P					

Environmental Component	Magnitude										
	Negative					Positive					
	5	4	3	2	1	0	1	2	3	4	5
ii. Land Use											
Farming Area						P					
Estate						P					
Forest							-				
Residential Area						P					
Industrial/Commercial						P					
iii. Transportatioin System						P					
iv. Economic Development							-				
3) Standard of Living						-					
4) Public Health						-					
5) Religious Activity						-					
6) Cultural Activity						-					
7) Archaeology						-					
8) Aesthetic Value/Tourism						-					
9) Psychology						-					
4. Receiving Area											
a. Natural Environment											
1) Climate						-					
2) Air Quality						-					
3) Geology						-					
4) Topography						-					
5) Hydrology						-					
6) Fauna						-					
7) Flora						-					
8) Ecological Area						-					
b. Social Environment											
1) Economic Activities											
i. Occupation											
Farmer						-					
Trader						-					
Retailer						-					
Factory Worker						-					
Office Worker						-					
ii. Land Use											
Farming Area						-					
Estate						-					
Forest						-					
Residential Area						-					
Industrial/Commercial						-					
iii. Transportatioin System						-					
iv. Economic Development						-					
v. Land Acquisition						-					
2) Standard of Living						-					
3) Public Health						-					
4) Religious Activity						-					
5) Cultural Activity						-					
6) Archaeology						-					
7) Aesthetic Value/Tourism						-					
8) Psychology						-					

Note : - : Nil T: Temporary P: Permanent C: Cumulative P*: Subject to Monitoring (P): Potential Dual Effect

Table 18 RESULT OF INTERVIEW SURVEY

Questionair	Karian		Cilawang		Tanjung		KSCS		River Iprvmt.	
1. Do you agree to relocate?										
1) Agree to Move	230	90.9%	80	88.9%	125	80.6%	98	95.1%	86	87.8%
2) Not Agree to Move	20	7.9%	6	6.7%	29	18.7%	3	2.9%	7	7.1%
3) No Answer	3	1.2%	4	4.4%	1	0.6%	2	1.9%	5	5.1%
Total	253	100.0%	90	100.0%	155	100.0%	103	100.0%	98	100.0%
2. Do you have a place to move to?										
1) To Relative's Place	23	9.1%	0	0.0%	6	3.9%	3	2.9%	4	4.1%
2) To My Friend's	6	2.4%	0	0.0%	0	0.0%	2	1.9%	2	2.0%
3) Find a Private Land	14	5.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
4) To My Own Land	16	6.3%	0	0.0%	12	7.7%	0	0.0%	0	0.0%
5) No Answer	194	76.7%	90	100.0%	137	88.4%	98	95.1%	92	93.9%
Total	253	100.0%	90	100.0%	155	100.0%	103	100.0%	98	100.0%
3. If you rely of the govt. land, for relocation, where is your desireable place?										
1) Near-by Village	165	65.2%	87	96.7%	119	76.8%	97	94.2%	93	94.9%
2) Within Kecamatan	58	22.9%	2	2.2%	16	10.3%	0	0.0%	0	0.0%
3) Within Kabupaten	4	1.6%	1	1.1%	8	5.2%	0	0.0%	0	0.0%
4) Within Java Island	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
5) Transmigration	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
6) Other/No Answers	26	10.3%	0	0.0%	12	7.7%	6	5.8%	5	5.1%
Total	253	100.0%	90	100.0%	155	100.0%	103	100.0%	98	100.0%
4. If you do not want to move, what would you do?										
1) Fight Agaist	0	0.0%	0	0.0%	9	5.8%	0	0.0%	2	2.0%
2) Nothing	7	2.8%	1	1.1%	3	1.9%	1	1.0%	1	1.0%
3) No answer	246	97.2%	89	98.9%	143	92.3%	102	99.0%	95	96.9%
Total	253	100.0%	90	100.0%	155	100.0%	103	100.0%	98	100.0%
5. If you have to find the same job, is it easy?										
1) Easy	214	84.6%	19	21.1%	118	76.1%	87	84.5%	87	88.8%
2) Not easy	29	11.5%	47	52.2%	25	16.1%	14	13.6%	3	3.1%
4) No answer	10	4.0%	24	26.7%	12	7.7%	2	1.9%	8	8.2%
Total	253	100.0%	90	100.0%	155	100.0%	103	100.0%	98	100.0%
6. If you moved, do you change your job ?										
1) Agriculture	21	8.3%	18	20.0%	16	10.3%	68	66.0%	73	74.5%
2) Factory worker	0	0.0%	0	0.0%	6	3.9%	6	5.8%	7	7.1%
3) Office worker	0	0.0%	0	0.0%	5	3.2%	0	0.0%	0	0.0%
4) Fishierman	5	2.0%	0	0.0%	0	0.0%	0	0.0%	1	1.0%
5) Start Own Business	32	12.6%	12	13.3%	18	11.6%	27	26.2%	9	9.2%
6) Rearing Livestock	0	0.0%	0	0.0%	1	0.6%	0	0.0%	2	2.0%
7) Government Job	6	2.4%	2	2.2%	2	1.3%	0	0.0%	0	0.0%
8) Others/No Answer	189	74.7%	58	64.4%	107	69.0%	2	1.9%	6	6.1%
Total	253	100.0%	90	100.0%	155	100.0%	103	100.0%	98	100.0%

Table 19 LIST OF POTENTIAL AND AVAILABLE RESETTLEMENT AREA

a. Estate							
Owner of the Area	Name of Location	Kabupaten	Kecamatan	Existing Area (ha)	Available Area (ha)	Remarks	Ref. No. in Figure 8&9
PT.P11*	Cisalak Baru	Lebak	Rangkasbitung Maja, Cimarga	2,980	1,550	1,430 ha is in the Protection Area	Fig. 8: 1-a,b,c
PT.Candi Putra	Pasir Ayunan	Lebak	Sajira	600	570	30 ha is in the Protection Area.	Fig. 8:2-a,b,c
PT.Silalangu	Silalangu	Lebak	Maja	464	379	85 ha to be sub-merged.	Fig. 8:3
PT.Pasir Roko	Pasir Kopo	Lebak	Cimarga	91	-	Whole area is in the Protection Area	Fig. 8:4
PT.Jaura Atmaja Utama	Jaura	Lebak	Maja	59	59		Fig. 8:5-a,b
Sub-total				4,194	2,558		
PT.P11*	Cikasungka	Bogor	P/panjang, Jasinga	3,094	3,094	Suitable for settlement but not for agriculture	Fig. 9:4-13
Kab. Bogor	Cikopo Mayak	Bogor	Jasinga	600	600	ditto	Fig. 9:14
PBS Cikopo Mayak	Cikopo Mayak	Bogor	Jasinga	2,427	2,427	ditto	Fig. 9:3
PBS Jasinga	Jasinga	Bogor	Jasinga	518	518	ditto	Fig. 9:2
Sub-total				6,639	6,639		
Total Existing Area				10,834			
Total Available Area for Relocation					9,198		

Note: " * " - Estate company owned by the Department of Agriculture

b. Forest							
Owner of the Area	Name of Location	Kabupaten	Kecamatan	Existing Area (ha)	Available Area (ha)	Note	Ref. No. in Figure 8&9
Perum Perhutani**	1) Gn.Cabe (Cipanas)	Lebak	Cimarga	2,210	-		Fig. 8:6-1
	2) Gn.Cabe (Muncang)	Lebak	Muncang	1,269	-		Fig. 8:6-2
	3) Ciberang I, II, III	Lebak	Cipanas	928	-		Fig. 8:6-3a,b,c
Perum Perhutani **		Bogor	Tenjo, Jasinga	4,235	-		Fig. 9:4-13
Total Existing Area				8,641			
Total Available Area for Relocation					-		

Note: ** - General Forestry Company owned by the Department of Forestry

Table 20 LAND COMPENSATION AREA

(unit : sq.m)					
Description	Karian	Cilawang	Tanjung	KSCS	River Improvement
I. Monetary compensation					
1 Agricultural land					
a) Irrigated land	3,824	312,471	1,446,834	167,915	7,251
b) Rainfed	886,212	1,708,269	7,115,658	1,359,875	145,921
c) Non-irrigated	1,877,584	5,329,260	10,257,508	837,210	446,828
2 Forest area	2,300,000	-	870,000	-	-
3 Government estate	-	-	-	-	-
4 Private estate	209,343	2,980,000	-	-	-
Total of Item I.	5,276,963	10,330,000	19,690,000	2,365,000	600,000
II. Land cost for resettlement area					
1 Agricultural land					
a) Irrigated land	12,616	-	-	-	-
b) Rainfed	2,923,758	-	-	-	-
c) Non-irrigated	6,196,006	-	-	-	-
2 Forest area	-	-	-	-	-
3 Government estate	-	-	-	-	-
4 Private estate	690,657	-	-	-	-
Total of Item II.	9,823,037				
Grand Total	15,100,000	10,330,000	19,690,000	2,365,000	600,000

Note : Land compensation area in KSCS includes the area for spoil bank of 915,000 sq.m.

Table 21 UNIT PRICES FOR ESTIMATION OF COMPENSATION COST

(unit: Rp.)						
	Unit	Karian	Cilawang	Tanjung	KSCS	River Improvement
Land acquisition						
(1) Irrigated rice field	sq.m	1,070	1,370	1,610	3,230	1,070
(2) Commercial agricultural land	sq.m	1,290	2,010	2,260	4,460	1,290
(3) Non-irrigated or Dry land	sq.m	720	900	1,050	2,160	720
(4) Residence	sq.m	2,990	7,660	8,440	10,260	2,990
(5) Industry	sq.m	3,510	20,010	20,010	18,150	3,510
(6) Trade land	sq.m	7,160	17,010	17,010	27,320	7,160
(7) Forest	sq.m	870	800	790	1,030	870
House compensation						
(1) Permanent house	sq.m	180,000	190,000	193,340	196,000	180,000
(2) Semi-permanent house	sq.m	120,000	130,000	133,340	128,000	120,000
(3) Non-permanent house	sq.m	98,000	98,000	93,340	98,000	98,000
(4) Temporary house	sq.m	55,000	56,500	57,000	56,200	55,000
(5) Road	m	12,500	12,750	12,840	12,900	12,500
(6) Grave	piece	50,000	50,000	50,000	50,000	50,000
(7) Electric	vA	460	470	480	470	460
(8) Telephone	line	535,000	667,500	711,670	718,000	535,000
Tree						
(1) Large tree	piece	12,000	13,500	14,000	13,800	12,000
(2) Small tree	piece	8,000	9,500	10,000	9,600	8,000
Public facilities						
1) Administration office	no.	47,117,000	50,812,000	52,064,000	-	-
2) Education facilities						
a) Primary school	no.	132,415,000	143,035,000	146,638,000	-	-
b) Junior high school	no.	190,264,000	206,056,000	211,420,000	-	-
3) Park	place	1,540,000	2,408,000	2,712,000	-	-
4) Clinic	no.	46,540,000	49,908,000	51,047,000	-	-
5) Mosque	no.	18,321,000	19,502,000	19,899,000	-	-
6) Market place	no.	109,283,000	116,007,000	118,264,000	-	-
Infra-structure						
Infra-structure incl. land preparation	sq.m	1,000	1,000	1,000	1,000	1,000
Irrigation facilities	sq.m	100	100	100	-	-

Table 22 LAND ACQUISITION AND COMPENSATION COST FOR KARIAN DAM SCHEME

Cost Items	Unit	Quantity	Unit Price (Rp.)	Amount (Rp.)
A. House compensation				
I. Buildings				
1) Monetary compensation				
a) Permanent	sq.m	10,488	180,000	1,887,840,000
b) Semi-permanent	sq.m	5,016	120,000	601,920,000
c) Non-permanent	sq.m	20,824	98,000	2,040,752,000
Sub-total		36,328		4,530,512,000
2) Housing cost to be handled to resettlers to resettlement area				
a) Permanent	sq.m	34,656	180,000	6,238,080,000
b) Semi-permanent	sq.m	16,568	120,000	1,988,160,000
c) Non-permanent	sq.m	68,628	98,000	6,725,544,000
Sub-total		119,852		14,951,784,000
<i>Total of Item I.</i>		156,180		19,482,296,000
II. Housing plot				
1) Monetary compensation	sq.m	534,988	2,990	1,599,614,120
2) Land cost for resettlement area	sq.m	1,765,012	1,290	2,276,865,480
<i>Total of Item II.</i>		2,300,000		3,876,479,600
<i>Total of Item A.</i>				23,358,775,600
B. Land compensation				
I. Monetary compensation				
1) Agricultural land				
a) Irrigated land	sq.m	3,824	1,070	4,091,680
b) Rainfed	sq.m	886,212	720	638,072,640
c) Dry land	sq.m	1,877,584	720	1,351,860,480
2) Forest area	sq.m	2,300,000	870	2,001,000,000
3) Government estate	sq.m	-	1,290	-
4) Private estate	sq.m	209,343	1,290	270,052,470
<i>Total of Item I.</i>		5,276,963		4,265,077,270
II. Land cost for preparation of resettlement area				
1) Agricultural land				
a) Irrigated land	sq.m	12,616	1,290	16,274,640
b) Rainfed	sq.m	2,923,758	1,290	3,771,647,820
c) Dry land	sq.m	6,196,006	1,290	7,992,847,740
2) Forest area	sq.m	-	-	-
3) Government estate	sq.m	-	-	-
4) Private estate	sq.m	690,657	1,290	890,947,530
<i>Total of Item II.</i>		9,823,037		12,671,717,730
<i>Total of Item B.</i>				16,936,795,000
C. Preparation of resettlement area				
I. Construction of public facilities				
1) Administration office	nos.	2	47,117,000	94,234,000
2) Education facilities				
a) Primary school	nos.	17	132,415,000	2,251,055,000
b) Junior high school	nos.	4	190,264,000	761,056,000
3) Park	places	4	1,540,000	6,160,000
4) Clinic	nos.	12	46,540,000	558,480,000
5) Mosque	nos.	12	18,321,000	219,852,000
6) Market place	places	12	109,283,000	1,311,396,000
<i>Total of Item I.</i>				5,202,233,000
II. Other public facilities in the resettlement area				
1) Infra-structures incl. land preparation	sq.m	12,123,037	1,000	12,123,037,000
2) Facilities for agricultural activities	sq.m	9,823,037	100	982,303,700
<i>Total of Item II.</i>				13,105,340,700
<i>Total of Item C.</i>				18,307,573,700
D. Others				
I. Large tree	pieces	3,083	12,000	36,996,000
II. Small tree	pieces	9,248	8,000	73,984,000
<i>Total of Item D.</i>				110,980,000
<i>Grand Total (Rounded up to)</i>				58,714,124,300
				58,714,125,000

Table 23 LAND ACQUISITION AND COMPENSATION COST FOR CILAWANG DAM SCHEME

Cost Items	Unit	Quantity	Unit Price (Rp.)	Amount (Rp.)
A. House compensation				
I. Buildings				
1) Monetary compensation				
a) Permanent	sq.m	-	-	-
b) Semi-permanent	sq.m	-	-	-
c) Non-permanent	sq.m	-	-	-
Sub-total				
2) Housing cost to be handled to resettlers to resettlement area				
a) Permanent	sq.m	24,030	190,000	4,565,700,000
b) Semi-permanent	sq.m	8,188	130,000	1,064,440,000
c) Non-permanent	sq.m	24,653	98,000	2,415,994,000
Sub-total		56,871		8,046,134,000
Total of Item I.		56,871		8,046,134,000
II. Housing plot				
1) Monetary compensation	sq.m	-	-	-
2) Land cost for resettlement area	sq.m	230,000	7,660	1,761,800,000
Total of Item II.		230,000		1,761,800,000
Total of Item A.				9,807,934,000
B. Land compensation				
I. Monetary Compensation				
1) Agricultural land				
a) Irrigated land	sq.m	312,471	1,370	428,085,270
b) Rainfed	sq.m	1,708,269	900	1,537,442,100
c) Dry land	sq.m	5,329,260	900	4,796,334,000
2) Forest area	sq.m	-	-	-
3) Government estate	sq.m	-	-	-
4) Private estate	sq.m	2,980,000	2,010	5,989,800,000
Total of Item I.		10,330,000		12,751,661,370
II. Land cost for resettlement area				
1) Agricultural land				
a) Irrigated land	sq.m	-	-	-
b) Rainfed	sq.m	-	-	-
c) Dry land	sq.m	-	-	-
2) Forest area	sq.m	-	-	-
3) Government estate	sq.m	-	-	-
4) Private estate	sq.m	-	-	-
Total of Item II.				
Total of Item B.		10,330,000		12,751,661,370
C. Preparation of resettlement area				
I. Construction of public facilities				
1) Administration office	nos.	1	50,812,000	50,812,000
2) Education facilities				
a) Primary school	nos.	7	143,035,000	1,001,245,000
b) Junior high school	nos.	2	206,056,000	412,112,000
3) Park	places	2	2,408,000	4,816,000
4) Clinic	nos.	5	49,908,000	249,540,000
5) Mosque	nos.	5	19,502,000	97,510,000
6) Market place	places	5	116,007,000	580,035,000
Total of Item I.				2,396,070,000
II. Other public facilities in the resettlement area				
1) Infra-structures incl. land preparation	sq.m	230,000	1,000	230,000,000
2) Facilities for agricultural activities	sq.m	-	-	-
Total of Item II.				230,000,000
Total of Item C.				2,626,070,000
D. Others				
I. Large tree	pieces	959	13,500	12,946,500
II. Small tree	pieces	2,876	9,500	27,322,000
Total of Item D.				40,268,500
Grand Total				25,225,933,870
(Rounded up to)				25,225,934,000

Table 24 LAND ACQUISITION AND COMPENSATION COST FOR TANJUNG DAM SCHEME

Cost Items	Unit	Quantity	Unit Price (Rp.)	Amount (Rp.)
A. House compensation				
I. Buildings				
1) Monetary compensation				
a) Permanent	sq.m	15,759	193,340	3,046,845,060
b) Semi-permanent	sq.m	4,944	133,340	659,232,960
c) Non-permanent	sq.m	8,755	93,340	817,191,700
Sub-total		29,458		4,523,269,720
2) Housing cost to be handled to resettlers to resettlement area				
a) Permanent	sq.m	120,304	193,340	23,259,575,360
b) Semi-permanent	sq.m	37,801	133,340	5,040,385,340
c) Non-permanent	sq.m	66,744	93,340	6,229,884,960
Sub-total		224,849		34,529,845,660
Total of Item I.		254,307		39,053,115,380
II. Housing plot				
1) Monetary compensation	sq.m	600,032	8,440	5,064,270,080
2) Land cost for resettlement area	sq.m	4,579,968	2,260	10,350,727,680
Total of Item II.		5,180,000		15,414,997,760
Total of Item A.				54,468,113,140
B. Land compensation				
I. Monetary Compensation				
1) Agricultural land				
a) Irrigated land	sq.m	1,446,834	1,610	2,329,402,740
b) Rainfed	sq.m	7,115,658	1,050	7,471,440,900
c) Dry land	sq.m	10,257,508	1,050	10,770,383,400
2) Forest area	sq.m	870,000	790	687,300,000
3) Government estate	sq.m	-	-	-
4) Private estate	sq.m	-	-	-
Total of Item I.		19,690,000		21,258,527,040
II. Land cost for resettlement area				
1) Agricultural land				
a) Irrigated land	sq.m	-	-	-
b) Rainfed	sq.m	-	-	-
c) Dry land	sq.m	-	-	-
2) Forest area	sq.m	-	-	-
3) Government estate	sq.m	-	-	-
4) Private estate	sq.m	-	-	-
Total of Item II.				
Total of Item B.				21,258,527,040
C. Preparation of resettlement area				
I. Construction of public facilities				
1) Administration office	nos.	3	52,064,000	156,192,000
2) Education facilities				
a) Primary school	nos.	24	146,638,000	3,519,312,000
b) Junior high school	nos.	6	211,420,000	1,268,520,000
3) Park	places	6	2,712,000	16,272,000
4) Clinic	nos.	17	51,047,000	867,799,000
5) Mosque	nos.	17	19,899,000	338,283,000
6) Market place	places	17	118,264,000	2,010,488,000
Total of Item I.				8,176,866,000
II. Other public facilities in the resettlement area				
1) Infra-structures incl. land preparation	sq.m	5,180,000	1,000	5,180,000,000
2) Facilities for agricultural activities	sq.m	-	-	-
Total of Item II.				5,180,000,000
Total of Item C.				13,356,866,000
D. Others				
I. Large tree	pieces	3,704	14,000	51,856,000
II. Small tree	pieces	11,111	10,000	111,110,000
Total of Item D.				162,966,000
Grand Total				89,246,472,180
(Rounded up to)				89,246,473,000

Table 25 LAND ACQUISITION AND COMPENSATION

	Unit	Phase I	Phase II	Quantity	Ta
A. House compensation					
I. Buildings					
1) Monetary compensation					
a) Permanent	sq.m	167	52	-	
b) Semi-permanent	sq.m	56	17	-	
c) Non-permanent	sq.m	111	35	-	
Sub-total		334	104		
2) Housing cost to be handled to resettlers to resettlement area					
a) Permanent	sq.m	3,332	1,048	-	
b) Semi-permanent	sq.m	1,000	314	-	
c) Non-permanent	sq.m	1,832	577	-	
Sub-total		6,164	1,939		
Total of Item I.					
II. Housing plot					
1) Monetary compensation	sq.m	8,972	2,823	-	
2) Land cost for resettlement area	sq.m	165,985	52,220	-	
Total of Item II.					
Total of Item A.					
B. Land compensation					
I. Monetary compensation					
1) Agricultural land					
a) Irrigated land	sq.m	134,697	14,673	5,439	
b) Rainfed	sq.m	1,090,857	118,828	44,045	
c) Dry land	sq.m	671,589	73,157	27,116	
2) Forest area	sq.m	-	-	-	
3) Government estate	sq.m	-	-	-	
4) Private estate	sq.m	-	-	-	
Total of Item I.					
II. Land cost for resettlement area					
1) Agricultural land					
a) Irrigated land	sq.m	-	-	-	
b) Rainfed	sq.m	-	-	-	
c) Dry land	sq.m	-	-	-	
2) Forest area	sq.m	-	-	-	
3) Government estate	sq.m	-	-	-	
4) Private estate	sq.m	-	-	-	
Total of Item II.					
Total of Item B.					
C. Preparation of resettlement area					
I. Construction of public facilities					
1) Administration office	nos.	-	-	-	
2) Education facilities					
a) Primary school	nos.	-	-	-	
b) Junior high school	nos.	-	-	-	
3) Park	places	-	-	-	
4) Clinic	nos.	-	-	-	
5) Mosque	nos.	-	-	-	
6) Market place	places	-	-	-	
Total of Item I.					
II. Other public facilities in the resettlement area					
1) Infra-structures incl. land preparation	sq.m	174,957	55,043	-	
2) Facilities for agricultural activities	sq.m	-	-	-	
Total of Item II.					
Total of Item C.					
D. Others					
I. Large tree	pieces	134	42	-	
II. Small tree	pieces	401	126	-	
Total of Item D.					
Grand Total					
(Rounded up to)					

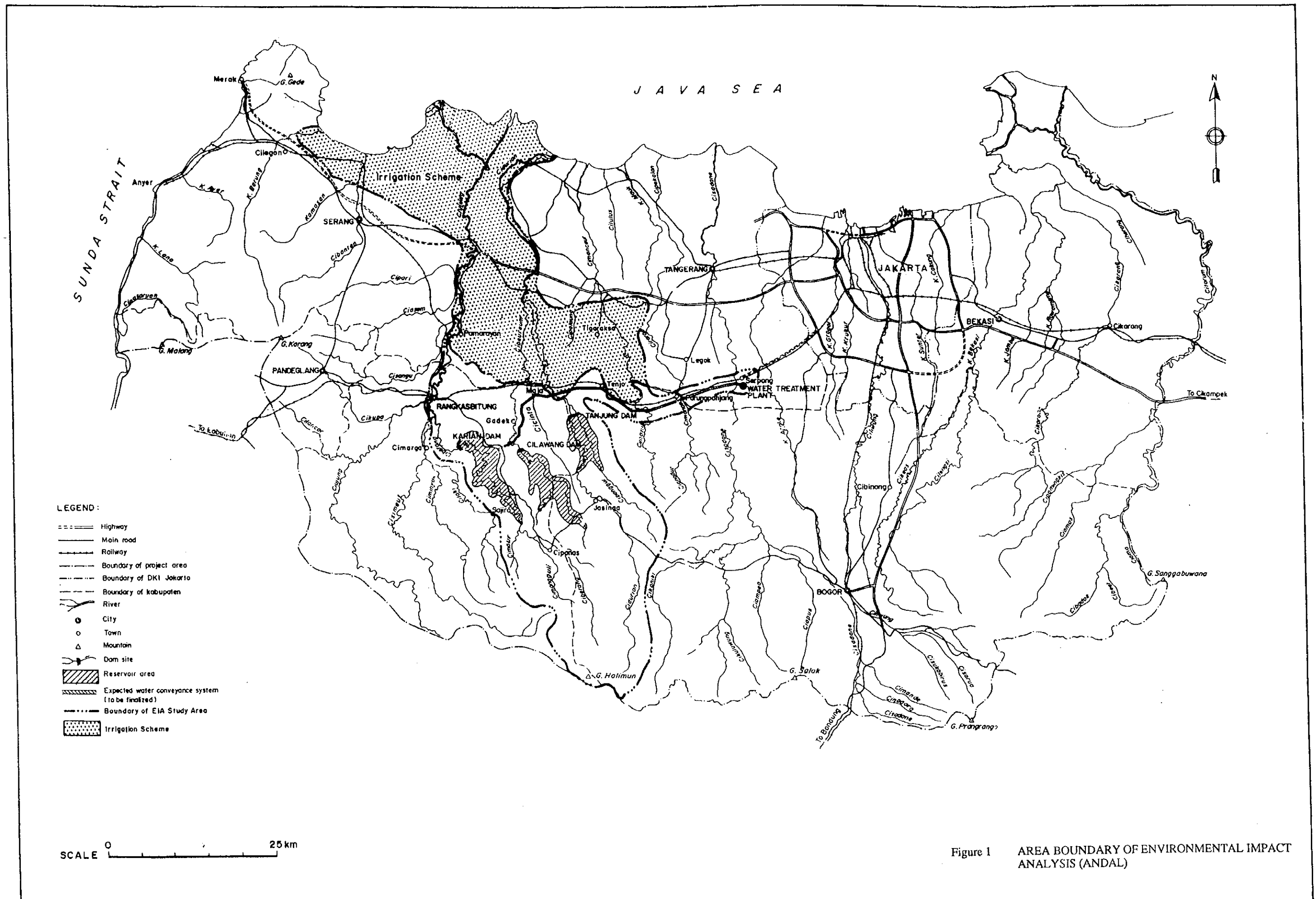
ON COST FOR KARIAN-SERPONG CONVEYANCE SYSTEM

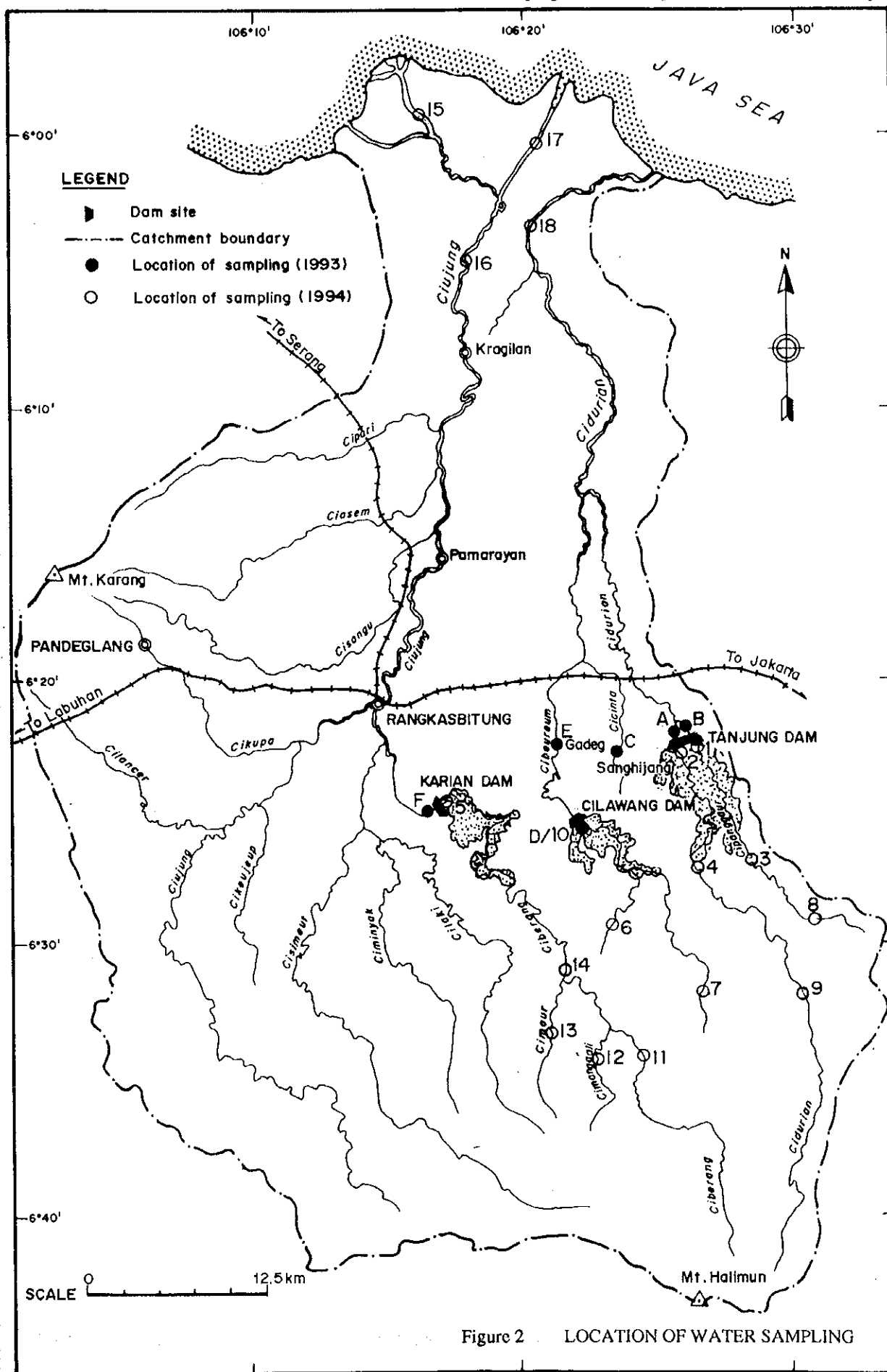
Total	Unit Price (Rp.)	Amount (Rp.)				
		Phase I	Phase II	Cilawang	Tanjung	Total
219	196,000	32,732,000	10,192,000	-	-	42,924,000
73	128,000	7,168,000	2,176,000	-	-	9,344,000
146	98,000	10,878,000	3,430,000	-	-	14,308,000
438		50,778,000	15,798,000	-	-	66,576,000
4,380	196,000	653,072,000	205,408,000	-	-	858,480,000
1,314	128,000	128,000,000	40,192,000	-	-	168,192,000
2,409	98,000	179,536,000	56,546,000	-	-	236,082,000
8,103		960,608,000	302,146,000			1,262,754,000
8,541		1,011,386,000	317,944,000			1,329,330,000
11,795	10,260	92,052,720	28,963,980	-	-	121,016,700
218,205	4,460	740,293,100	232,901,200	-	-	973,194,300
230,000		832,345,820	261,865,180			1,094,211,000
		1,843,731,820	579,809,180			2,423,541,000
167,915	3,230	435,071,310	47,393,790	17,567,970	42,335,610	542,365,450
1,359,875	2,160	2,356,251,120	256,668,480	95,137,200	229,273,200	2,937,330,000
837,210	2,160	1,450,632,240	158,019,120	58,570,560	141,151,680	1,808,373,600
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
2,365,000		4,241,954,670	462,081,390	171,275,730	412,760,490	5,288,069,050
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
		4,241,954,670	462,081,390	171,275,730	412,760,490	5,288,069,050
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
230,000	1,000	174,957,000	55,043,000	-	-	230,000,000
-	-	-	-	-	-	-
		174,957,000	55,043,000			230,000,000
		174,957,000	55,043,000			230,000,000
176	13,800	1,849,200	579,600	-	-	2,428,800
527	9,600	3,849,600	1,209,600	-	-	5,059,200
		5,698,800	1,789,200			7,488,000
		6,266,342,290	1,098,722,770	171,275,730	412,760,490	7,949,098,050
						7,949,099,000

Table 26. LAND ACQUISITION AND COMPENSATION COST FOR RIVER IMPROVEMENT WORKS

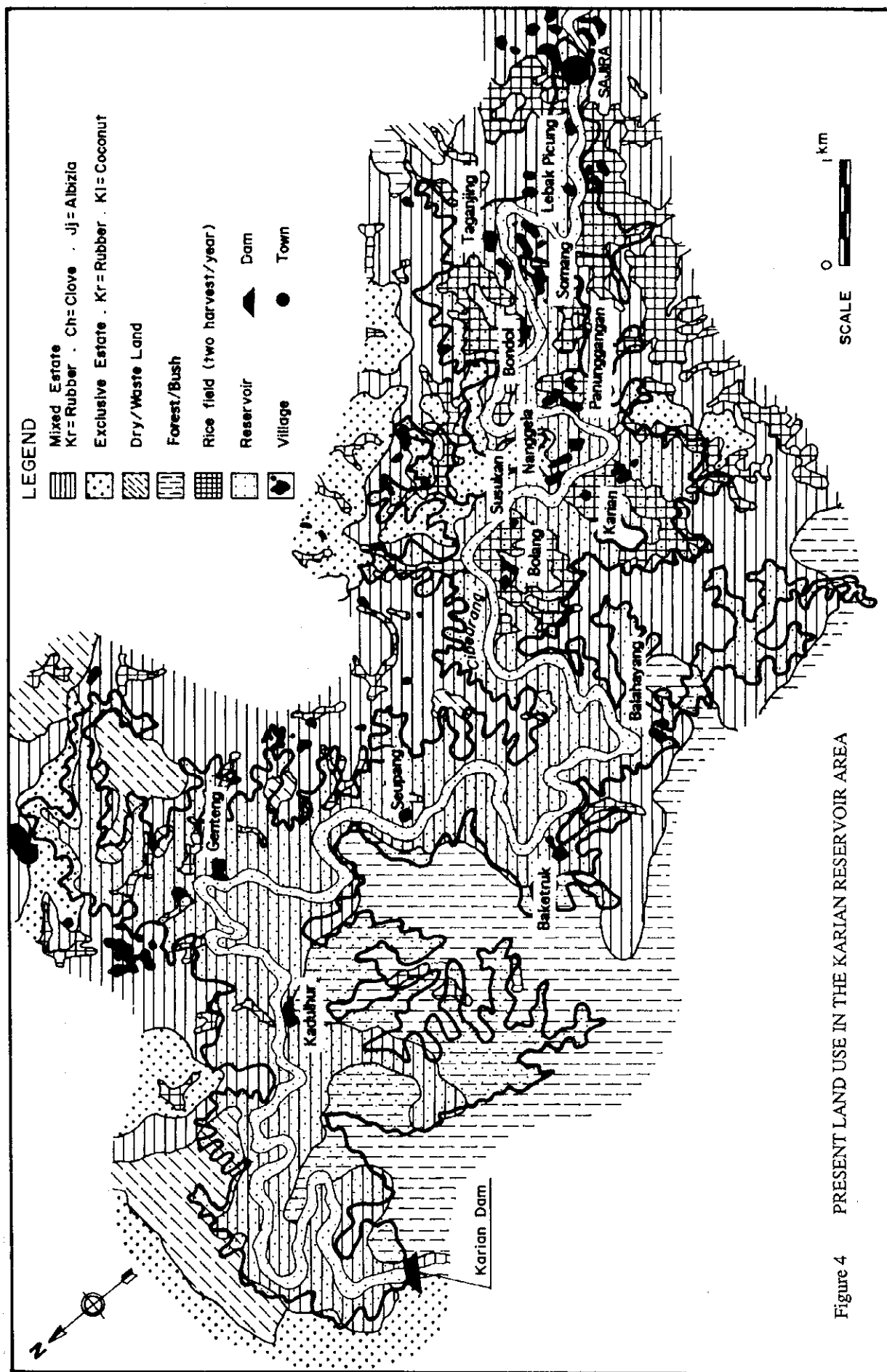
Cost Items	Unit	Quantity	Unit Price (Rp.)	Amount (Rp.)
A. House compensation				
I. Buildings				
1) Monetary compensation				
a) Permanent	sq.m	222	180,000	39,960,000
b) Semi-permanent	sq.m	74	120,000	8,880,000
c) Non-permanent	sq.m	148	98,000	14,504,000
Sub-total		444		63,344,000
2) Housing cost to be handled to resettlers to resettlement area				
a) Permanent	sq.m	3,330	180,000	599,400,000
b) Semi-permanent	sq.m	888	120,000	106,560,000
c) Non-permanent	sq.m	2,590	98,000	253,820,000
Sub-total		6,808		959,780,000
Total of Item I.		7,252		1,023,124,000
II. Housing plot				
1) Monetary compensation	sq.m	6,735	2,990	20,137,650
2) Land cost for resettlement area	sq.m	103,265	1,290	133,211,850
Total of Item II.		110,000		153,349,500
Total of Item A.				1,176,473,500
B. Land compensation				
I. Monetary Compensation				
1) Agricultural land				
a) Irrigated land	sq.m	7,251	1,610	11,674,110
b) Rainfed	sq.m	145,921	1,050	153,217,050
c) Dry land	sq.m	446,828	1,050	469,169,400
2) Forest area	sq.m	-	-	-
3) Government estate	sq.m	-	-	-
4) Private estate	sq.m	-	-	-
Total of Item I.		600,000		634,060,560
II. Land cost for resettlement area				
1) Agricultural land				
a) Irrigated land	sq.m	-	-	-
b) Rainfed	sq.m	-	-	-
c) Dry land	sq.m	-	-	-
2) Forest area	sq.m	-	-	-
3) Government estate	sq.m	-	-	-
4) Private estate	sq.m	-	-	-
Total of Item II.				
Total of Item B.				634,060,560
C. Preparation of resettlement area				
I. Construction of public facilities				
1) Administration office	nos.	-	-	-
2) Education facilities				
a) Primary school	nos.	-	-	-
b) Junior high school	nos.	-	-	-
3) Park	places	-	-	-
4) Clinic	nos.	-	-	-
5) Mosque	nos.	-	-	-
6) Market place	places	-	-	-
Total of Item I.				
II. Other public facilities in the resettlement area				
1) Infra-structures incl. land preparation	sq.m	110,000	1,000	110,000,000
2) Facilities for agricultural activities	sq.m	-	-	-
Total of Item II.				110,000,000
Total of Item C.				110,000,000
D. Others				
I. Large tree	pieces	147	12,000	1,764,000
II. Small tree	pieces	441	8,000	3,528,000
Total of Item D.				5,292,000
Grand Total				1,925,826,060
(Rounded up to)				1,925,827,000

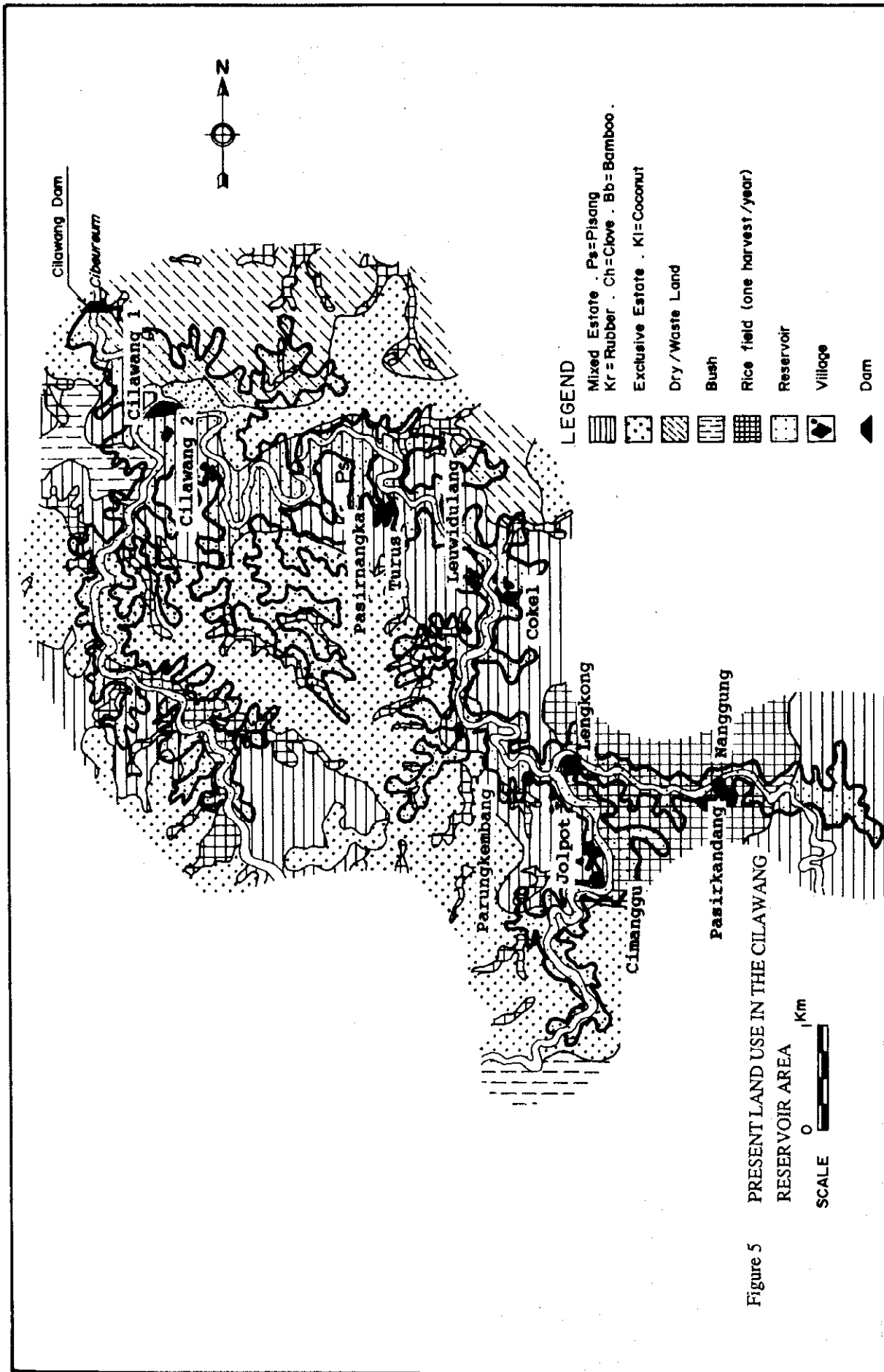
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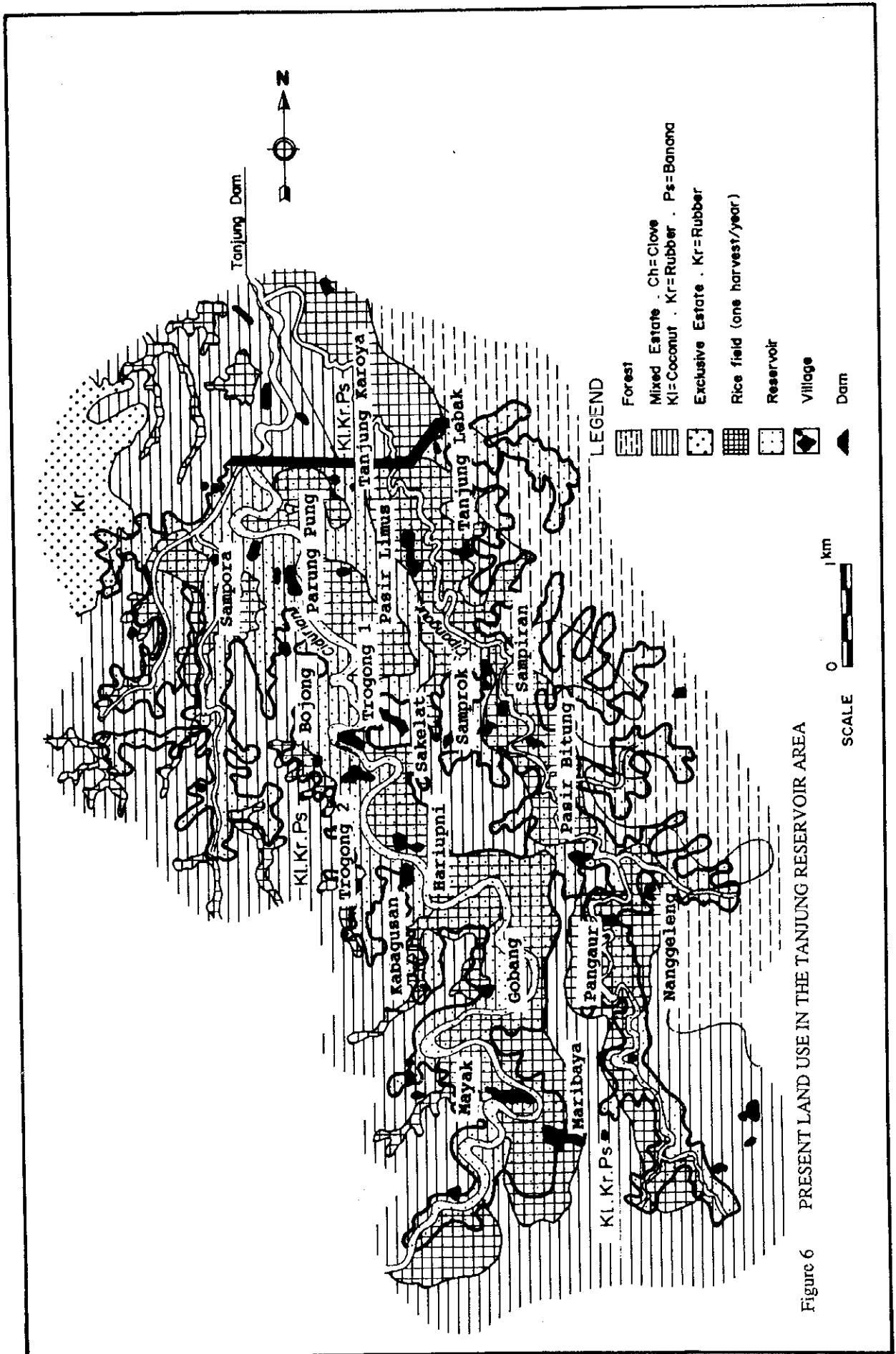


Figure 6 PRESENT LAND USE IN THE TANJUNG RESERVOIR AREA

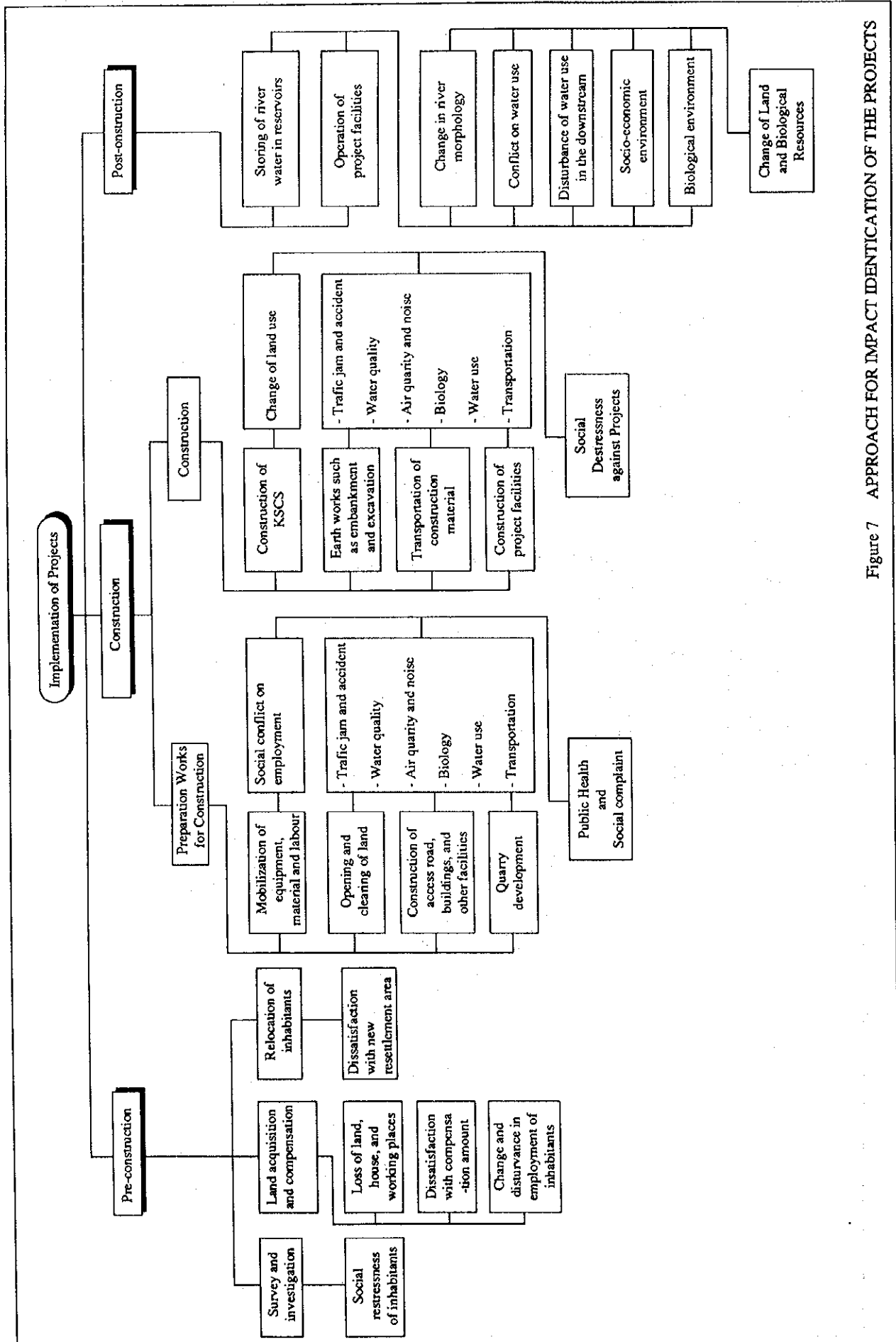
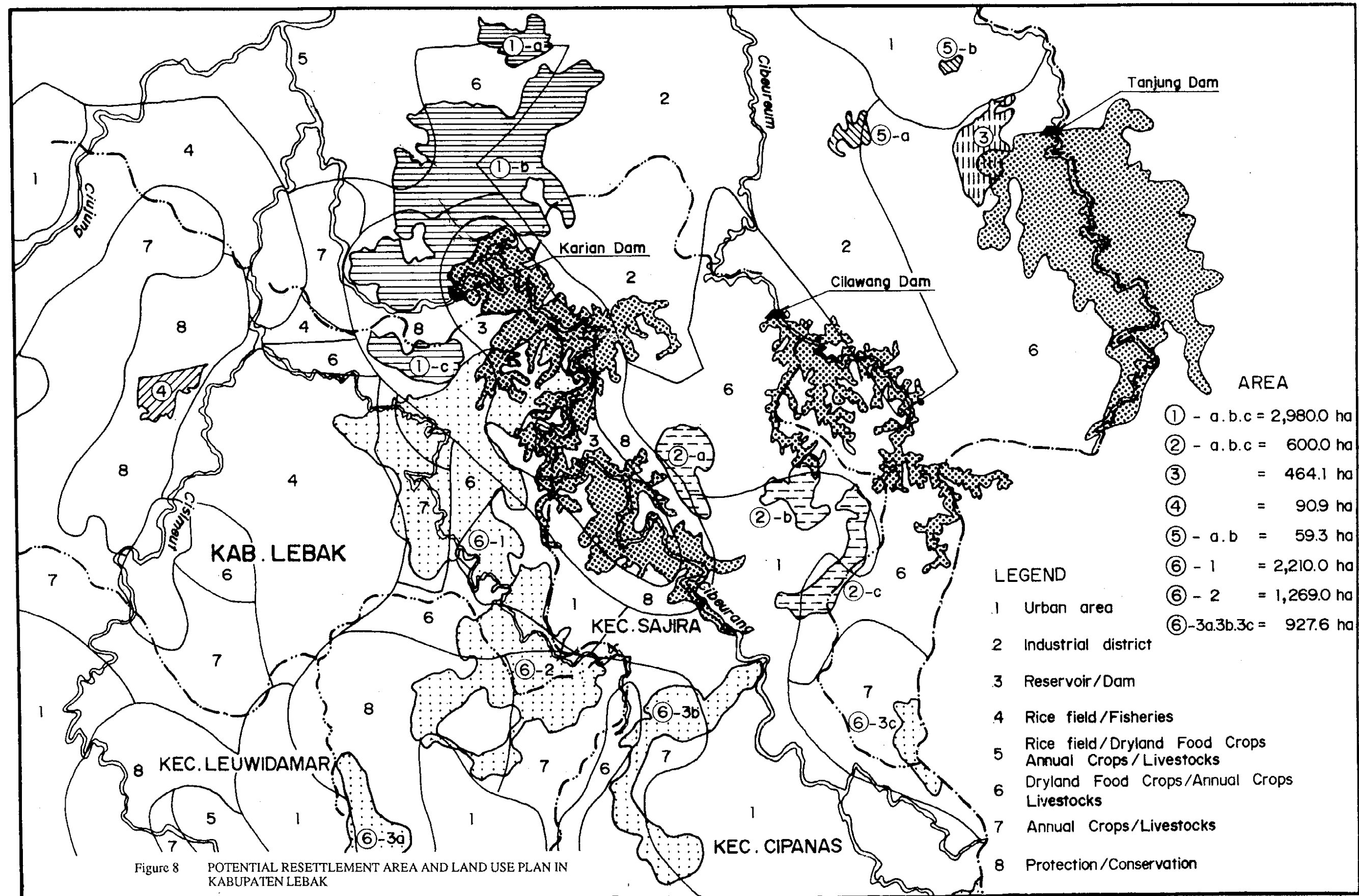
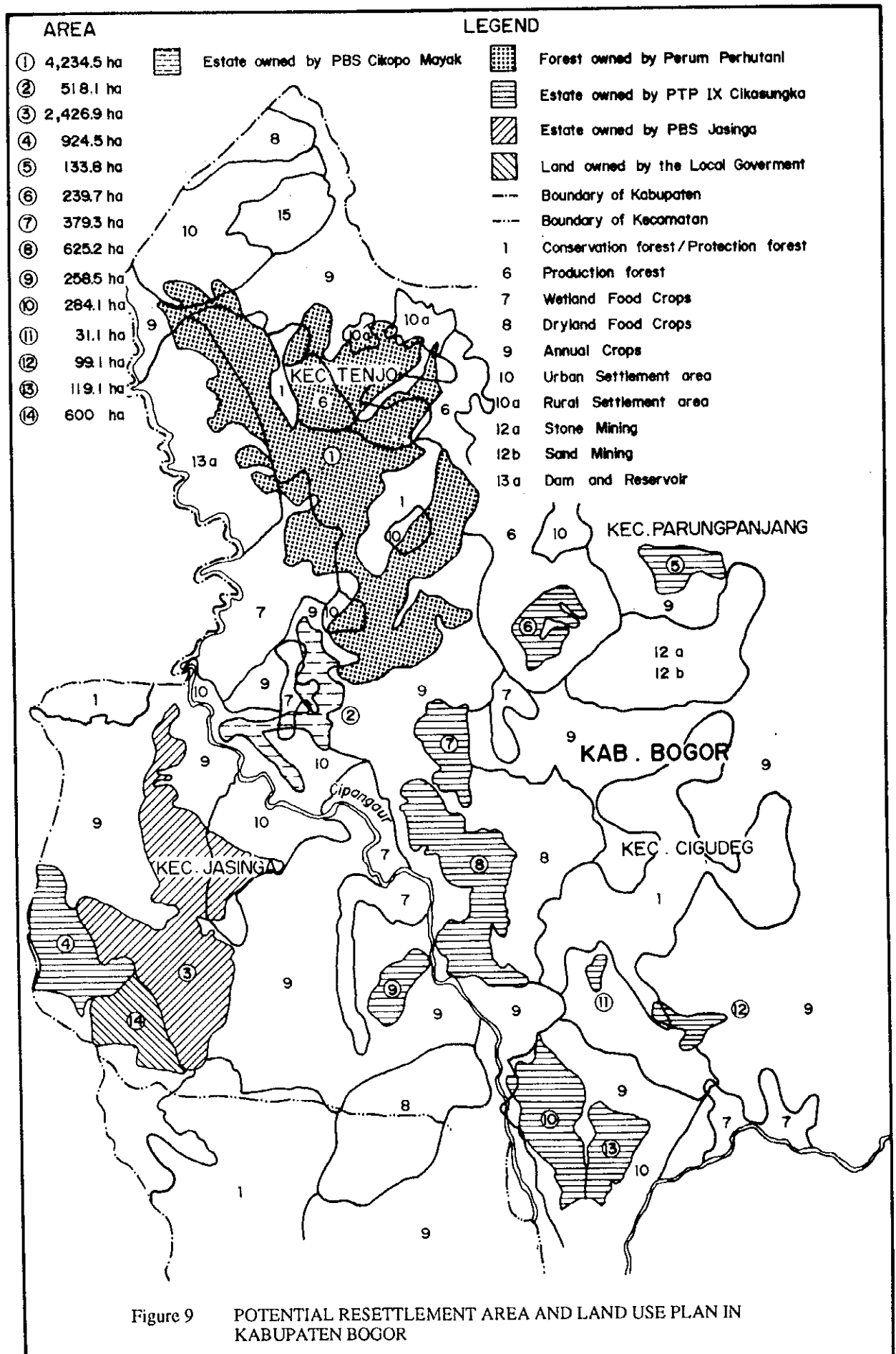


Figure 7 APPROACH FOR IMPACT IDENTIFICATION OF THE PROJECTS





ANNEX 9

CONSTRUCTION PLAN AND COST ESTIMATE

**THE STUDY
ON
CIUJUNG-CIDURIAN INTEGRATED WATER RESOURCES**

Annex 9 : Construction Plan and Cost Estimnate

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1. INTRODUCTION

The Karian Multi-purpose Dam Construction Project undertaken in 1985 comprised of four schemes; i) irrigation development in K-C-C areas, ii) supplemental irrigation water supply to the existing Cijung and Cicinta irrigation areas, iii) municipal and industrial water supply to Cilegon and adjacent kecamatans along the existing main canal of the Cijung irrigation schemes, and iv) river improvement works along the river stretch of about 18 km between Rangkasbitung and the existing Pamarayan weir against probable flood with a return period of 10 years. While, the Tanjung dam scheme was planned to develop irrigation area in Tanjung-Cidurian area by the Cisadane river basin development project.

Presently, the main purposes of the aforesaid dams have been changed to the municipal and industrial water supply to Serang, Tangerang and DKI Jakarta due to rapid industrialization and urbanization in these areas with sub-components of the river improvement works and supplemental irrigation water supply to the existing Cijung and Rancasumur irrigation areas. While, the Pasir Kopo dam was proposed by the JWRMS and the water balance analysis in this study was further reviewed by updating hydrological data in the Cijung Cidurian river basins.

The main features of the proposed dams and reservoirs, Karian-Serpong conveyance system and river improvement works are summarized as follows:

Main Features	Karian	Pasir Kopo		Cilawang	Tanjung
		A	C		
I. Dam scheme					
1) Catchment area (km ²)	288	172	172	93	280
2) Dam type	Rockfill	Rockfill	Rockfill	Rockfill	Rockfill
3) Dam crest level (EL. m)	72.5	97.0	106.5	81.0	60.5
4) Flood high water level (EL.m)	69.9	94.2	103.7	78.5	59.5
5) Normal high water level	67.5	90.5	100.5	75.6	56.5
6) Low water level	46.0	80.0	80.0	66.5	50.0
7) Dam height (m)	60.5	52.0	61.5	36.0	35.5
8) Reservoir area (ha)	1,740	640	920	1,056	2,487
9) Effective storage volume (mil. m ³)	219.0	44.5	112.6	62.0	120.0
10) Embankment volume of main dam (mil. m ³)	1.23	0.42	0.70	0.42	8.39
11) Design flood discharge (PMF)					
a) Inflow	3,400	3,300	3,300	1,700	3,098
b) Outflow	2,670	1,760	1,430	1,230	727
12) Spillway gate					
a) Type	Radial gate	overflow type	overflow type	Radial gate	overflow type
b) Nos.	2			2	
c) Height	12.5			9.5	
d) Width	12.5			9.0	
13) Side overflow spillway weir (m)	50.0	125.0	125.0	20.0	-
14) Flood control volume against 10-year probable flood (mil. m ³)	33.5	-	-	-	-

Main Features	Description
II. Karian-Serpong conveyance system	
1) Length (km)	
a) KSCS I	36.5
b) KSCS II	19.3
c) KSCS III	11.9
d) Cilawang canal	17.1
e) Tanjung canal	
2) Type of conveyance	
a) KSCS I&II and Cilawang & Tanjung Canal	Gravity conveyance
b) KSCS III	Pumping-up and pipeline
3) Maximum flow capacities (m ³ /s)	
a) KSCS I	12.4
b) KSCS II	13.8
c) KSCS III	6.0
d) Cilawang canal	4.1
e) Tanjung canal	9.7
III. River improvement works	
1) River length to be improved (km)	18.20
2) Improvement method	Provision of river dredging, short-cut channel (4 km) and flood dyke
3) Design discharge	
a) Design scale	10-year probable flood discharge
b) Design discharge	1,100 m ³ /s with retardation of flood peak discharge in the Karian reservoir
4) Earth work volume	
a) Embankment volume (mil. m ³)	0.60
b) Excavation volume (mil. m ³)	1.40
c) Dredging volume (mil. m ³)	0.67

The construction plan were established based on the result of preliminary design on the Karian-Serpong water conveyance system (KSCS) and the project cost of proposed KSCS was estimated for the purpose of economic evaluation and statement of financial requirement.

While, the main purposes of the proposed four dam schemes have been changed to the municipal and industrial water supply to Serang, Tangerang and DKI Jakarta due to rapid industrialization and urbanization in these areas from the agricultural development proposed by the previous studies. In the current study, project cost was reviewed based on work items and quantities estimated by the previous feasibility studies for the Karian, Cilawang and Tanjung dam schemes and by the preliminary design for the Pasir Kopo dam of this study at the master plan level, and updated unit cost for these work.

2. KARIAN-SERPONG CONVEYANCE SYSTEM

2.1 Construction Plan

2.1.1 Basic Conditions and Assumptions

(1) Working day and hour for construction

Workable days for such earth works as embankment, excavation and hauling, and concrete works are considered to be dominated by the weather conditions, especially rainfall. Therefore, the rainy days in the study area are examined by using the rainfall record at Cisalak Baru (Station No. 37.F) from 1980 to 1991 near the Rangkasbitung, at which altitude is similar to that along the KSCS. Based on the result, the following criteria are applied to count the workable days through a year for these works:

Daily Rainfall Amount (mm/day)	Assumption on Workable Days
1) less than or equal to 5 mm	All outdoor works are possible to be carried out.
2) 5 mm to 10 mm	Earth works are required to be suspended during rainfall of which duration is assumed to be a half day. But other outdoor works are fully performed.
3) 10 mm to 30 mm	Earth and concrete works are required to be suspended during rainfall of which duration is assumed to be a day. But, rock works is possible to be done in a half day.
4) more than 30 mm	All outdoor works have to be suspended and earth works are necessary to be suspended for two days.

Also, the working days were estimated excluding Sundays and national holidays.

While, for daily working hour and shift, one shift per one day and 7 hours a shift were principally applied except tunnel works which is carried out by two shifts operation referring to the similar construction work in Indonesia.

The available working days and hours for construction works are summarized in Table 1.

(2) Construction method and equipment

To achieve an efficient and qualified construction, the mechanized system of construction, which is currently utilized for construction works of the similar projects in Indonesia, is planned to be employed for the KSCS. The conventional method and type of equipment will be principally applied, giving consideration to the local conditions.

(3) Hourly production rate of construction equipment

Hourly production rate of construction equipment is estimated in consideration of the site conditions and the following swell or shrinkage factor of materials:

Material	Loose/Insitu	Compaction/Insitu
Common soil	1.20	0.90
Gravel & sand	1.15	1.05
Cobble stone	1.15	1.05
Weathered rock	1.45	1.20
Rock	1.65	1.30

The hourly production rates of construction equipment are shown in Tables 2 to 10 together with the assumptions for estimating those.

2.1.2 Construction time schedule

The KSCS is developed by dividing into two phases (First phase and IIA) in the scenario A or three (3) phases (First phase, IIC-a and IIC-b) in the scenario C. In both scenarios, the first phase development is planned to construct the water conveyance system between the Ciuyah intake facility and the Parungpanjang WTP. The second phase development will be made for Tanjung canal and waterway to Serpong in the scenario C or Cilawang canal and the waterway to Serpong. The third phase development, consisting of construction of the Cilawang canal and waterway to Parungpanjang, is proposed only for the scenario C.

Pre-construction activities which are the definitive study and the detailed design including preparation of tender documents and the financial arrangement and the land acquisition is necessitated before the commencement of construction works, and it is assumed that two (2) years for the definitive study and the detailed design and one (1) year for the financial arrangement and the land acquisition.

The major structures in the aforesaid phases and their construction periods are as follows:

Structures	First Phase	Second Phase					
		Scenario A			Scenario C		
		IIA			IIC-a		IIC-b
Waterway	35.3 km	48.3 km			35.5 km		17.1 km
Railway crossing structure	1 no.	2 nos.			2 nos.		-
Road crossing structure	36 nos.	53 nos.			41 nos.		16 nos.
Syphon	7 nos.	6 nos.			4 nos.		2 nos.
Cross drain, box culvert	8 nos.	1 nos.			2 nos.		-
Cross drain, pipe culverts	45 nos.	7 nos.			6 nos.		6 nos.
Cross drain, open channel	10 nos.	23 nos.			20 nos.		5 nos.
Foot path	22 nos.	35 nos.			26 nos.		12 nos.
Pumping station	-	1 no.			1 no.		-
Aqueduct	-	1 no.			1 no.		-
Ciuyah tunnel	1.2 km	-			-		-
Construction Period	4 years	3 years			3 years		2 years

All of the construction works will be performed by the contractor to be selected by tendering process and their commencement years are scheduled at 1998/1999 fiscal year for the first phase and thereafter, 2011/2012 (scenario C) or 2012/2013 (scenario A) for the second

phase, and 2016/2017 for the third phase, subject to future adjustment according to the future demand growth.

The proposed construction time schedule for first phase, phase IIA in Scenario A, phases IIC-a and IIC-b in Scenario C is shown in Figures 1 to 7.

2.1.3 Construction method

(1) Waterway

Waterway of the KSCS comprises of two waterway type; one is a open channel type with a bed slope of 1/5,000, which is applied for KSCS I & II, Tanjung and Cilawang canals; and the other is pipeline type applied for KSCS III.

The clearing work and removal of the top soil with a thickness of about 5 cm will be made as preparatory works. The excavation work for the waterway is planned to be carried out by using 1.2 m³ backhoe, 11t dump truck and 11t bulldozer. Excavated material consists of common soil and soft rock along the most of the waterway route. Soft rock will be used as embankment material after crushing by bulldozer. Some excavated materials will be hauled to the temporary stockpile to use as embankment material, and an excess material will be hauled to the spoil banks located along the waterway route.

Embankment material will be hauled from temporary stockpile to embankment site using aforesaid backhoe and dump truck, and will be spread by using bulldozer with a layer of about 30 cm. Compaction works for embankment material will be done using 8-10t tamping roller. In case that moisture content in embankment material seems to be insufficient, embankment material will be sprinkled with sufficient water. Soft clay layers exist in old river channels or alluvial planes along the embankment of waterway. There is a possibility that differential settlement may be caused by the soft soil layer. To take measures to meet the situation, extra embankment ranging from 0.3 to 1.0 m height for preloading with a period ranging from one year to two years will be provided at places where differential settlement is anticipated along the waterway to be embanked,

Concrete rectangular channel is planned to be constructed between the Ciuyah tunnel and the Parungpanjang. After settlement of the preloading, the lean concrete with gravel bedding will be provided at foundation of the channel. Arrangement of reinforcement bar and assembly of form will be made then, concrete with a 1.5 m lift will be placed using 4.5 m³ truck mixer, Ø 40 mm concrete vibrator, and 55 m³ concrete pump car. Placement cycle is assumed to be five (5) days.

A prestressed concrete pipes with 2.2 m diameter will be installed and embedded along the waterway route between the Parungpanjang WTP and the left bank of Cisadane river. The steel pipes is planned to be utilized between the left bank of Cisadane river and the Serpong

WTP. Installation works of these pipes will be performed by using 30t truck crane and 11t truck. The prestressed concrete pipes and steel pipes are available in the study area.

(2) Railway crossing structure

Two (2) kind of railway crossing structures are planned; one is precast box culvert with a length of about 90 m, and the other is precast pipe culvert with a length of about 30 m. The precast box culvert and the precast pipe culvert are scheduled to be constructed at Tenjo and near Parungpanjang for crossing railway, respectively. The box culvert will be made by reinforced concrete, and its interior wall of the culvert will be lined by steel plate for preventing from water leakage at the joint. The pipe culvert will be jointed with a rubber seal.

Construction method called as "Forward Jack Pulling Method", which is one of prospective method and already utilized at crossing portions of the existing roads and/or railways in Jakarta, is applied for the precast box culvert, while the construction method for the precast pipe culvert is applied by providing temporary railway.

In order not to affect active traffic conditions, a horizontal pipe roof supported with a number of pipes will be transversally inserted below the earth covering of the railway by arranging them in a row. The precast box culvert is fabricated dividing into six (6) sections to avoid enormous reaction force, and arranged being four (4) sections for one working site and two (2) sections for the other working site. Each one (1) number of precast box culvert are fabricated in the both working sites. A horizontal boring are made between those precast box culverts through the ground under the railway, and the PC cables are set through the bored horizontal holes with a pulling jacks and fixtures, then the precast box culvert is straightly pulled by jacks through the ground from the working site to the receiving site where the reaction force acts. The soil materials are excavated by the cutting edge attached to the front end of precast box culvert. The installation method of remaining sections is a similar to the above procedure. Finally the cutting edges of both precast box culverts are docked and welded in the ground under the railway.

The precast pipe culvert near Parunpanjang is scheduled to be constructed by providing temporary railway aside the existing railway in the second phase. After removing the existing railroad, the excavation works will be done, and the precast pipe culvert is installed by using truck crane with capacity of 30 tons. Then, the backfill works will be carried out. The installation of railway will be undertaken after finishing backfill works.

The consultation with the Indonesia State Railway Office is necessitated at the time of detailed design and construction stages.

(3) Road crossing

The construction works comprise temporary road, demolition of asphalt concrete, excavation, concrete works, embankment, base course, and asphalt concrete.

A temporary road made by gravel metalling will be provided aside the road crossing, and the traffic switches into the temporary road. The demolition of asphalt concrete will be executed using 20 kg breaker, and the excavation works will be done until the specified dimensions using 1.2 m³ backhoe, 11t dump truck, and 11t bulldozer.

Following to provision of temporary road, box culvert will be constructed through lean concrete with gravel bedding, arrangement of reinforcement and the assembly of forms, concrete placing using 4.5 m³ truck mixer, Ø 40 mm concrete vibrator, and 55 m³ concrete pump car. The placement cycle is assumed to be seven (7) days.

Embankment works will be made after finishing concrete works and construction method similar to that used for waterway is applied.

Base course with a thickness of about 30 cm will be provided on the subsoil using a combination of 3.1 m motor grader, 10-12t macadam roller, and 8-20t tire roller, then the asphalt concrete with a layer of 5 cm will be constructed on the base course using 3-4.5 m asphalt finisher, 10-12t macadam roller, and 8-20t tire roller.

After completion of the road crossing, the traffic switches into road crossing again from the temporary road, and the removal of temporary road will be carried out using 1.2 m³ backhoe, 11t dump truck, and 11t bulldozer.

(4) Aqueduct at the Cisdane river

An aqueduct is planned to be constructed across the Cisdane river just upstream existing railway bridge in the second phase. Construction works consist of temporary bridge, coffering, piling, excavation for piers and abutments, concrete of substructure, backfill, and installation of steel pipe, and these works will be basically done during dry season.

Before start of the works, a temporary bridge will be provided aside the proposed aqueduct for transportation of equipment, material and labour.

A temporary steel sheet piles (type IV) will be driven surrounding each pier using 2.5t diesel hammer, and waling and strut will be provided inside surrounding sheet piles. Piling work will be done using a 2.5t diesel hammer and follower.

Excavation of abutment and pier will be carried out using 0.7 m³ backhoe, 11t dump truck, and 150 mm submersible pump. After the excavation, concrete with a 1.5 m lift will be made using 4.5 m³ truck mixer, Ø40 mm concrete vibrator, and 55 m³ concrete pump car. The placement cycle is assumed to be seven (7) days.

Backfilling will be conducted after placing concrete of substructure, and the temporary steel sheet piles will be extracted using 60 kW vibro hammer after removing waling and strut.

Steel pipes will be installed between piers by using 30t truck crane and 11t truck. After completion of the aforesaid works, the temporary bridge will be removed from the site.

(5) Syphon structure

Syphon structures are scheduled to be constructed in the Cibeureum, Cidurian, Cicinta, Payaheum, Cimatuk and Cibunar rivers along the proposed waterway route. These syphons are planned to be constructed in the first phase. Furthermore, additional syphons are scheduled to be provided at the same locations in the phases IIA or IIC excluding the Cibeureum river.

Construction works comprise the coffering, excavation of foundation, concrete works, backfill, and revetment and will be basically executed during a dry season.

A half portion of syphon will be constructed at first. A semi-circular coffer dam made by steel sheet piles will be extended from upstream to downstream boundaries of the works. Accordingly the river diversion channel will be located on the outside of the boundaries.

Similarly at the completion of the first syphon construction, the other half portion will be constructed switching river flow to the first syphon portion by the semi-circular coffer dam made by steel sheet piles.

Excavation of foundation will be undertaken using 0.7 m³ backhoe, 11t dump truck and 11t bulldozer. Following to excavation works, lean concrete with gravel bedding, concrete placing after setting reinforcement bars and forms will be done by using 4.5 m³ truck mixer, Ø40 mm concrete vibrator, and 55 m³ concrete pump car. The placement cycle is assumed to be seven (7) days. Backfilling will be performed after concrete works. Revetment works will be provided by manpower on the surface of both banks.

(6) Box culvert for cross drain

Eleven (11) numbers of box culverts are planned to be constructed crossing the waterway. Construction works consist of gabion matressing and provision of inlet structure, box culvert and outlet structure.

A temporary drain will be excavated by using 0.7 m³ backhoe and 11t bulldozer, and the existing drain will be diverted to temporary one. Then, excavation of inlet, barrel and outlet portions will be thoroughly performed, using 0.7 m³ backhoe, 11t dump truck, and 11t bulldozer. Following to excavation works, concrete works similar to that for other concrete structures. Gabion matressing will be done by using 11 ton dump truck and manpower and embankment of waterway will be carried out using 11t bulldozer and 8-10t vibrating roller.

(7) Pipe culvert & open channel for cross drain

Construction works and method for pipe culvert and open channel are similar to that for box culvert, but the pre-cast concrete pipe culvert will be procured from the local market.

(8) Foot path

Foot path is planned to be provided at ninetyfive (95) locations along the KSCS. Form and reinforcement bar to be supported by steel supports will be firstly assembled at the site where the foot path is constructed, then the concrete placing will be done by using 4.5 m³ truck mixer, ϕ 40 mm concrete vibrator, and 55 m³ concrete pump car.

(9) Pump station

One (1) number of pump station is scheduled to be constructed at Parungpanjang to pump water up to Serpong WTP.

The construction works for pumping station for conveying raw water to Serpong WTP comprise provision of pump house, forebay, air chamber, outlet, overflow, diesel generator, transformer, meter house, etc.

Prior to excavation works, temporary steel sheet piles (Type III) will be driven surrounding pump structure to be constructed using 2.5t diesel hammer, 20t truck crane, and 11t truck. RC piles with a diameter of 400 mm will be driven to the designated elevation by using 2.5t diesel hammer and follower. A temporary H shape steel pile of 300 mm will be driven as the support of strut with an interval of 3 m using 2.5t diesel hammer, and the waling and strut will be provided inside the sheet piles for the sustainment of earth pressure behind the sheet piles, then temporary steel slab will be provided on the waling and strut to ensure the working space of the backhoe and dump truck.

Excavation works will be done from ground surface to the bottom of pump station using 0.7 m³ backhoe, 11t dump truck, and 11t bulldozer. After excavation works, concrete works will be carried out by the same kind of construction method for the aforesaid concrete structure.

Backfilling will be done after completing substructures concrete and then, temporary steel slabs, waling and struts, H shape steel piles, and steel sheet piles are removed from the site using 30t truck crane, 60 kW vibro hammer, and 11t truck.

Housing facilities to be accommodated with diesel generator, transformer and meter will be constructed in the compound of pump station.

Hydro-mechanical works comprising an overhead traveling crane, trashracks, stoplog, gate, hoist, pump facilities and panel will be fabricated in the contractor's factory, and transported

and installed in the pump station using 15t truck crane, welder, chain block, jack, and scaffolding.

(10) Ciuyah tunnel

A concrete lined circular shaped waterway tunnel with a length of 1,199 m and an inner diameter of 4 m is planned to be constructed in the Ciuyah area.

Excavation and concrete lining works will be carried out by tire type equipment. The works will be conducted from the outlet to the inlet. Excavation works will be undertaken by two (2) shifts operating in a day. Concrete lining will be carried out only after the completion of tunnel excavation.

Based on the geological condition encountered, full face method will be adopted for the excavation of waterway tunnel using a drill jumbo. In zones of bad rock or excessive water, heading and bench method, ring cut method, or drift method will be applicable. The length of blasting is assumed to be 1.5 m. Mucking works will be carried out by a combination of 1.9 m³ crawler type loader, 11t dump truck, and 11t bulldozer.

Immediately after the mucking out operations, shotcrete with 5 cm to 10 cm thick will be applied by a shotcrete machine with a capacity of 6 m³/hr. Rockbolts will be fixed after the application of shotcrete. Drainage and ventilation facilities will be provided in the tunnel.

After completion of the tunnel drive, concrete lining will be installed for the entire tunnel length using a needle beam type steel lining form of 10.5 m long. The lining concrete will be poured by combination of 4.5 m³ truck mixer and 55 m³ concrete pump car. The lining concrete will be poured in three (3) days cycle over span length of 10.5 m. Following to concrete lining, backfilling and consolidation grouting will be carried out by 30 kg leg hammer, 5.5 kW grout mixer, and 7.5 kW grout pump.

A vertical type gate shaft will be constructed at a distance of 110 m from the inlet of waterway tunnel. The internal diameter of shaft is 14.5 m, and the height between the top and bottom of the shaft is 27.6 m. A pilot heading, 2.4 m x 2.4 m will be drilled by 180 kg crawler drill from the surface to the bottom of shaft. After finishing drilling holes, a blasting with a length of 1.0 m will be performed from the surface downwards to the bottom.

Enlargement of the shaft will be performed from the surface downwards to the bottom using 180 kg crawler drill. A blasting length of 1.0 m is assumed. Mucking will be discharged through the pilot heading using 0.35 m³ backhoe. Hoisting facilities will be provided on the top portion of the shaft for hoisting and lowering of equipment, material, and tunnel workers.

Mucking to be discharged through the pilot heading will be hauled to the spoil bank through inlet end using 1.9 m³ crawler type loader, 11t dump truck, and 11t bulldozer.

Shotcrete of 10 cm thick with/without rock bolts will be placed immediately after excavation work to make the excavated rock surface settle.

Concrete lining will be proceeded from the bottom upwards using a slip form with a 1.5 m lift. Equipment to be used for concrete lining at the shaft is similar to that for the waterway tunnel. Concrete lining will be poured in 1.5 m lift in a five (5) days cycle.

2.2 Estimate of Construction Cost

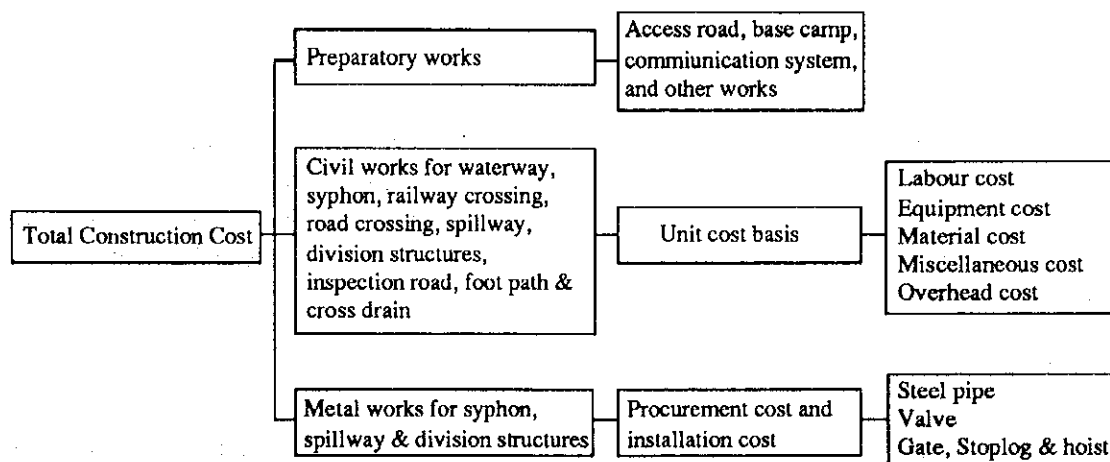
2.2.1 Basic conditions and assumptions

The construction cost was estimated at a feasibility study level for the purposes of economic evaluation and statement of financial requirement of the project under the following assumptions and conditions:

- (1) Unit prices of material, labor and equipment which constitute unit cost of the civil works are based on a price level in August, 1994 calendar year.
- (2) The exchange rates of currencies are Yen 1.00 = 21.77 and US dollar \$ 1.00 = Rp. 2,177 as of August, 1994.
- (3) The estimated unit costs are composed of foreign and local currency portions and the total unit prices are expressed in Rupiah currency.

2.2.2 Constitution of construction cost

The construction cost consists of those for preparatory works, civil works and metal works, sum of which is defined as the total construction cost. Constitution of the aforesaid works is shown as follows.



Cost for preparatory works was estimated based on lump-sum basis referring to cost of the similar project in Indonesia. While, cost for civil works was based on unit cost basis i.e. labor cost, equipment cost, material price, miscellaneous cost and overhead cost. Among the aforesaid cost items, miscellaneous and overhead costs were assumed at 2 to 5 % and 25 % of the sum of labor cost, equipment cost, and material price as the minor tools and minor material cost, respectively. Cost for metal works was estimated by applying the current price for procurement and installation of metal structures.

2.2.3 Unit prices

The cost for civil works was estimated on the unit cost basis, supported by the unit prices of labor, equipment, material, miscellaneous and overhead items. In order to obtain the bases of the market trend of these prices, the information and data were collected from the related organizations such as DGWRD, PLN, DKI Jakarta, IMF, the statistical offices, local government offices and private companies. Based upon the results of information and data collected, and analysis was conducted for establishing the unit prices. Basic conditions and assumptions applied for estimating unit prices are described as follows:

(1) Labor cost

Labour cost was based on the analysis of the results of information and data collected from various sources. The labor costs include all fringe benefits such as vacation and sick leaves, charges of insurance, living allowance, etc. The unit labor costs are shown in Table 11.

(2) Equipment cost

Equipment cost was estimated based on the assumption that most of the contractors use own construction equipment for construction works in Indonesia taking into the present situation of contractor's capability. The cost includes depreciation cost, repair and maintenance cost, and management cost but import duties of the equipment is excluded in the cost. The life time, rate of repair and maintenance, and rate of management are determined by using guidelines available in Indonesia and Japan.

The hourly or daily equipment cost are divided into the foreign and local currency portions. The foreign currency portion consists of 100 % of depreciation cost and 80 % of repair and maintenance cost, while the local currency portion consists of 20 % of repair and maintenance cost and 100 % of management cost. The estimated unit equipment costs are shown in Tables 12.

(3) Material price

Material prices were based on the analysis of the information and data collected from various sources. The unit prices of each construction material are allocated into the foreign and local cost components taking into account the latest market prices, sources of origin, ocean freight,

and inland transportation charge. The estimated unit prices of construction materials are shown in Table 13.

2.2.4 Unit cost for civil works

(1) Main civil works

The unit costs were estimated in steps; 1) selecting appropriate equipment in its capacity and combination of equipment against the quantities required for the work item, 2) establishing hourly production of equipment under certain working conditions, 3) computing the raw materials required for unit quantity, 4) assuming operation hours of equipment and tradewise labor force required for the nominal quantities, 5) summing-up the total amount based on the unit prices as above determined, 6) calculating miscellaneous and overhead costs, and 7) forming an unit cost from the total amount dividing by the quantity required. The estimated unit costs of major work items are indicated in Table 14.

(2) Other minor civil works

The cost of other works which are minor civil works and not usually accounted in the unit cost basis. In estimating construction cost, 5 % of cost for civil works was assumed as cost for such minor works.

2.2.5 Metal works

Major metal works incorporated in the project was assumed to be imported. The bases of estimates have been developed from the standard design, and then cost has been estimated based on the past bidding records of similar projects and the market costs in the southeastern Asia.

The cost of metal work includes cost of designing, supplying materials, manufacturing, painting, testing, packing the products and delivering up to the port of the export, ocean freight, insurance premium, landing cost at Tanjung Periok Port, inland transportation, and installation.

The cost of metal work consists of 90 % for the foreign currency portion and remaining 10 % for local curing portion.

2.2.6 Construction cost

The construction cost comprises preparatory works, civil works and metal works.

The construction cost is estimated by using the aforesaid procedures and estimated unit cost and work quantities based on the design of the Karian - Serpong water conveyance system.

The KSCS is planned to be developed by stagewise i.e. KSCS First phase, KSCS II & III and Cilawang canal, phase IIA, KSCS II & III and Tanjung canal phase IIC, and Cilawang canal phase IIC. Accordingly, the construction cost is estimated by each phases. As well as the KSCS, the construction costs of the proposed dam schemes made by the previous studies, river improvement works, and Pasir Kopo dam recommended by JWRMS are also estimated.

The breakdown of the construction cost for each scheme is shown in Tables 15 to 30.

3. PROPOSED DAM SCHEMES AND RIVER IMPROVEMENT WORKS

3.1 Basic Conditions for Updating Construction Cost

Construction cost for such the dam and related structures as dam embankment, spillway, intake, river outlet, and so on, and river improvement works comprising of river dredging, provision of flood dyke, short-cut channel and revetment works was reviewed based on the work quantities estimated by the previous studies and updated unit cost by this study.

While, the scale of Pasir Kopo dam was changed from the original one defined in the north Banten water resources development plan in order to cope with the rapidly increasing M&I water demands in Serang. Therefore, the preliminary design was made at the master plan level as described in Annex 4 in order to estimate work quantities for the dam construction.

The proposed construction plan made by the previous studies was also reviewed and concluded that it is reasonable in consideration of site conditions and work quantities and is able to be applicable for updating the construction cost:

- | | | | |
|----|-------------------------|---|---------|
| a) | Karian dam | : | 4 years |
| b) | Pasir Kopo dam | : | 4 years |
| c) | Cilawang dam | : | 4 years |
| d) | Tanjung dam | : | 6 years |
| e) | River improvement works | : | 4 years |

3.2 Construction cost

The construction cost was reviewed by using the aforesaid procedures applied for estimating construction cost of the Karian-Serpong conveyance system. Among the cost, the land acquisition and compensation costs for the schemes were estimated by the environmental study. The updated unit prices, work quantities and construction cost are given in Tables 31 to 44.

4. PROJECT COST AND DISBURSEMENT SCHEDULE

The project cost for the Karian, Pasir Kopo, Cilawang and Tanjung dam schemes, Karian-Serpong conveyance system and river improvement works along the Ciujung river was estimated by adding compensation cost, engineering services cost, administration cost, value added tax (PPN), physical contingency, price escalation and interest to the estimated total construction cost based on the following conditions:

- (1) Land acquisition and compensation cost was estimated by the environmental study in Annexes 4 and 8.
- (2) Engineering services will cover the design and whole construction period. The rates of engineering services to the total construction cost was assumed at 14 % for foreign currency portion and 9 % for local currency portion.
- (3) The Government administration cost was set at 5.0 % of the total construction cost.
- (4) Value added tax (PPN) as the governmental tax was estimated at 10 % of the total construction cost and engineering service cost.
- (5) Physical contingency was provided to cope with the unforeseen physical condition and assumed to be 10 % for each foreign and local currency portion of a sum of total construction cost and costs in items 1 to 4. Price escalation rate was assumed to be 3 % per annum for foreign currency portion and 8 % per annum for local currency portion till the completion of the first phase development in 2002 and afterwards, a rate of zero was applied for both portions taking into account the uncertainty of escalation rate in future.
- (6) The interest during construction was estimated for the a sum of total construction cost and costs in items 1 to 5 in the foreign currency portion assuming the interest rate of 2.6 % per annum which corresponds to the latest rate of Overseas Economic Cooperation Fund (OECF) .
- (7) Implementation period of the projects from the definitive study and detailed design to completion of the construction works is planned as follows:

Projects	Implementation Period	
	Scenario A	Scenario C
Karian and KSCS I	1995 to 2002	1995 to 2002
River Improvement Works	1995 to 2002	
Pasir Kopo dam	2008 to 2015	2004 to 2011
Cilawang dam and Cilawang Canal	2008 to 2015	2011 to 2018
Tanjung dam and Tanjung Canal	-	2005 to 2014
KSCS II & III	2008 to 2015	2005 to 2014

The project cost based on the mentioned conditions are given in Tables 45 to 51 and summarized in Table 52. As indicated in the tables, the contingency for price escalation in the projects planned to be implemented in the second phase development was estimated at a large amount comparing with the total construction cost due to assumption that the current price escalation rate of 3 % for foreign currency and 8 % for local currency is applicable for a period of 30 years in the time horizon till the year 2025. But, actual price level in future will be different from the present and therefore, it is recommended that the project cost including price escalation should be reviewed at the study for review of the current water resources development plan in the second step of the water supply master plan.

TABLES

Table 1 WORKABLE DAYS

Descriptions	Average Monthly Rainy Days (1980 - 1991) at Cisalak Baru (Code No. 37 F) / Workable Days												Total
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
(1) Average Monthly Rainfall Day													
0 - 5 mm	18	18	23	22	25	26	26	26	24	25	23	23	279
6 - 10 mm	4	3	2	3	2	2	1	1	2	2	2	2	26
11 - 30 mm	6	5	4	3	3	1	2	2	2	3	3	4	38
over 30 mm	3	2	2	2	1	1	2	2	2	1	2	2	22
Total (a)	31	28	31	30	31	30	31	31	30	31	30	31	365
(2) Workable Days for Earth Work													
Suspension Day by Rainfall													
0 - 5mm	0	0	0	0	0	0	0	0	0	0	0	0	0
6 - 10mm	2	1.5	1	1.5	1	1	0.5	0.5	1	1	1	1	13
11 - 30mm	6	5	4	3	3	1	2	2	2	3	3	4	38
30mm over	6	4	4	4	2	2	4	4	4	2	4	4	44
Sub-total (b)	14	10.5	9	8.5	6	4	6.5	6.5	7	6	8	9	95
Sunday & Holidays (c)	6	6	6	5	7	4	6	6	4	6	4	5	65
Adjusted Suspension Day (d)	11	8	7	7	5	3	5	5	6	5	7	8	78
Total Suspension Day (e)	17	14	13	12	12	7	11	11	10	11	11	13	143
Workable Day (f)	14	14	18	18	19	23	20	20	20	20	19	18	222
(3) Workable Days for Rock Excavation Works													
Suspension Day by Rainfall													
0 - 5mm	0	0	0	0	0	0	0	0	0	0	0	0	0
6 - 10mm	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 30mm	3	2.5	2	1.5	1.5	0.5	1	1	1	1.5	1.5	2	19
30mm over	3	2	2	2	1	1	2	2	2	1	2	2	22
Sub-total (b)	6	4.5	4	3.5	2.5	1.5	3	3	3	2.5	3.5	4	41
Sunday & Holidays (c)	6	6	6	5	7	4	6	6	4	6	4	5	65
Adjusted Suspension Day (d)	5	4	3	3	2	1	2	2	3	2	3	3	34
Total Suspension Day (e)	11	10	9	8	9	5	8	8	7	8	7	8	99
Workable Day (f)	20	18	22	22	22	25	23	23	23	23	23	23	266
(4) Workable Days for Concrete Work													
Suspension Day by Rainfall													
0 - 5mm	0	0	0	0	0	0	0	0	0	0	0	0	0
6 - 10mm	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 30mm	6	5	4	3	3	1	2	2	2	3	3	4	38
30mm over	3	2	2	2	1	1	2	2	2	1	2	2	22
Sub-total (b)	9	7	6	5	4	2	4	4	4	4	5	6	60
Sunday & Holidays (c)	6	6	6	5	7	4	6	6	4	6	4	5	65
Adjusted Suspension Day (d)	7	6	5	4	3	2	3	3	3	3	4	5	49
Total Suspension Day (e)	13	12	11	9	10	6	9	9	7	9	8	10	114
Workable Day (f)	18	17	20	21	21	24	22	22	23	22	22	21	251
(5) Workable Days for Tunnel Work													
Suspension Day by Rainfall													
0 - 5mm	0	0	0	0	0	0	0	0	0	0	0	0	0
6 - 10mm	0	0	0	0	0	0	0	0	0	0	0	0	0
11 - 30mm	0	0	0	0	0	0	0	0	0	0	0	0	0
30mm over	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total (b)	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunday & Holidays (c)	6	6	6	5	7	4	6	6	4	6	4	5	65
Adjusted Suspension Day (d)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Suspension Day (e)	6	6	6	5	7	4	6	6	4	6	4	5	65
Workable Day (f)	25	22	25	25	24	26	25	25	26	25	26	26	300

Note :

(a) : Calendar Day

(b) : Average Monthly Rainfall Day Multiplied by Criteria of Suspension Day by Rainfall

(c) : Sunday & National Holidays

(d) : Adjusted Suspension Day by Rainfall due to Overlapping of Holiday and Rainfall Day

 $d = (a-c) * b/a$ (e) : $c + d$ (f) : $a - e$

Table 2 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (1/9)
(1) Bulldozer

Excavating work

$$Q = 60 * q * F * E / C_m$$

Where

Q : Hourly production (m³/hr)

q : Blade capacity (m³)

F : Swell or shrinkage factor shown in Table A

E : Operating efficiency

C_m : Cycle time (min.)

$$C_m = L/V_1 + L/V_2 + T_g$$

L : Hauling distance (m)

V₁ : Forward speed (m/min.)

V₂ : Reverse speed (m/min.)

T_g : Gear change and other

Table A Swell or shrinkage factor

Material	Insitu	Loose	Compaction
Common soil	1.00	1.20	0.90
Gravel & Sand	1.00	1.15	1.05
Cobble Stone	1.00	1.15	1.05
Weathered Rock	1.00	1.45	1.20
Rock	1.00	1.65	1.30

	q	F	E	L	V ₁	V ₂	T _g	C _m	Q(I)	Q(L)	Q(C)
a) Bulldozer 32 ton											
Common soil	7.2	0.83	0.6	20	42	58	0.33	1.151	186.9	224.3	168.2
Gravel & Sand	7.2	0.87	0.6	20	42	58	0.33	1.151	195.9	225.3	205.7
Cobble Stone	7.2	0.87	0.5	20	42	58	0.33	1.151	163.3	187.8	171.4
Weathered Rock	7.2	0.69	0.5	20	42	58	0.33	1.151	129.5	187.8	155.4
Rock	7.2	0.61	0.4	20	42	58	0.33	1.151	91.6	151.1	119.1
b) Bulldozer 21 ton											
Common soil	4.3	0.83	0.6	20	42	58	0.33	1.151	111.6	134.0	100.5
Gravel & Sand	4.3	0.87	0.6	20	42	58	0.33	1.151	117.0	134.6	122.9
Cobble Stone	4.3	0.87	0.5	20	42	58	0.33	1.151	97.5	112.1	102.4
Weathered Rock	4.3	0.69	0.5	20	42	58	0.33	1.151	77.3	112.1	92.8
Rock	4.3	0.61	0.4	20	42	58	0.33	1.151	54.7	90.2	71.1
c) Bulldozer 15 ton											
Common soil	2.4	0.83	0.6	20	42	58	0.33	1.151	62.3	74.8	56.1
Gravel & Sand	2.4	0.87	0.6	20	42	58	0.33	1.151	65.3	75.1	68.6
Cobble Stone	2.4	0.87	0.5	20	42	58	0.33	1.151	54.4	62.6	57.1
Weathered Rock	2.4	0.69	0.5	20	42	58	0.33	1.151	43.2	62.6	51.8
Rock	2.4	0.61	0.4	20	42	58	0.33	1.151	30.5	50.4	39.7
d) Bulldozer 11 ton											
Common soil	2	0.83	0.6	20	42	58	0.33	1.151	51.9	62.3	46.7
Gravel & Sand	2	0.87	0.6	20	42	58	0.33	1.151	54.4	62.6	57.1
Cobble Stone	2	0.87	0.5	20	42	58	0.33	1.151	45.4	52.2	47.6
Weathered Rock	2	0.69	0.5	20	42	58	0.33	1.151	36.0	52.2	43.2
Rock	2	0.61	0.4	20	42	58	0.33	1.151	25.4	42.0	33.1

(2) Bulldozer

Ripping work

$$Q = (Q_1 * Q_2) / (Q_1 + Q_2)$$

$$Q_1 = 60 * A_n * D * E * F / C_m$$

where

Q : Hourly production, ripping and excavating (m³/hr)

Q₁ : Hourly production, ripping work (m³/hr)

Q₂ : Hourly production, excavating work (m³/hr)

A_n : Cross section area of ripping tooth (m²)

D : Ripping length (m)

E : Operating efficiency

F : Swell or shrinkage factor

C_m : Cycletime

$$C_m = 0.05 * D + 0.25$$

	A _n	D	E	F	C _m	Q ₁	Q ₂	Q(I)	Q(L)	Q(C)
a) Bulldozer 32 Ton										
Seismic speed										
1,000 - 1,500 m/sec.	0.35	20	0.7	1	1.25	235.2	129.5	83.5	100.2	75.2
1,500 - 2,000 m/sec.	0.22	20	0.7	1	1.25	147.8	129.5	69.0	82.8	62.1
b) Bulldozer 21 Ton										
Seismic speed										
1,000 - 1,500 m/sec.	0.22	20	0.7	1	1.25	147.8	77.3	50.8	60.9	45.7

Table 3 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (2/9)**(3) Bulldozer**

Spreading work

$$Q = W * V * D * E * F / N$$

Where

Q : Hourly production (m³/hr)

W : Effective spreading width (m)

V : Working Speed (m/hr)

D : Depth of spreading width (m)

E : Operating efficiency

F : Swell or Shrinkage factor

N : Number of spreading

		W	V	D	E	F	N	Q(I)	Q(L)	Q(C)
a)	Bulldozer 21 Ton									
	Common soil	3.8	2000	0.2	0.7	0.83	6	147.2	176.6	132.5
	Gravel & Sand	3.8	2000	0.2	0.7	0.87	6	154.3	177.4	162.0
	Cobble Stone	3.8	1700	0.3	0.7	0.87	4	295.1	339.3	309.8
	Weathered Rock	3.8	1700	0.3	0.7	0.69	4	234.0	339.3	280.8
	Rock	3.8	1700	0.3	0.7	0.61	4	206.9	341.4	268.9
b)	Bulldozer 11 Ton									
	Common soil	3.2	2000	0.2	0.7	0.83	6	147.2	148.7	111.6
	Gravel & Sand	3.2	2000	0.2	0.7	0.87	6	129.9	149.4	136.4
	Cobble Stone	3.2	1700	0.3	0.7	0.87	4	248.5	285.7	260.9
	Weathered Rock	3.2	1700	0.3	0.7	0.69	4	197.1	285.7	236.5
	Rock	3.2	1700	0.3	0.7	0.61	4	174.2	287.5	226.5

(4) Loader and Excavator

Loading Work

$$Q = 3,600 * q * K * E * F / C_m$$

Where

Q : Hourly production (m³/hr)q : Bucket capacity, heaped (m³)

K : Bucket coefficient

E : Operating efficiency

F : Swell or Swell or shrinkage factor

C_m : Cycle time (sec)

		q	K	E	F	C _m	Q(I)	Q(L)	Q(C)
a)	Crawler loader 2.3 m ³								
	Common soil	2.3	0.80	0.75	0.83	60	68.7	82.5	61.9
	Gravel & Sand	2.3	0.80	0.75	0.87	60	72.0	82.8	75.6
	Cobble Stone	2.3	0.65	0.75	0.87	60	58.5	67.3	61.5
	Weathered Rock	2.3	0.65	0.75	0.69	60	46.4	67.3	55.7
	Rock	2.3	0.65	0.75	0.61	60	41.0	67.7	53.3
b)	Wheel Loader 1.4 m ³								
	Common soil	1.4	0.80	0.75	0.83	62	68.7	48.6	36.4
	Gravel & Sand	1.4	0.80	0.75	0.87	62	42.4	48.8	44.6
	Cobble Stone	1.4	0.65	0.75	0.87	62	34.5	39.6	36.2
	Weathered Rock	1.4	0.65	0.75	0.69	62	27.3	39.6	32.8
	Rock	1.4	0.65	0.75	0.61	62	24.2	39.9	31.4
c)	Backhoe 1.2 m ³								
	Common soil	1.2	0.90	0.75	0.83	30	68.7	96.8	72.6
	Gravel & Sand	1.2	0.90	0.75	0.87	30	84.6	97.2	88.8
	Cobble Stone	1.2	0.75	0.75	0.87	30	70.5	81.0	74.0
	Weathered Rock	1.2	0.75	0.75	0.69	30	55.9	81.0	67.1
	Rock	1.2	0.75	0.75	0.61	30	49.4	81.5	64.2
d)	Backhoe 0.7 m ³								
	Common soil	0.7	0.90	0.75	0.83	25	68.7	67.8	50.8
	Gravel & Sand	0.7	0.90	0.75	0.87	25	59.2	68.1	62.2
	Cobble Stone	0.7	0.75	0.75	0.87	25	49.3	56.7	51.8
	Weathered Rock	0.7	0.75	0.75	0.69	25	39.1	56.7	46.9
	Rock	0.7	0.75	0.75	0.61	25	34.6	57.1	45.0
e)	Backhoe 0.4 m ³								
	Common soil	0.4	0.90	0.75	0.83	25	68.7	38.7	29.0
	Gravel & Sand	0.4	0.90	0.75	0.87	25	33.8	38.9	35.5
	Cobble Stone	0.4	0.75	0.75	0.87	25	28.2	32.4	29.6
	Weathered Rock	0.4	0.75	0.75	0.69	25	22.4	32.4	26.8
	Rock	0.4	0.75	0.75	0.61	25	19.8	32.6	25.7

Table 4 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (3/9)

	C	B	K	n	Cms	Es	D	VI	V2	t1	t2	Cmt	Et	F	Q(I)	Q(L)	Q(C)
c) 11 Ton Dump Truck loaded by 0.7 m3 Backhoe																	
Common soil																	
	7.2	0.7	0.9	11.43	30	0.75	500	333	500	1	0.5	11.62	0.9	0.83	27.8	33.3	25.0
	7.2	0.7	0.9	11.43	30	0.75	1,000	333	500	1	0.5	14.12	0.9	0.83	22.9	27.4	20.6
	7.2	0.7	0.9	11.43	30	0.75	1,500	333	500	1	0.5	16.62	0.9	0.83	19.4	23.3	17.5
	7.2	0.7	0.9	11.43	30	0.75	2,000	333	500	1	0.5	19.13	0.9	0.83	16.9	20.2	15.2
	7.2	0.7	0.9	11.43	30	0.75	2,500	333	500	1	0.5	21.63	0.9	0.83	14.9	17.9	13.4
	7.2	0.7	0.9	11.43	30	0.75	3,000	333	500	1	0.5	24.13	0.9	0.83	13.4	16.0	12.0
	7.2	0.7	0.9	11.43	30	0.75	3,500	333	500	1	0.5	26.63	0.9	0.83	12.1	14.5	10.9
	7.2	0.7	0.9	11.43	30	0.75	4,000	333	500	1	0.5	29.13	0.9	0.83	11.1	13.3	10.0
	7.2	0.7	0.9	11.43	30	0.75	5,000	333	500	1	0.5	34.13	0.9	0.83	9.5	11.3	8.5
Gravel & Sand																	
	7.2	0.7	0.9	11.43	30	0.75	500	333	500	1	0.5	11.62	0.9	0.87	29.1	33.5	30.6
	7.2	0.7	0.9	11.43	30	0.75	1,000	333	500	1	0.5	14.12	0.9	0.87	24.0	27.5	25.1
	7.2	0.7	0.9	11.43	30	0.75	1,500	333	500	1	0.5	16.62	0.9	0.87	20.3	23.4	21.4
	7.2	0.7	0.9	11.43	30	0.75	2,000	333	500	1	0.5	19.13	0.9	0.87	17.7	20.3	18.6
	7.2	0.7	0.9	11.43	30	0.75	2,500	333	500	1	0.5	21.63	0.9	0.87	15.6	18.0	16.4
	7.2	0.7	0.9	11.43	30	0.75	3,000	333	500	1	0.5	24.13	0.9	0.87	14.0	16.1	14.7
	7.2	0.7	0.9	11.43	30	0.75	3,500	333	500	1	0.5	26.63	0.9	0.87	12.7	14.6	13.3
	7.2	0.7	0.9	11.43	30	0.75	4,000	333	500	1	0.5	29.13	0.9	0.87	11.6	13.4	12.2
	7.2	0.7	0.9	11.43	30	0.75	5,000	333	500	1	0.5	34.13	0.9	0.87	9.9	11.4	10.4
Cobble stone																	
	7.2	0.7	0.75	13.71	25	0.75	500	333	500	1	0.5	11.62	0.9	0.87	29.1	33.5	30.6
	7.2	0.7	0.75	13.71	25	0.75	1,000	333	500	1	0.5	14.12	0.9	0.87	24.0	27.5	25.1
	7.2	0.7	0.75	13.71	25	0.75	1,500	333	500	1	0.5	16.62	0.9	0.87	20.3	23.4	21.4
	7.2	0.7	0.75	13.71	25	0.75	2,000	333	500	1	0.5	19.13	0.9	0.87	17.7	20.3	18.6
	7.2	0.7	0.75	13.71	25	0.75	2,500	333	500	1	0.5	21.63	0.9	0.87	15.6	18.0	16.4
	7.2	0.7	0.75	13.71	25	0.75	3,000	333	500	1	0.5	24.13	0.9	0.87	14.0	16.1	14.7
	7.2	0.7	0.75	13.71	25	0.75	3,500	333	500	1	0.5	26.63	0.9	0.87	12.7	14.6	13.3
	7.2	0.7	0.75	13.71	25	0.75	4,000	333	500	1	0.5	29.13	0.9	0.87	11.6	13.4	12.2
	7.2	0.7	0.75	13.71	25	0.75	5,000	333	500	1	0.5	34.13	0.9	0.87	9.9	11.4	10.4
Weathered Rock																	
	7.2	0.7	0.75	13.71	25	0.75	500	333	500	1	0.5	11.62	0.9	0.69	23.1	33.5	27.7
	7.2	0.7	0.75	13.71	25	0.75	1,000	333	500	1	0.5	14.12	0.9	0.69	19.0	27.5	22.8
	7.2	0.7	0.75	13.71	25	0.75	1,500	333	500	1	0.5	16.62	0.9	0.69	16.1	23.4	19.4
	7.2	0.7	0.75	13.71	25	0.75	2,000	333	500	1	0.5	19.13	0.9	0.69	14.0	20.3	16.8
	7.2	0.7	0.75	13.71	25	0.75	2,500	333	500	1	0.5	21.63	0.9	0.69	12.4	18.0	14.9
	7.2	0.7	0.75	13.71	25	0.75	3,000	333	500	1	0.5	24.13	0.9	0.69	11.1	16.1	13.3
	7.2	0.7	0.75	13.71	25	0.75	3,500	333	500	1	0.5	26.63	0.9	0.69	10.1	14.6	12.1
	7.2	0.7	0.75	13.71	25	0.75	4,000	333	500	1	0.5	29.13	0.9	0.69	9.2	13.4	11.1
	7.2	0.7	0.75	13.71	25	0.75	5,000	333	500	1	0.5	34.13	0.9	0.69	7.9	11.4	9.4
Rock																	
	7.2	0.7	0.75	13.71	25	0.75	500	333	500	1	0.5	11.62	0.9	0.61	20.4	33.7	26.5
	7.2	0.7	0.75	13.71	25	0.75	1,000	333	500	1	0.5	14.12	0.9	0.61	16.8	27.7	21.8
	7.2	0.7	0.75	13.71	25	0.75	1,500	333	500	1	0.5	16.62	0.9	0.61	14.3	23.5	18.5
	7.2	0.7	0.75	13.71	25	0.75	2,000	333	500	1	0.5	19.13	0.9	0.61	12.4	20.5	16.1
	7.2	0.7	0.75	13.71	25	0.75	2,500	333	500	1	0.5	21.63	0.9	0.61	11.0	18.1	14.3
	7.2	0.7	0.75	13.71	25	0.75	3,000	333	500	1	0.5	24.13	0.9	0.61	9.8	16.2	12.8
	7.2	0.7	0.75	13.71	25	0.75	3,500	333	500	1	0.5	26.63	0.9	0.61	8.9	14.7	11.6
	7.2	0.7	0.75	13.71	25	0.75	4,000	333	500	1	0.5	29.13	0.9	0.61	8.1	13.4	10.6
	7.2	0.7	0.75	13.71	25	0.75	5,000	333	500	1	0.5	34.13	0.9	0.61	6.9	11.5	9.0

Table 5 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (4/9)

	C	B	K	n	Cms	Es	D	V1	V2	t1	t2	Cmt	Et	F	Q(I)	Q(L)	Q(C)
b)	11 Ton Dump Truck loaded by 1.2 m3 Backhoe																
	Weathered Rock																
	7.2	1.2	0.75	8.00	25	0.75	500	333	500	1	0.5	8.45	0.9	0.69	31.8	46.1	38.1
	7.2	1.2	0.75	8.00	25	0.75	1,000	333	500	1	0.5	10.95	0.9	0.69	24.5	35.5	29.4
	7.2	1.2	0.75	8.00	25	0.75	1,500	333	500	1	0.5	13.45	0.9	0.69	19.9	28.9	23.9
	7.2	1.2	0.75	8.00	25	0.75	2,000	333	500	1	0.5	15.95	0.9	0.69	16.8	24.4	20.2
	7.2	1.2	0.75	8.00	25	0.75	2,500	333	500	1	0.5	18.45	0.9	0.69	14.5	21.1	17.4
	7.2	1.2	0.75	8.00	25	0.75	3,000	333	500	1	0.5	20.95	0.9	0.69	12.8	18.6	15.4
	7.2	1.2	0.75	8.00	25	0.75	3,500	333	500	1	0.5	23.45	0.9	0.69	11.4	16.6	13.7
	7.2	1.2	0.75	8.00	25	0.75	4,000	333	500	1	0.5	25.96	0.9	0.69	10.3	15.0	12.4
	7.2	1.2	0.75	8.00	25	0.75	5,000	333	500	1	0.5	30.96	0.9	0.69	8.7	12.6	10.4
	7.2	1.2	0.75	8.00	25	0.75	10,000	333	500	1	0.5	55.97	0.9	0.69	4.8	6.9	5.8
	7.2	1.2	0.75	8.00	25	0.75	11,500	333	500	1	0.5	63.48	0.9	0.69	4.2	6.1	5.1
	7.2	1.2	0.75	8.00	25	0.75	14,000	333	500	1	0.5	75.99	0.9	0.69	3.5	5.1	4.2
	7.2	1.2	0.75	8.00	25	0.75	14,500	333	500	1	0.5	78.49	0.9	0.69	3.4	5.0	4.1
	7.2	1.2	0.75	8.00	25	0.75	20,000	333	500	1	0.5	106.00	0.9	0.69	2.5	3.7	3.0
	7.2	1.2	0.75	8.00	25	0.75	22,000	333	500	1	0.5	116.01	0.9	0.69	2.3	3.4	2.8
	7.2	1.2	0.75	8.00	25	0.75	27,000	333	500	1	0.5	141.03	0.9	0.69	1.9	2.8	2.3
	Rock																
	7.2	1.2	0.75	8.00	25	0.75	500	333	500	1	0.5	8.45	0.9	0.61	28.1	46.3	36.5
	7.2	1.2	0.75	8.00	25	0.75	1,000	333	500	1	0.5	10.95	0.9	0.61	21.7	35.7	28.2
	7.2	1.2	0.75	8.00	25	0.75	1,500	333	500	1	0.5	13.45	0.9	0.61	17.6	29.1	22.9
	7.2	1.2	0.75	8.00	25	0.75	2,000	333	500	1	0.5	15.95	0.9	0.61	14.9	24.5	19.3
	7.2	1.2	0.75	8.00	25	0.75	2,500	333	500	1	0.5	18.45	0.9	0.61	12.9	21.2	16.7
	7.2	1.2	0.75	8.00	25	0.75	3,000	333	500	1	0.5	20.95	0.9	0.61	11.3	18.7	14.7
	7.2	1.2	0.75	8.00	25	0.75	3,500	333	500	1	0.5	23.45	0.9	0.61	10.1	16.7	13.1
	7.2	1.2	0.75	8.00	25	0.75	4,000	333	500	1	0.5	25.96	0.9	0.61	9.1	15.1	11.9
	7.2	1.2	0.75	8.00	25	0.75	5,000	333	500	1	0.5	30.96	0.9	0.61	7.7	12.6	10.0
	7.2	1.2	0.75	8.00	25	0.75	10,000	333	500	1	0.5	55.97	0.9	0.61	4.2	7.0	5.5
	7.2	1.2	0.75	8.00	25	0.75	11,500	333	500	1	0.5	63.48	0.9	0.61	3.7	6.2	4.9
	7.2	1.2	0.75	8.00	25	0.75	14,000	333	500	1	0.5	75.99	0.9	0.61	3.1	5.1	4.1
	7.2	1.2	0.75	8.00	25	0.75	14,500	333	500	1	0.5	78.49	0.9	0.61	3.0	5.0	3.9
	7.2	1.2	0.75	8.00	25	0.75	20,000	333	500	1	0.5	106.00	0.9	0.61	2.2	3.7	2.9
	7.2	1.2	0.75	8.00	25	0.75	22,000	333	500	1	0.5	116.01	0.9	0.61	2.0	3.4	2.7
	7.2	1.2	0.75	8.00	25	0.75	27,000	333	500	1	0.5	141.03	0.9	0.61	1.7	2.8	2.2

Table 6 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (5/9)

	C	B	K	n	Cms	Es	D	V1	V2	t1	t2	Cmt	Et	F	Q(I)	Q(L)	Q(C)
b)	11 Ton Dump Truck loaded by 1.2 m3 Backhoe																
Common soil																	
7.2	1.2	0.9	6.67	30	0.75	500	333	500	1	0.5	8.45	0.9	0.83	38.2	45.8	34.4	
7.2	1.2	0.9	6.67	30	0.75	1,000	333	500	1	0.5	10.95	0.9	0.83	29.5	35.4	26.5	
7.2	1.2	0.9	6.67	30	0.75	1,500	333	500	1	0.5	13.45	0.9	0.83	24.0	28.8	21.6	
7.2	1.2	0.9	6.67	30	0.75	2,000	333	500	1	0.5	15.95	0.9	0.83	20.2	24.3	18.2	
7.2	1.2	0.9	6.67	30	0.75	2,500	333	500	1	0.5	18.45	0.9	0.83	17.5	21.0	15.7	
7.2	1.2	0.9	6.67	30	0.75	3,000	333	500	1	0.5	20.95	0.9	0.83	15.4	18.5	13.9	
7.2	1.2	0.9	6.67	30	0.75	3,500	333	500	1	0.5	23.45	0.9	0.83	13.8	16.5	12.4	
7.2	1.2	0.9	6.67	30	0.75	4,000	333	500	1	0.5	25.96	0.9	0.83	12.4	14.9	11.2	
7.2	1.2	0.9	6.67	30	0.75	5,000	333	500	1	0.5	30.96	0.9	0.83	10.4	12.5	9.4	
7.2	1.2	0.9	6.67	30	0.75	10,000	333	500	1	0.5	55.97	0.9	0.83	5.8	6.9	5.2	
7.2	1.2	0.9	6.67	30	0.75	11,500	333	500	1	0.5	63.48	0.9	0.83	5.1	6.1	4.6	
7.2	1.2	0.9	6.67	30	0.75	14,000	333	500	1	0.5	75.99	0.9	0.83	4.2	5.1	3.8	
7.2	1.2	0.9	6.67	30	0.75	14,500	333	500	1	0.5	78.49	0.9	0.83	4.1	4.9	3.7	
7.2	1.2	0.9	6.67	30	0.75	20,000	333	500	1	0.5	106.00	0.9	0.83	3.0	3.7	2.7	
7.2	1.2	0.9	6.67	30	0.75	22,000	333	500	1	0.5	116.01	0.9	0.83	2.8	3.3	2.5	
7.2	1.2	0.9	6.67	30	0.75	27,000	333	500	1	0.5	141.03	0.9	0.83	2.3	2.7	2.1	
Gravel & Sand																	
7.2	1.2	0.9	6.67	30	0.75	500	333	500	1	0.5	8.45	0.9	0.87	40.0	46.1	42.1	
7.2	1.2	0.9	6.67	30	0.75	1,000	333	500	1	0.5	10.95	0.9	0.87	30.9	35.5	32.4	
7.2	1.2	0.9	6.67	30	0.75	1,500	333	500	1	0.5	13.45	0.9	0.87	25.2	28.9	26.4	
7.2	1.2	0.9	6.67	30	0.75	2,000	333	500	1	0.5	15.95	0.9	0.87	21.2	24.4	22.3	
7.2	1.2	0.9	6.67	30	0.75	2,500	333	500	1	0.5	18.45	0.9	0.87	18.3	21.1	19.2	
7.2	1.2	0.9	6.67	30	0.75	3,000	333	500	1	0.5	20.95	0.9	0.87	16.1	18.6	17.0	
7.2	1.2	0.9	6.67	30	0.75	3,500	333	500	1	0.5	23.45	0.9	0.87	14.4	16.6	15.1	
7.2	1.2	0.9	6.67	30	0.75	4,000	333	500	1	0.5	25.96	0.9	0.87	13.0	15.0	13.7	
7.2	1.2	0.9	6.67	30	0.75	5,000	333	500	1	0.5	30.96	0.9	0.87	10.9	12.6	11.5	
7.2	1.2	0.9	6.67	30	0.75	10,000	333	500	1	0.5	55.97	0.9	0.87	6.0	6.9	6.3	
7.2	1.2	0.9	6.67	30	0.75	11,500	333	500	1	0.5	63.48	0.9	0.87	5.3	6.1	5.6	
7.2	1.2	0.9	6.67	30	0.75	14,000	333	500	1	0.5	75.99	0.9	0.87	4.5	5.1	4.7	
7.2	1.2	0.9	6.67	30	0.75	14,500	333	500	1	0.5	78.49	0.9	0.87	4.3	5.0	4.5	
7.2	1.2	0.9	6.67	30	0.75	20,000	333	500	1	0.5	106.00	0.9	0.87	3.2	3.7	3.4	
7.2	1.2	0.9	6.67	30	0.75	22,000	333	500	1	0.5	116.01	0.9	0.87	2.9	3.4	3.1	
7.2	1.2	0.9	6.67	30	0.75	27,000	333	500	1	0.5	141.03	0.9	0.87	2.4	2.8	2.5	
Cobble stone																	
7.2	1.2	0.75	8.00	25	0.75	500	333	500	1	0.5	8.45	0.9	0.87	40.0	46.1	42.1	
7.2	1.2	0.75	8.00	25	0.75	1,000	333	500	1	0.5	10.95	0.9	0.87	30.9	35.5	32.4	
7.2	1.2	0.75	8.00	25	0.75	1,500	333	500	1	0.5	13.45	0.9	0.87	25.2	28.9	26.4	
7.2	1.2	0.75	8.00	25	0.75	2,000	333	500	1	0.5	15.95	0.9	0.87	21.2	24.4	22.3	
7.2	1.2	0.75	8.00	25	0.75	2,500	333	500	1	0.5	18.45	0.9	0.87	18.3	21.1	19.2	
7.2	1.2	0.75	8.00	25	0.75	3,000	333	500	1	0.5	20.95	0.9	0.87	16.1	18.6	17.0	
7.2	1.2	0.75	8.00	25	0.75	3,500	333	500	1	0.5	23.45	0.9	0.87	14.4	16.6	15.1	
7.2	1.2	0.75	8.00	25	0.75	4,000	333	500	1	0.5	25.96	0.9	0.87	13.0	15.0	13.7	
7.2	1.2	0.75	8.00	25	0.75	5,000	333	500	1	0.5	30.96	0.9	0.87	10.9	12.6	11.5	
7.2	1.2	0.75	8.00	25	0.75	10,000	333	500	1	0.5	55.97	0.9	0.87	6.0	6.9	6.3	
7.2	1.2	0.75	8.00	25	0.75	11,500	333	500	1	0.5	63.48	0.9	0.87	5.3	6.1	5.6	
7.2	1.2	0.75	8.00	25	0.75	14,000	333	500	1	0.5	75.99	0.9	0.87	4.5	5.1	4.7	
7.2	1.2	0.75	8.00	25	0.75	14,500	333	500	1	0.5	78.49	0.9	0.87	4.3	5.0	4.5	
7.2	1.2	0.75	8.00	25	0.75	20,000	333	500	1	0.5	106.00	0.9	0.87	3.2	3.7	3.4	
7.2	1.2	0.75	8.00	25	0.75	22,000	333	500	1	0.5	116.01	0.9	0.87	2.9	3.4	3.1	
7.2	1.2	0.75	8.00	25	0.75	27,000	333	500	1	0.5	141.03	0.9	0.87	2.4	2.8	2.5	

Table 7 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (6/9)

	C	B	K	n	Cms	Es	D	V1	V2	t1	t2	Cmt	Et	F	Q(I)	Q(L)	Q(C)
a)	11 Ton Dump Truck loaded by 2.3 m3 wheel loader																
	Weathered Rock																
	7.2	2.3	0.65	4.82	60	0.75	500	333	500	1	0.5	10.42	0.9	0.69	25.7	37.3	30.9
	7.2	2.3	0.65	4.82	60	0.75	1,000	333	500	1	0.5	12.92	0.9	0.69	20.8	30.1	24.9
	7.2	2.3	0.65	4.82	60	0.75	1,500	333	500	1	0.5	15.43	0.9	0.69	17.4	25.2	20.9
	7.2	2.3	0.65	4.82	60	0.75	2,000	333	500	1	0.5	17.93	0.9	0.69	15.0	21.7	18.0
	7.2	2.3	0.65	4.82	60	0.75	2,500	333	500	1	0.5	20.43	0.9	0.69	13.1	19.0	15.8
	7.2	2.3	0.65	4.82	60	0.75	3,000	333	500	1	0.5	22.93	0.9	0.69	11.7	17.0	14.0
	7.2	2.3	0.65	4.82	60	0.75	3,500	333	500	1	0.5	25.43	0.9	0.69	10.5	15.3	12.7
	7.2	2.3	0.65	4.82	60	0.75	4,000	333	500	1	0.5	27.93	0.9	0.69	9.6	13.9	11.5
	7.2	2.3	0.65	4.82	60	0.75	5,000	333	500	1	0.5	32.94	0.9	0.69	8.1	11.8	9.8
	7.2	2.3	0.65	4.82	60	0.75	10,000	333	500	1	0.5	57.95	0.9	0.69	4.6	6.7	5.6
	Rock																
	7.2	2.3	0.65	4.82	60	0.75	500	333	500	1	0.5	10.42	0.9	0.61	22.8	37.5	29.6
	7.2	2.3	0.65	4.82	60	0.75	1,000	333	500	1	0.5	12.92	0.9	0.61	18.4	30.3	23.9
	7.2	2.3	0.65	4.82	60	0.75	1,500	333	500	1	0.5	15.43	0.9	0.61	15.4	25.4	20.0
	7.2	2.3	0.65	4.82	60	0.75	2,000	333	500	1	0.5	17.93	0.9	0.61	13.2	21.8	17.2
	7.2	2.3	0.65	4.82	60	0.75	2,500	333	500	1	0.5	20.43	0.9	0.61	11.6	19.2	15.1
	7.2	2.3	0.65	4.82	60	0.75	3,000	333	500	1	0.5	22.93	0.9	0.61	10.3	17.1	13.4
	7.2	2.3	0.65	4.82	60	0.75	3,500	333	500	1	0.5	25.43	0.9	0.61	9.3	15.4	12.1
	7.2	2.3	0.65	4.82	60	0.75	4,000	333	500	1	0.5	27.93	0.9	0.61	8.5	14.0	11.0
	7.2	2.3	0.65	4.82	60	0.75	5,000	333	500	1	0.5	32.94	0.9	0.61	7.2	11.9	9.4
	7.2	2.3	0.65	4.82	60	0.75	10,000	333	500	1	0.5	57.95	0.9	0.61	4.1	6.8	5.3

Table 8 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (7/9)**(5) Dump Truck**

$$Q = 60 * C * F * Et / Cmt$$

where

Q : Hourly Production (m³/hr)C : Vessel capacity (m³)

F : Swell or shrinkage factor as shown in Table A

Et : Operating efficiency

Cmt : Cycletime of dump truck

$$Cmt = n * Cms / (60 * Es) + (D/V1 + D/V2 + t1 + t2)$$

Cms : Cycletime of loader

n : Nos of loading operation

$$n = C / (B * K)$$

B : Bucket capacity of loader (m³)

K : Bucket coefficient

D : Hauling distance (m)

V1 : Travelling speed with load (m/min)

V2 : Travelling speed without load (m/min)

t1 : Unloading time (min)

t2 : Waiting and others (min)

Table A Swell or shrinkage factor

Material	Insitu	Loose	Compaction
Common soil	1.00	1.20	0.90
Gravel & Sand	1.00	1.15	1.05
Cobble Stone	1.00	1.15	1.05
Weathered Rock	1.00	1.45	1.20
Rock	1.00	1.65	1.30

	C	B	K	n	Cms	Es	D	V1	V2	t1	t2	Cmt	Et	F	Q(I)	Q(L)	Q(C)
a) 11 Ton Dump Truck loaded by 2.3 m³ wheel loader																	
Common soil																	
7.2	2.3	0.8	3.91	60	0.75	500	333	500	1	0.5	9.22	0.9	0.83	35.0	42.0	31.5	
7.2	2.3	0.8	3.91	60	0.75	1,000	333	500	1	0.5	11.72	0.9	0.83	27.5	33.0	24.8	
7.2	2.3	0.8	3.91	60	0.75	1,500	333	500	1	0.5	14.22	0.9	0.83	22.7	27.2	20.4	
7.2	2.3	0.8	3.91	60	0.75	2,000	333	500	1	0.5	16.72	0.9	0.83	19.3	23.2	17.4	
7.2	2.3	0.8	3.91	60	0.75	2,500	333	500	1	0.5	19.22	0.9	0.83	16.8	20.1	15.1	
7.2	2.3	0.8	3.91	60	0.75	3,000	333	500	1	0.5	21.73	0.9	0.83	14.9	17.8	13.4	
7.2	2.3	0.8	3.91	60	0.75	3,500	333	500	1	0.5	24.23	0.9	0.83	13.3	16.0	12.0	
7.2	2.3	0.8	3.91	60	0.75	4,000	333	500	1	0.5	26.73	0.9	0.83	12.1	14.5	10.9	
7.2	2.3	0.8	3.91	60	0.75	5,000	333	500	1	0.5	31.73	0.9	0.83	10.2	12.2	9.2	
7.2	2.3	0.8	3.91	60	0.75	10,000	333	500	1	0.5	56.75	0.9	0.83	5.7	6.8	5.1	
Gravel & Sand																	
7.2	2.3	0.8	3.91	60	0.75	500	333	500	1	0.5	9.22	0.9	0.87	36.7	42.2	38.5	
7.2	2.3	0.8	3.91	60	0.75	1,000	333	500	1	0.5	11.72	0.9	0.87	28.9	33.2	30.3	
7.2	2.3	0.8	3.91	60	0.75	1,500	333	500	1	0.5	14.22	0.9	0.87	23.8	27.4	25.0	
7.2	2.3	0.8	3.91	60	0.75	2,000	333	500	1	0.5	16.72	0.9	0.87	20.2	23.3	21.2	
7.2	2.3	0.8	3.91	60	0.75	2,500	333	500	1	0.5	19.22	0.9	0.87	17.6	20.2	18.5	
7.2	2.3	0.8	3.91	60	0.75	3,000	333	500	1	0.5	21.73	0.9	0.87	15.6	17.9	16.3	
7.2	2.3	0.8	3.91	60	0.75	3,500	333	500	1	0.5	24.23	0.9	0.87	14.0	16.1	14.7	
7.2	2.3	0.8	3.91	60	0.75	4,000	333	500	1	0.5	26.73	0.9	0.87	12.7	14.6	13.3	
7.2	2.3	0.8	3.91	60	0.75	5,000	333	500	1	0.5	31.73	0.9	0.87	10.7	12.3	11.2	
7.2	2.3	0.8	3.91	60	0.75	10,000	333	500	1	0.5	56.75	0.9	0.87	6.0	6.9	6.3	
Cobble stone																	
7.2	2.3	0.65	4.82	60	0.75	500	333	500	1	0.5	10.42	0.9	0.87	32.5	37.3	34.1	
7.2	2.3	0.65	4.82	60	0.75	1,000	333	500	1	0.5	12.92	0.9	0.87	26.2	30.1	27.5	
7.2	2.3	0.65	4.82	60	0.75	1,500	333	500	1	0.5	15.43	0.9	0.87	21.9	25.2	23.0	
7.2	2.3	0.65	4.82	60	0.75	2,000	333	500	1	0.5	17.93	0.9	0.87	18.9	21.7	19.8	
7.2	2.3	0.65	4.82	60	0.75	2,500	333	500	1	0.5	20.43	0.9	0.87	16.6	19.0	17.4	
7.2	2.3	0.65	4.82	60	0.75	3,000	333	500	1	0.5	22.93	0.9	0.87	14.8	17.0	15.5	
7.2	2.3	0.65	4.82	60	0.75	3,500	333	500	1	0.5	25.43	0.9	0.87	13.3	15.3	14.0	
7.2	2.3	0.65	4.82	60	0.75	4,000	333	500	1	0.5	27.93	0.9	0.87	12.1	13.9	12.7	
7.2	2.3	0.65	4.82	60	0.75	5,000	333	500	1	0.5	32.94	0.9	0.87	10.3	11.8	10.8	
7.2	2.3	0.65	4.82	60	0.75	10,000	333	500	1	0.5	57.95	0.9	0.87	5.8	6.7	6.1	

Table 9 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (8/9)

(6) Compacting Equipment

$$A = V \cdot W \cdot E/N$$

$$Q = V \cdot W \cdot E \cdot F \cdot D/N$$

where,

A : Hourly production (m³/hr)Q : Hourly production (m³/hr)

V : Operating speed (m/hr)

W : Effective compaction with (m)

$$W = W_o - 0.2$$

W_o : Drum width (m)

E : Operating efficiency

F : Swell or shrinkage factor

D : Compacted with (m)

N : Number of compaction

			V	W _o	W	E	F	D	N	A	Q(I)	Q(C)
a)	Vibrating Roller 8-10 T	(Embankment)	2,000	2.1	1.9	0.6	1.11	0.3	6	380.0	126.5	113.9
b)	Vibrating Roller 4 T	(Embankment)	2,000	1.1	0.9	0.6	1.11	0.3	6	180.0	59.9	53.9
c)	Vibrating Roller 500 Kg	(Embankment)	2,000	0.6	0.5	0.6	1.11	0.3	6	100.0	33.3	30.0
d)	Vibrating Compactor 90 Kg	(Backfill)	900		0.38	0.5	1.11	0.2	3	57.0	12.7	11.4
e)	Macadam Roller 10-12 T	(Base course)	2,000	2.1	1.9	0.6	0.95	0.2	6	380.0	72.2	75.8
		(Asphalt Concrete)	2,000	2.1	1.9	0.6	0.95	0.1	10	228.0	21.7	22.7
f)	Tire Roller 8-20 T	(Base course)	2,500	2.3	2.1	0.6	0.95	0.2	6	525.0	99.8	104.7
		(Asphalt Concrete)	2,500	2.3	2.1	0.6	0.95	0.1	10	315.0	29.9	31.4
g)	Tamper 80 Kg		900		0.25	0.5	0.95	0.2	3	37.5	7.1	7.5

(7) Motor Grader

$$Q = 60 \cdot W \cdot L \cdot H \cdot E \cdot F / (P \cdot C_m)$$

where,

Q : Hourly production (m³/hr)

W : Spreading width (m)

$$W = B \cdot \sin 60^\circ - 0.3$$

B : Blade width (m)

L : Spreading length (m)

H : Spreading depth (m)

E : Operating efficiency

F : Swell or shrinkage factor

P : Nos of grading

C_m : Cycletime (min)

$$C_m = L/V_1 + L/V_2 + 2 \cdot t$$

V₁ : Forwarding speed (m/min)V₂ : Reversing speed (m/min)

t : Gear change and others (min)

		W	B	L	H	E	F	P	V ₁	V ₂	t	C _m	Q(I)
a)	Motor Grader 3.1 m												
	Common soil	2.39	3.1	200	0.2	0.6	0.83	3	67	100	1	6.99	136
	Gravel & sand	2.39	3.1	200	0.2	0.6	0.87	3	67	100	1	6.99	142.6
b)	Motor Grader 3.7 m												
	Common soil	2.91	3.7	200	0.2	0.6	0.83	3	67	100	1	6.99	165.7
	Gravel & sand	2.91	3.7	200	0.2	0.6	0.87	3	67	100	1	6.99	173.7

(8) Agitator Truck

$$Q = 60 \cdot C \cdot E / C_m$$

where,

Q : Hourly Production (m³/hr)

C : Capacity of agitator truck

E : Operating efficiency

C_m : Cycletime

$$C_m = t_1 + t_2 + t_3 + D/V_1 + D/V_2$$

t₁ : Charging time (min)t₂ : Discharging time (min)t₃ : Waiting and setting time (min)

D : Hauling distance (m)

V₁ : Hauling speed (m/min)V₂ : Returning speed (m/min)

	C	E	t ₁	t ₂	t ₃	D	V ₁	V ₂	C _m	Q
4.5 m ³ Agitator Truck	4.5	0.8	3	5	2	500	333	500	12.50	17.28
	4.5	0.8	3	5	2	1,000	333	500	15.00	14.40
	4.5	0.8	3	5	2	1,500	333	500	17.50	12.34
	4.5	0.8	3	5	2	2,000	333	500	20.01	10.80
	4.5	0.8	3	5	2	2,500	333	500	22.51	9.60
	4.5	0.8	3	5	2	3,000	333	500	25.01	8.64
	4.5	0.8	3	5	2	3,500	333	500	27.51	7.85
	4.5	0.8	3	5	2	4,000	333	500	30.01	7.20
	4.5	0.8	3	5	2	4,500	333	500	32.51	6.64
	4.5	0.8	3	5	2	5,000	333	500	35.02	6.17
	4.5	0.8	3	5	2	7,000	333	500	45.02	4.80
	4.5	0.8	3	5	2	9,000	333	500	55.03	3.93
	4.5	0.8	3	5	2	11,000	333	500	65.03	3.32

Table 10 HOURLY PRODUCTION RATE OF CONSTRUCTION EQUIPMENT (9/9)**(9) Concrete Pump**

$$Q = q * E * Tf$$

where,

Q : Hourly Production (m³/hr)q : Capacity of concrete pump (m³/hr)

E : Operating efficiency

Tf : Rate of actual operation hour

		q	E	Tf	Q
a)	45 m ³ Concrete Pump	45	0.7	0.6	18.9
b)	60 m ³ Concrete Pump	60	0.7	0.6	25.2
c)	80 m ³ Concrete Pump	80	0.7	0.6	33.6

(10) Steel Sheet Pile

$$Q = 60/Tc$$

$$Tc = (Ts + Tb)/F$$

where,

Q : Hourly Production (No/hr)

Tc : Construction time of sheet pile (min)

Ts : Preparatory time (min)

Tb : Driving or extracting time (min)

$$Tb = rb * l * K$$

rb : Driving or extracting time per meter (min/m)

Piling : 1.8 (60 kW Vibro Hammer), 2.05 (2.5 t Diesel Hammer)

Extracting : 0.7 (60 kW Vibro Hammer)

l : Length of piling (m)

k : Coefficient of sheet pile and equipment

Piling : Type III 0.85 (60 kW Vibro Hammer), Type IV 1.1 (2.5 t Diesel Hammer)

Extracting : 0.9 (60 kW Vibro Hammer)

F : Operating efficiency

Note : N Value 35 < N

Length	F	K	l	rb	Tb	Ts	Tc	Q
Sheet Pile, L = 12 m, Type III								
Driving (60 kW Vibro Hammer)	0.8	0.85	6.0	1.80	9.18	7.0	20.23	3.0
Driving (2.5 t Diesel Hammer)	0.8	1.00	12.0	2.05	24.60	7.0	39.50	1.5
Extracting (60 kW Vibro Hammer)	0.7	0.90	6.0	0.70	3.78	4.0	11.11	5.4
Extracting (60 kW Vibro Hammer)	0.7	0.90	12.0	0.70	7.56	4.0	16.51	3.6
Sheet Pile, L = 12 m, Type IV								
Driving (2.5 t Vibro Hammer)	0.8	1.10	6.0	2.05	13.53	7.0	25.66	2.3
Extracting (60 kW Vibro Hammer)	0.7	0.90	6.0	0.70	3.78	4.0	11.11	5.4

(11) Pile Work

$$Q = 60/Tc$$

$$Tc = (Tb + Tw + Tp)/F$$

where,

Q : Hourly production (No/hr)

Tc : Construction time of PC. pile (min)

Tb : Driving time (min)

$$Tb = K * a * l^b$$

K : Coefficient of pile

a : Coefficient of soil

l : Length of piling (m)

b : Coefficient of hammer

Tw : Welding time (min)

Tp : Preparatory time (min)

F : Operating efficiency

Length	F	TP	Tw	b	l	a	K	Tb	Tc	Q
PC. pile, 400 mm (2.5 t hammer)										
10 m	0.9	16	0	0.89	10	1.4	1.0	10.9	29.9	2.0
15 m	0.9	21	16	0.89	15	1.4	1.0	15.6	58.4	1.0
20 m	0.9	21	16	0.89	20	1.4	1.0	20.1	63.5	0.9
25 m	0.9	26	32	0.89	25	1.4	1.0	24.6	91.7	0.7
30 m	0.9	26	32	0.89	30	1.4	1.0	28.9	96.5	0.6

Table 11 DAILY WAGE OF LABOUR

Description	Unit	Foreign Currency (Rp.)	Local Currency (Rp.)
Foreman A	Man-day	-	12,960
Foreman B	Man-day	-	8,640
Operator A	Man-day	-	10,800
Operator B	Man-day	-	8,640
Driver A	Man-day	-	9,720
Driver B	Man-day	-	7,560
Mechanic A	Man-day	-	9,180
Mechanic B	Man-day	-	7,560
Electrician A	Man-day	-	9,180
Electrician B	Man-day	-	7,560
Carpenter	Man-day	-	8,100
Form Worker	Man-day	-	8,100
Reinforcing Worker	Man-day	-	7,560
Concrete Worker	Man-day	-	7,560
Driller	Man-day	-	8,100
Powder man	Man-day	-	9,180
Tunnel Worker	Man-day	-	9,720
Plumber	Man-day	-	7,560
Welder	Man-day	-	9,180
Mason	Man-day	-	7,020
Boring Worker	Man-day	-	8,100
Grout Worker	Man-day	-	8,100
Rigger	Man-day	-	8,640
Gabion Worker	Man-day	-	7,020
Pavement Worker	Man-day	-	7,020
Skilled Labour	Man-day	-	8,640
Common Labour	Man-day	-	5,400
Foreign Technician A	Man-day	639,630	-
Foreign Technician B	Man-day	426,420	-

Table 12 UNIT COST OF EQUIPMENT

Description	Capacity	Unit	Foreign Currency (Rp.)	Local Currency (Rp.)
Buildozer	11 ton	hour	29,883	9,760
Buildozer	16 ton	hour	39,756	12,984
Buildozer	21 ton	hour	70,225	22,657
Buildozer	32 ton	hour	100,080	32,289
Buildozer	40 ton	hour	100,080	32,289
Swamp Bulldozer	13 ton	hour	76,481	24,934
Bulldozer w/ripper	21 ton	hour	108,609	35,041
Bulldozer w/ripper	32 ton	hour	22,359	7,302
Backhoe	0.35 m3	hour	48,027	15,686
Backhoe	0.70 m3	hour	50,162	16,384
Backhoe	0.80 m3	hour	73,109	23,877
Backhoe	1.20 m3	hour	31,485	10,283
Crawler Loader	1.40 m3	hour	50,162	16,384
Crawler Loader	2.30 m3	hour	74,711	24,399
Crawler Loader	3.20 m3	hour	32,752	10,567
Crawler Loader, Slide dump	0.8 m3	hour	57,317	18,493
Crawler Loader, Slide dump	1.6 m3	hour	26,068	8,515
Wheel Loader	1.40 m3	hour	43,492	14,204
Wheel Loader	2.30 m3	hour	60,835	19,869
Wheel Loader	3.20 m3	hour	53,490	15,038
Muck Loader, Rail	0.35 m3	hour	81,488	22,910
Muck Loader, Rail	0.60 m3	hour	15,806	5,562
Dump Truck	4 ton	hour	26,151	9,204
Dump Truck	8 ton	hour	37,195	13,090
Dump Truck	11 ton	hour	16,647	5,859
Dump Truck, Tunnel	4 ton	hour	27,546	9,693
Dump Truck, Tunnel	8 ton	hour	39,152	13,779
Dump Truck, Tunnel	11 ton	hour	14,202	5,155
Cargo Truck	4 ton	hour	19,194	6,966
Cargo Truck	8 ton	hour	28,953	10,508
Cargo Truck	11 ton	hour	68,039	19,297
Tractor w/ Semi Trailer	32 ton	hour	61,877	21,226
Battery Locomotive	6 ton	hour	75,921	26,044
Battery Locomotive	10 ton	hour	106,292	36,462
Muck Car	8 ton	hour	25,450	6,397
Muck Car	4.5 m3	day	31,408	7,895
Crawler Crane	6.0 m3	hour	104,160	42,970
Crawler Crane	40 ton	hour	57,830	19,181
Crawler Crane	50 ton	hour	246,742	101,792
Truck Crane	10 ton	hour	39,244	16,834
Truck Crane	20 ton	hour	61,708	26,470
Truck Crane	25 ton	hour	84,349	34,798
Truck Crane	30 ton	hour	92,561	39,704
Truck Crane	35 ton	hour	112,865	46,561
Truck Crane	3 ton	hour	144,433	59,585
Diesel Pile Hammer	2.5 ton	hour	26,775	8,803
Diesel Pile Hammer	3.5 ton	hour	33,549	11,030
Vibration Hammer	40 kw	hour	35,769	10,098
Grout Pump	30 l/min	hour	2,547	909
Grout Pump	100 l/min	hour	4,736	1,691
Grout Pump	200 l/min	hour	5,900	2,107
Grout Mixer	100 l x 1	hour	1,082	386
Grout Mixer	200 l x 2	hour	2,525	902
Grout Mixer	400 l x 2	hour	4,077	1,456
Boring Machine	5.5 kw	hour	8,962	3,201
Grout Measuring Device	0 - 120 l	hour	10,662	3,440
Leg Hammer	30 kg	hour	1,574	376
Leg Hammer	40 kg	hour	1,771	423
Pick Hammer	7.5 kg	hour	218	52
Drill Jumbo, Hyd. Rail	2 boom, 100kg	hour	225,129	73,526
Drill Jumbo, Hyd. Crawler	2 boom, 100 kg	hour	337,449	108,872
Crawler drill, Air	80 kg	hour	21,390	7,033
Crawler drill, Hyd.	150 kg	hour	28,986	9,508
Crawler drill, Hyd.	100 kg	hour	110,326	151,955
Crawler drill, Hyd.	150 kg	hour	124,843	41,045
Dust Collector	180 kg	hour	138,391	45,500
Dust Collector	150 m3/min	hour	44,863	12,594
Dust Collector	300 m3/min	hour	52,503	14,657
Shotcrete	5 - 10 m3	hour	51,250	16,195
Motor Grader	10 - 15 m3	hour	92,440	29,211
Motor Grader	3.1 m	hour	36,159	13,506
Macadam Roller	3.7 m	hour	47,116	17,585
Tire Roller	8 - 20 ton	hour	23,823	8,891
Vibration Roller	0.5 ton	hour	26,877	10,031
Vibration Roller	4 ton	hour	4,081	1,523
Vibration Roller	8 - 10 ton	hour	15,394	5,746
Vibration Roller	15 - 18 ton	hour	44,129	16,470
Tamping Roller	13.5 - 20 ton	hour	69,016	25,758
Tractor	21 ton	hour	31,001	12,641
Air Tamper	18 kg	hour	60,568	19,781
Tamper	80 kg	hour	415	81
Compactor	90 kg	hour	1,062	211
Concrete Plant	1.0 m3 x 2	hour	963	192
Agitator Truck	3.2 m3	hour	201,784	73,239
Agitator Truck	4.5 m3	hour	25,654	8,379
Concrete Pump Truck w/Boom	45 m3/hr	hour	37,261	12,169
Concrete Pump Truck w/Boom	60 m3/hr	hour	91,437	25,757
Concrete Pump	45 m3/hr	hour	113,856	32,073
Concrete Pump	60 m3/hr	hour	87,100	24,767
Concrete Pacer	3 m3	hour	127,165	36,159
Concrete Pacer	4.5 m3	hour	43,549	12,383
Agitator Car	3 m3	hour	66,777	18,987
Agitator Car	4 m3	hour	37,044	10,534
Asphalt Plant	40 t/h	hour	236,674	86,660
Asphalt Finisher	2.4 - 5 m	hour	103,067	43,046
Asphalt Sprayer	200 l	day	3,064	764
Asphalt Kettle	200 l	day	4,663	1,162
Sprinkler Truck	6 kl	hour	16,181	5,980
Port. Air Compressor	7.5 m3/min	hour	9,494	2,937
Port. Air Compressor	10.5 m3/min	hour	14,580	4,511
Port. Air Compressor	14.5 m3/min	hour	16,839	5,210
St. Air Compressor	12 m3/min	hour	9,175	2,853
St. Air Compressor	20 m3/min	hour	15,097	4,696
Axial Fan	50 m3/min	day	2,107	579
Axial Fan	130 m3/min	day	3,953	1,085
Axial Fan	185 m3/min	day	4,956	1,362
Contra Axial Fan	150 m3/min	day	30,380	8,343
Contra Axial Fan	400 m3/min	day	57,669	15,837
Contra Axial Fan	500 m3/min	day	79,580	21,855
Contra Axial Fan	750 m3/min	day	96,115	26,394
Contra Axial Fan	1,000 m3/min	day	107,894	29,630
Submersible Pump	80 mm x 20 m	day	4,980	1,468
Submersible Pump	100 mm x 20 m	day	8,357	2,461
Submersible Pump	150 mm x 20 m	day	11,954	3,521
Submersible Pump	200 mm x 20 m	day	17,833	5,253
Diesel Generator	45 KVA	hour	4,584	1,576
Grout Central Plant	60 kw	hour	6,824	2,346
Concrete Bucket	1.0 m3	day	11,432	3,135
Concrete Vibrator	1.5 m3	day	26,063	7,146
Concrete Vibrator	38 mm	day	3,913	821
Engine Welder	70 mm	day	6,553	1,374
Rail	250 A	day	29,050	6,991
Turn Table	22 kg/m	day	2,107	982
Turn Table	30 kg/m	day	3,053	1,422
Port. Belt Conveyor	8 ton	day	76,765	26,005
Quick Agent Supply	11 ton	hour	83,162	28,173
Dredger	7 m	hour	1,553	326
Dredger	2.4 l/min	hour	4,141	1,011
Dredger	1,350 ps	hour	620,842	427,077

Table 13 UNIT PRICE OF MATERIAL

Description	Unit	Foreign Currency (Rp.)	Local Currency (Rp.)	Description	Unit	Foreign Currency (Rp.)	Local Currency (Rp.)
Light Oil (Diesel)	lit	140	250	Horizontal Frame	p.c.	23,070	9,890
Gasoline	lit	270	450	Cross Brass	p.c.	7,210	3,090
Kerosine	lit	120	250	Coupling Pin	p.c.	1,440	620
Engine Oil	lit	2,040	3,110	Arm Lock	p.c.	1,800	770
Grease	kg	4,510	6,820	Jack Base	p.c.	7,930	3,400
Portland Cement	ton	123,590	82,410	Drilling Bit, 38 mm	p.c.	163,150	9,060
Air Entraining Agent	kg	2,850	340	Rod, 25 H	p.c.	383,780	21,320
Water Reducing Agent	kg	2,210	260	Shank Rod, 32 mm	p.c.	441,340	24,520
Quick Setting Agent	kg	3,590	420	Joint Sleeve, 32 mm	p.c.	153,590	8,530
Reinforcement Bar (Deormed)	ton	757,050	324,450	Taper Rod, 22 mm, 1.4 m	p.c.	225,310	0
Reinforcement Bar (Roand)	ton	721,000	309,000	Toper Rod, 22 mm, 1.7 m	p.c.	252,350	0
H-Shape Steel	ton	1,170,080	292,520	Toper Rod, 22 mm, 2.0 m	p.c.	279,390	0
Channel Steel	ton	997,040	249,260	Cross Bit, 36 mm	p.c.	149,250	0
Steel Plate	ton	955,840	238,960	Cross Bit, 44 mm	p.c.	169,070	0
Annealed Iron Wire	kg	1,440	620	Cross Bit, 46 mm	p.c.	175,840	0
Steel Wire	kg	1,950	830	Cross Bit, 65 mm	p.c.	556,200	0
Nail	kg	2,810	1,210	Drilling Rod, 32 R, 3 m	p.c.	762,200	0
Welded Wire Mesh	sq. m	3,960	990	Shank Rod, 32 R	p.c.	485,650	0
Wire Net	sq. m	8,240	2,060	Joint Sleeve, 32 R	p.c.	168,920	0
Dynamite, Open	kg	5,550	4,540	Diamond Bit	carat	214,340	53,590
Dynamite, Tunel	kg	6,510	5,340	Diamond Reamer	carat	195,860	50,010
AnFo	kg	960	790	Boring Rod 40.5 mm	p.c.	354,400	88,600
Electric Detonator	p.c.	880	1,080	Metal Crown (Bit), 46 mm	p.c.	105,550	26,390
Kamper (class 17, Plank)	cu. m	120,510	281,190	Tube Core Barrel, 46 mm, 1.5 m	p.c.	341,140	85,280
Plywood	cu. m	186,950	436,210	Core Lifter	p.c.	146,510	34,570
Steel Sheet Pile (Type II)	m	92,700	10,300	Steel Pipe 50 mm, 6 m	m	5,550	2,380
Steel Sheet Pile (Type III)	m	115,880	12,880	Steel Pipe 65 mm, 6 m	m	7,790	3,340
Steel Sheet Pile (Type IV)	m	148,320	16,480	Steel Pipe 80 mm, 6 m	m	9,010	3,860
Concrete Pipe w/ Re-Bar, 400 mm	m	44,500	29,660	Steel Pipe 100 mm, 6 m	m	13,120	5,620
Concrete Pipe w/ Re-Bar, 500 mm	m	67,980	45,320	Steel Pipe 150 mm, 6 m	m	20,400	8,740
Concrete Pipe w/ Re-Bar, 600 mm	m	98,880	65,920	Rockbolt 25 mm, 2.5 m	p.c.	41,720	4,640
Concrete Pipe w/ Re-Bar, 1,000 mm	m	218,280	145,520	Bearing Plate	p.c.	6,670	740
Concrete Pipe w/ Re-Bar, 1,200 mm	m	370,800	247,200	Nut (M25)	p.c.	4,450	490
Concrete Pipe w/ Re-Bar, 1,500 mm	m	414,550	276,370	Regin (27 mm x 320 mm)	p.c.	16,690	1,850
Concrete Pipe w/ Re-Bar, 1,800 mm	m	501,820	334,540	Grass for Slope Protection	sq. m	0	1,030
Concrete Pipe w/ Re-Bar, 2,600 mm	m	1,023,410	682,270	Electricity (PLN)	kwh	30	120
Bentonite	kg	1,030	110	Electricity (Self Supply)	kwh	120	120
PVC Pipe 50 mm	m	5,520	1,380	Asphalt	ton	360,500	360,500
PVC Pipe 75 mm	m	11,120	2,780	Coarse Aggregate	cu.m	25,240	10,820
PVC Pipe 100 mm	m	16,810	4,200	Fine Aggregate	cu.m	25,240	10,820
PVC Pipe 150 mm	m	32,630	8,160	Crusher Run	cu.m	25,240	10,820
PVC Water Stop 200 mm	m	17,300	4,330	Gravel	cu.m	21,630	9,270
PVC Water Stop 300 mm	m	28,840	7,210	Sand	cu.m	21,630	9,270
Elastic Joint Filler, 10 mm	sq. m	17,300	4,330	Masonry Stone	cu.m	15,860	6,800
Adhesive for PVC Pipe	kg	10,880	2,720	Clamp	p.c.	1,850	210
Metal Form 300 x 500	p.c.	53,560	13,390	Cone	p.c.	560	60
Pipe Support 48.6 mm	m	4,610	1,980	Separator, 8 - 10 mm	m	1,110	120
Portal Frame 1,219 x 1700 mm	p.c.	21,630	9,270	Form Oil	lit	820	1,240
				Form Tie 250 mm	p.c.	700	1,050

Table 14 UNIT COST OF EACH WORK ITEM

Description	Unit	Total (Rp.)	Foreign Currency (Rp.)	Local Currency (Rp.)	Description	Unit	Total (Rp.)	Foreign Currency (Rp.)	Local Currency (Rp.)
Clearing and Stripping	sq. m	1,900	1,210	690	Concrete Pile 500 mm	m	178,800	96,530	82,270
Excavation, common, River	cu. m	5,700	3,870	1,830	Concrete Pile 400 mm	m	114,430	61,780	52,650
Excavation, Wethered, River	cu. m	10,160	6,930	3,230	Base Coarse	cu. m	67,690	46,520	21,170
Excavation, Rock, River	cu. m	24,900	18,010	6,890	Subbase Coarse	cu. m	60,920	41,870	19,050
Excavation Div. Tunnel	cu. m	161,900	105,770	56,130	Surface Course	sq. m	8,060	4,400	3,660
Shotcrete, T = 10cm, Tunnel	sq. m	71,780	52,820	18,960	Road Drainage U-300 x 500	m	92,810	44,460	48,350
Rockbolt, Tunnel	m	48,020	40,890	7,130	Concrete Pipe 800 mm	m	309,250	181,220	128,030
Steel Support H 125 & H 150	ton	3,733,070	2,666,660	1,066,410	Concrete Pipe 1,000 mm	m	530,870	290,470	240,400
Random Backfill	cu. m	6,400	4,080	2,320	Concrete Pipe 1,200 mm	m	624,080	366,520	257,560
Shotcrete, t = 10 cm, Open	sq. m	39,020	26,180	12,840	Concrete Pipe 1,500 mm	m	940,180	553,270	386,910
Concrete, Open, 180 kg/cm ²	cu. m	159,760	105,840	53,920	Concrete Pile 2,200 mm	m	2,812,580	1,690,380	1,122,200
Concrete, Tunnel, 180 kg/cm ²	cu. m	184,270	120,730	63,540	Concrete Block, Revetment	sq. m	128,960	70,470	58,490
Concrete, Plug, 150 kg/cm ²	cu. m	172,220	113,320	58,900	Joint Filler, 10 mm	sq. m	31,690	23,390	8,300
Form, Open, Plywood	sq. m	28,060	8,780	19,280	Perforated PVC Pipe, 200 mm	m	61,220	47,970	13,250
Form, Tunnel	sq. m	52,370	46,750	5,620	Steel Form for Surge Tank	sq. m	75,040	66,080	8,960
Reinforcement, Open	ton	1,756,010	1,064,770	691,240	Weep Hole, 75 mm	m	20,360	15,830	4,530
Reinforcement, Tunnel	ton	1,909,910	1,107,300	802,610	Excavation, Spoil Bank (1 km)				
Curtain Gout, Tunnel	m	241,740	183,820	57,920	1) Common	cu. m	5,300	3,700	1,600
Embankment, Core, L = 20km	cu. m	29,380	20,120	9,260	2) Soft rock	cu. m	9,060	6,320	2,740
Embankment, Filter, L = 20km	cu. m	24,480	16,840	7,640	Excavation, Stockpile (0.5 km)				
Embankment, Rock, L = 27km	cu. m	53,920	39,500	14,420	1) Common	cu. m	4,820	3,350	1,470
Blanket Grout, Crowler Drill	m	135,360	101,700	33,660	2) Soft rock	cu. m	8,250	5,740	2,510
Curtain Grout, Open	m	241,380	183,550	57,830	Excavation, Stockpile (3.5 km)				
Excavation, Common, Spillway	cu. m	7,940	5,370	2,570	1) Common	cu. m	8,670	6,110	2,560
Excavation, Weathered, Spillway	cu. m	12,620	8,640	3,980	2) Soft rock	cu. m	10,550	6,630	3,920
Excavation, Rock, Spillway	cu. m	36,620	28,230	8,390	Embankment, Waterway	cu. m	5,950	4,100	1,850
Backfill, Impervious Materials	cu. m	6,800	4,340	2,460					
Backfill Pervious Materials	cu. m	25,370	17,860	7,510					
Concrete, Open, 210 kg/cm ²	cu. m	161,310	106,700	54,610					
Form, Open, Metal & Plywood	sq. m	23,020	8,620	14,400					
Excavation, Common, Intake	cu. m	7,050	4,680	2,370					
Excavation, Weathered, Intake	cu. m	10,880	7,410	3,470					
Excavation, Rock, Intake	cu. m	28,000	20,120	7,880					
Consolidation Gout, Boring Mach.	m	221,710	169,770	51,940					
Embankment, Core, L = 10km	cu. m	18,190	12,370	5,820					
Embankment, Filter, L = 14km	cu. m	19,230	13,200	6,030					
Embankment, Rock, L = 22km	cu. m	49,120	35,990	13,130					
Riprap, L = 22km	cu. m	75,540	53,000	22,540					
Sod Facing	sq. m	3,220	270	2,950					
Wet Masonry Wall	cu. m	81,630	44,580	37,050					
Wet Masonry Wall, t = 300 mm	sq. m	24,500	13,380	11,120					
Excavation, Shaft	cu. m	110,200	78,730	31,470					
Embankment, Core, L = 11.5 km	cu. m	19,950	13,590	6,360					
Embankment, Filter, L = 11.5 km	cu. m	16,970	11,640	5,330					
Embankment Rock, L = 14.5 km	cu. m	41,360	30,620	10,740					
Shotcrete, t = 10cm, Tunnel	sq. m	74,890	51,950	22,940					
Concrete, Tunnel, Rail, 180 kg/cm ²	cu. m	250,480	161,540	88,940					
Excavation, Tunnel, Rail	cu. m	166,580	105,030	61,550					
Concrete, Plug, Rail, 150 kg/cm ²	cu. m	243,730	157,850	85,880					
Form Work, Needle Beam	sq. m	44,210	30,610	13,600					
Embankment, Homogeneous	cu. m	9,850	6,610	3,240					
Gravel Metalling	cu. m	64,890	44,630	20,260					
Dry Masonry, t = 300 mm	sq. m	22,350	12,870	9,480					
Dredging	cu. m	7,440	4,320	3,120					
Excavation, Common, Backhoe	cu. m	4,900	3,300	1,600					
Excavation, Shortcut, Backhoe	cu. m	7,220	4,870	2,350					
Excavation, Soft Rock	cu. m	10,160	6,930	3,230					
Embankment, Borrowed Material, L = 1 km	cu. m	8,540	5,640	2,900					
Embankment, Borrowed Material, L = 0.5 km	cu. m	7,990	5,230	2,760					
Embankment, Excavated Material	cu. m	5,910	3,690	2,220					
Drainage Ditch	cu. m	8,970	6,050	2,920					
Gabion	cu. m	50,600	32,950	17,650					
Gravel Bedding/Sand Bedding	cu. m	28,600	18,940	9,660					
Concrete, Levelling, 150 kg/cm ²	cu. m	153,500	102,160	51,340					
Water Stop, 200 mm	m	31,690	23,390	8,300					
Water Stop, 300 mm	m	49,480	38,010	11,470					
Water Stop, Surface Type	m	76,060	66,600	9,460					
Fence, H = 3 m	m	223,110	195,890	27,220					

Table 15 CONSTRUCTION COST FOR KSCS IN PHASE I (1/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
1. Preparation Works						
1.1 Access Road (Improvement of existing village road)	km	8	866,671,990	389,461,480	6,933,375,920	3,115,691,840
1.2 Base Camp (Office and quarters)	L.S.				1,829,188,330	4,486,428,000
1.3 Other Works (2% of Item 2)	L.S.				1,940,031,549	1,197,060,876
Total of Item 1					10,702,595,799	8,799,180,716
2. Civil Works						
2.1 Waterway						
(1) Clearing and stripping	m2	969,100	1,210	690	1,172,611,000	668,679,000
(2) Excavation, Spoil bank (1 km)						
1) Common	m3	1,180,500	3,700	1,600	4,367,850,000	1,888,800,000
2) Soft rock	m3	795,500	6,320	2,740	5,027,560,000	2,179,670,000
(3) Excavation, Stock pile (0.5 km)						
1) Common	m3	299,300	3,350	1,470	1,002,655,000	439,971,000
2) Soft rock	m3	143,300	5,740	2,510	822,542,000	359,683,000
(4) Excavation, Stock pile (3.5 km)						
1) Common	m3	572,800	6,110	2,560	3,499,808,000	1,466,368,000
2) Soft rock	m3	429,700	6,630	3,920	2,848,911,000	1,684,424,000
(5) Embankment	m3	1,333,400	4,100	1,850	5,466,940,000	2,466,790,000
(6) Slope protection with sod facing	m2	480,200	270	2,950	129,654,000	1,416,590,000
(7) Slope protection with shotcrete	m2	120,300	26,180	12,840	3,149,454,000	1,544,652,000
(8) Backfill, Random material	m3	142,200	4,080	2,320	580,176,000	329,904,000
(9) Gravel for drain	m3	39,200	17,860	7,510	700,112,000	294,392,000
(10) Gravel bedding for canal in embankment	m3	5,700	18,950	9,660	108,015,000	55,062,000
(11) Structural concrete (210 kg/cm2)	m3	142,300	106700	54610	15,183,410,000	7,771,003,000
(12) Levelling concrete (150 kg/cm2)	m3	18,200	102,160	51,340	1,859,312,000	934,388,000
(13) Form	m3	467,800	8,780	19,280	4,107,284,000	9,019,184,000
(14) Reinforcing bar	ton	14,400	1,064,770	691,240	15,332,688,000	9,953,856,000
(15) PVC water stop (B=20cm)	m	40,700	23,390	8,300	951,973,000	337,810,000
(16) Joint filler (t=10mm)	m2	3,400	23,390	8,300	79,526,000	28,220,000
(17) Perforated PVC pipe for drain (D=0.2m)	m	58,400	47,970	13,250	2,801,448,000	773,800,000
(18) Others (5 %)	L.S.				3,459,596,450	2,180,662,300
Sub-total					72,651,525,450	45,793,908,300
2.2 Syphon						
(1) Coffering and dewatering	L.S.				949,371,600	246,437,000
(2) Cleaning and stripping	m2	21,900	1,210	690	26,499,000	15,111,000
(3) Excavation,common	m3	65,500	4,680	2,370	306,540,000	155,235,000
(4) Backfill	m3	36,400	4,080	2,320	148,512,000	84,448,000
(5) Embankment	m3	40,000	4,100	1,850	164,000,000	74,000,000
(6) Gravel bedding	m3	250	18,950	9,660	4,737,500	2,415,000
(7) Slope protection with sod facing	m2	29,800	270	2,950	8,046,000	87,910,000
(8) Structural concrete (210 kg/cm2)	m3	7,300	106,700	54,610	778,910,000	398,653,000
(9) Levelling concrete (150 kg/cm2)	m3	500	102,160	51,340	51,080,000	25,670,000
(10) Form	m2	22,100	8,780	19,280	194,038,000	426,088,000
(11) Reinforcing bar	ton	730	1,064,770	691,240	777,282,100	504,605,200
(12) Joint filler (t=10mm)	m2	640	23,390	8,300	14,969,600	5,312,000
(13) PVC waterstop (B=20cm)	m	1,300	23,390	8,300	30,407,000	10,790,000
(14) Miscellaneous metal work (screen and etc.)	ton	7	9,246,270	1,027,360	64,723,890	7,191,520
(15) Revetment with concrete block	m2	9,900	70,470	58,490	697,653,000	579,051,000
(16) Gabion mattress	m3	780	32,960	17,650	25,708,800	13,767,000
(16) Others (5 %)	L.S.				212,123,925	131,834,186
Sub-total					4,454,602,415	2,768,517,906
2.3 Railway Crossing						
(1) Clearing and Stripping	m2	1,200	1,210	690	1,452,000	828,000
(2) Slope protection with concrete block	m2	800	70,470	58,490	56,376,000	46,792,000
(3) Slope protection with sod facing	m2	1,600	270	2,950	432,000	4,720,000
(4) Excavation, underground	m3	2,300	105,770	56,130	243,271,000	129,099,000
(5) Structural concrete (210 kg/cm2)	m3	1,000	106,700	54,610	106,700,000	54,610,000
(6) Form	m2	2,700	8,780	19,280	23,706,000	52,056,000
(7) Reinforcing bar	ton	94	1,064,770	691,240	100,088,380	64,976,560

Table 16 CONSTRUCTION COST FOR KSCS IN PHASE I (2/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
(8) Preparation work and construction with Forword jack pulling method	L.S.				5,676,033,000	1,419,008,000
(9) Waterstop (surface type)	m	210	66,600	9,460	13,986,000	1,986,600
(10) Miscellaneous metal work (screen and etc.)	t	0.4	9,246,270	1,027,360	3,698,508	410,944
(11) Others (5 %)	L.S.				311,287,144	88,724,355
Sub-total					6,537,030,032	1,863,211,459
2.4 Road Crossing						
(1) Cleaning and stripping	m2	8,200	1,210	690	9,922,000	5,658,000
(2) Excavation, common	m3	20,000	4,680	2,370	93,600,000	47,400,000
(3) Embankment	m3	171,500	4,100	1,850	703,150,000	317,275,000
(4) Gravel bedding	m3	910	18,950	9,660	17,244,500	8,790,600
(5) Slope protection with sod facing	m2	74,800	270	2,950	20,196,000	220,660,000
(6) Structural concrete (210 kg/cm2)	m3	7,700	106,700	54,610	821,590,000	420,497,000
(7) Levelling concrete (150 kg/cm2)	m3	460	102,160	51,340	46,993,600	23,616,400
(8) Form	m2	15,700	8,780	19,280	137,846,000	302,696,000
(9) Reinforcing bar	ton	770	1,064,770	691,240	819,872,900	532,254,800
(10) Joint filler (t=10mm)	m2	770	23,390	8,300	18,010,300	6,391,000
(11) PVC waterstop (B=20cm)	m	1,400	23,390	8,300	32,746,000	11,620,000
(12) Miscellaneous metal work (screen and etc.)	ton	9	9,246,270	1,027,360	83,216,430	9,246,240
(13) Surface course (t=50mm, asphalt)	m2	9,200	7340	6100	67,528,000	56,120,000
(14) Base course (t=200mm, crushed stone)	m3	1,900	46520	21170	88,388,000	40,223,000
(15) Sub-base course (t=300mm, crushed stone)	m3	2,800	41870	19050	117,236,000	53,340,000
(16) Subgrade (t=500mm, sand)	m3	4,600	18950	9660	87,170,000	44,436,000
(17) Guard rail	m	3,100	81810	20450	253,611,000	63,395,000
(18) Others (5 %)	L.S.				170,916,037	108,180,952
Sub-total					3,589,236,767	2,271,799,992
2.5 Spillway at Cicinta						
(1) Clearing and stripping	m2	760	1,210	690	919,600	524,400
(2) Excavation, common	m3	2,500	4,680	2,370	11,700,000	5,925,000
(3) Backfill	m3	1,100	4,080	2,320	4,488,000	2,552,000
(4) Gravel bedding	m3	100	18,950	9,660	1,895,000	966,000
(5) Slope protection with sod facing	m2	500	270	2,950	135,000	1,475,000
(6) Structural concrete (210 kg/cm2)	m3	550	106,700	54,610	58,685,000	30,035,500
(7) Levelling concrete (150 kg/cm2)	m3	50	102,160	51,340	5,108,000	2,567,000
(8) Form	m2	1,300	8,780	19,280	11,414,000	25,064,000
(9) Reinforcing bar	ton	60	1,064,770	691,240	63,886,200	41,474,400
(10) Gravel for drain	m3	110	17,860	7,510	1,964,600	826,100
(11) Perforated PVC pipe for drain (D=0.2m)	m	170	47,970	13,250	8,154,900	2,252,500
(12) Joint filler (t=10mm)	m2	40	23,390	8,300	935,600	332,000
(13) PVC waterstop (B=20cm)	m	90	23,390	8,300	2,105,100	747,000
(14) Gabion mattress	m3	80	32,960	17,650	2,636,800	1,412,000
(15) Miscellaneous metal work (hand rail, etc.)	t	1.0	7,705,220	856,140	7,705,220	856,140
(16) Others (5 %)	L.S.				9,086,651	5,850,452
Total of Item 2.5					190,819,671	122,859,492
2.6 Division Structure at Tenjo						
(1) Clearing and stripping	m2	10,800	1,210	690	13,068,000	7,452,000
(2) Excavation, common	m3	29,900	4,680	2,370	139,932,000	70,863,000
(3) Backfill	m3	6,500	4,080	2,320	26,520,000	15,080,000
(4) Gravel bedding	m3	310	18,950	9,660	5,874,500	2,994,600
(5) Slope protection with sod facing	m2	5,800	270	2,950	1,566,000	17,110,000
(6) Structural concrete (210 kg/cm2)	m3	1,800	106,700	54,610	192,060,000	98,298,000
(7) Levelling concrete (150 kg/cm2)	m3	160	102,160	51,340	16,345,600	8,214,400
(8) Form	m2	2,900	8,780	19,280	25,462,000	55,912,000
(9) Reinforcing bar	ton	180	1,064,770	691,240	191,658,600	124,423,200
(10) Gravel for drain	m3	170	17,860	7,510	3,036,200	1,276,700
(11) Perforated PVC pipe for drain (D=0.2m)	m	160	47,970	13,250	7,675,200	2,120,000
(12) Joint filler (t=10mm)	m2	330	23,390	8,300	7,718,700	2,739,000
(13) PVC waterstop (B=20cm)	m	340	23,390	8,300	7,952,600	2,822,000
(14) Wet cobble masonry (t=500mm)	m2	5,500	22,290	18,530	122,595,000	101,915,000
(15) Miscellaneous metal work (hand rail, etc.)	t	7.0	7,705,220	856,140	53,936,540	5,992,980
(16) Others (5 %)	L.S.				40,770,047	25,860,644
Sub-total					856,170,987	543,073,524
2.7 Division Structure at Parungpanjang						

Table 17 CONSTRUCTION COST FOR KSCS IN PHASE I (3/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)		Unit price
			FC	I.C	FC	LC	
(1) Clearing and stripping	m2	615	1210	690	744,150	424,350	
(2) Excavation, common	m3	2,550	4680	2,370	11,934,000	6,043,500	
(3) Embankment	m3	300	4100	1,850	1,230,000	555,000	
(3) Backfill	m3	525	4080	2,320	2,142,000	1,218,000	
(4) Gravel bedding	m3	90	18,950	9,660	1,705,500	869,400	
(5) Slope protection with sod facing	m2	105	270	2,950	28,350	309,750	
(6) Structural concrete (210 kg/cm2)	m3	645	106700	54,610	68,821,500	35,223,450	
(7) Levelling concrete (150 kg/cm2)	m3	45	102160	51,340	4,597,200	2,310,300	
(8) Form	m2	1,260	8,780	19,280	11,062,800	24,292,800	
(9) Reinforcing bar	ton	65	1,064,770	691,240	68,677,665	44,584,980	
(10) Joint filler (t=10mm)	m2	30	23,390	8,300	701,700	249,000	
(11) PVC waterstop (B=20cm)	m	60	23,390	8,300	1,403,400	498,000	
(12) Miscellaneous metal work (hand rail, etc.)	t	1.5	7705220	856,140	11,557,830	1,284,210	
(13) Others (5 %)	L.S.				9,230,305	5,893,137	
Sub-total					193,836,400	123,755,877	
2.8 Inspection Road							
(1) Sub-grade (t=500, sand)	m3	4,100	18,950	9,660	77,695,000	39,606,000	
(2) Base course (t=250, crushed stone)	m3	24,200	46,520	21,170	1,125,784,000	512,314,000	
(3) Surface course (t=150, gravel metalling)	m3	15,700	44,630	20,260	700,691,000	318,082,000	
(4) Shoulder (t=250, Rock/stone)	m3	14,200	29,430	7,360	417,906,000	104,512,000	
(5) Road drainage (U-300x300)	m	58,400	44,460	48,350	2,596,464,000	2,823,640,000	
(6) Others (5 %)	L.S.				245,927,000	189,907,700	
Sub-total					5,164,467,000	3,988,061,700	
2.9 Foot Path							
(1) Structural concrete (210 kg/cm2)	m3	230	106,700	54,610	24,541,000	12,560,300	
(2) Levelling concrete (150 kg/cm2)	m3	20	102,160	51,340	2,043,200	1,026,800	
(3) Form	m2	660	8,780	19,280	5,794,800	12,724,800	
(4) Joint filler (t=10mm)	m2	230	23,390	8,300	5,379,700	1,909,000	
(5) Waterstop (B=20cm)	m	400	23,390	8,300	9,356,000	3,320,000	
(6) Gravel bedding	m3	30	18,950	9,660	568,500	289,800	
(7) Reinforcing bar	ton	30	1,064,770	691,240	31,943,100	20,737,200	
(8) Miscellaneous metal work (hand rail etc.)	ton	6	7,705,220	856,140	46,231,320	5,136,840	
(9) Others (5 %)	L.S.				6,292,881	2,885,237	
Sub-total					132,150,501	60,589,977	
2.10 Cross Drain							
(1) Clearing and stripping	m2	6,100	1,210	690	7,381,000	4,209,000	
(2) Excavation, common	m3	34,500	4,680	2,370	161,460,000	81,765,000	
(3) Backfill	m3	3,000	4,080	2,320	12,240,000	6,960,000	
(4) Gravel bedding	m3	1,500	18,950	9,660	28,425,000	14,490,000	
(5) Slope protection with sod facing	m2	3,100	270	2,950	837,000	9,145,000	
(6) Structural concrete (210 kg/cm2)	m3	8,200	106,700	54,610	874,940,000	447,802,000	
(7) Levelling concrete (150 kg/cm2)	m3	750	102,160	51,340	76,620,000	38,505,000	
(8) Form	m2	25,900	8,780	19,280	227,402,000	499,352,000	
(10) Reinforcing bar	ton	820	1,064,770	691,240	873,111,400	566,816,800	
(13) Concrete pipe (D=0.8m)	m	290	181,220	128,030	52,553,800	37,128,700	
(14) Concrete pipe (D=1.0m)	m	310	290,470	204,400	90,045,700	63,364,000	
(15) Concrete pipe (D=1.2m)	m	620	366,520	257,560	227,242,400	159,687,200	
(16) Concrete pipe (D=1.5m)	m	510	553,270	386,910	282,167,700	197,324,100	
(17) Wet cobble masonry (t=500mm)	m2	1,000	22,290	18,530	22,290,000	18,530,000	
(18) Gabion mattress	m3	3,300	32,960	17,650	108,768,000	58,245,000	
(19) Miscellaneous metal work (hand rail etc.)	t	4.2	7705220	856,140	32,361,924	3,595,788	
(20) Others (5 %)	L.S.				153,892,296	110,345,979	
Sub-total					3,231,738,220	2,317,265,567	
Total of Item 2					97,001,577,442	59,853,043,795	
3. Metal Works							
3.1 Syphon							
(1) Steel pipe, valve, step, manhole cover, etc. (for manholes in 3 syphon)	ton	6	9,351,000	1,039,000	56,106,000	6,234,000	
(2) Others (5 %)	L.S.				2,805,300	311,700	
Sub-total					58,911,300	6,545,700	

Table 18 CONSTRUCTION COST FOR KSCS IN PHASE I (4/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
3.2 Spillway at Cicinta						
(1) Gate (4.85 x 3.20) and electric hoist including related metal works	ton	15	15,410,450	1,712,270	231,156,750	25,684,050
(2) Stoplog (4.85 x 3.20) and movable hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
(3) Others (5 %)	L.S.				17,722,018	1,969,111
Sub-total					372,162,368	41,351,321
3.3 Division Structure at Tenjo						
(1) Gate (1.00 x 1.00)and mannual hoist including related metal works	ton	3	15,410,450	1,712,270	46,231,350	5,136,810
(2) Gate (4.85 x 3.05)and electric hoist including related metal works	ton	7	15,410,450	1,712,270	107,873,150	11,985,890
(3) Gate (2.7 x 3.05)and electric hoist including related metal works	ton	4	15,410,450	1,712,270	61,641,800	6,849,080
(4) Gate (3.75 x 3.05)and electric hoist including related metal works	ton	6	15,410,450	1,712,270	92,462,700	10,273,620
(5) Stoplog (2.70 x 3.05) and movable hoist including related metal works	ton	5	15,410,450	1,712,270	77,052,250	8,561,350
(6) Stoplog (3.75 x 3.05)and movable hoist including related metal works	ton	12	15,410,450	1,712,270	184,925,400	20,547,240
(7) Stoplog (5.30 x 3.05) and movable hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
(8) Stoplog (5.4 x 3.05) and movable hoist including related metal works	ton	9	15,410,450	1,712,270	138,694,050	15,410,430
(9) Syphon(B=1.00,H=2.65,L=2.45)	set	5	13,484,140	1,498,240	67,420,700	7,491,200
(10) Others (5 %)	L.S.				44,979,250	4,997,689
Sub-total					944,564,250	104,951,469
3.4 Division Structure at Parung panjang						
(1) Gate (3.75 x 2.50)and electric hoist including related metal works	ton	11	15,410,450	1,712,270	169,514,950	18,834,970
(2) Stoplog (3.75 x 2.50) and movable hoist including related metal works	ton	5	15,410,450	1,712,270	77,052,250	8,561,350
(3) Stoplog (5.40 x 2.50) and movable hoist including related metal works	ton	7	15,410,450	1,712,270	107,873,150	11,985,890
(4) Stoplog (3.65 x 2.50) and movable hoist including related metal works	ton	5	15,410,450	1,712,270	77,052,250	8,561,350
(5) Stoplog (2.70 x 2.50) and movable hoist including related metal works	ton	4	15,410,450	1,712,270	61,641,800	6,849,080
(6) Others (5 %)	L.S.				24,656,720	2,739,632
Sub-total					517,791,120	57,532,272
Total of Item 3					1,893,429,038	210,380,762
Total					109,597,602,279	68,862,605,272

Table 19 CONSTRUCTION COST FOR KSCS IN PHASE IIA (1/5)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)		
			FC	LC	FC	LC	
1. Preparation Works							
1.1 Access Road (Improvement of existing village road)	km	8	866,671,990	389,461,480	6,933,375,920	3,115,691,840	
1.2 Base Camp (Office and quarters)	L.S.				1,829,188,330	4,486,428,000	
1.3 Other Works (2% of Item 2)	L.S.				1,789,504,682	1,112,670,110	
Total of Item 1					8,762,564,250	7,602,119,840	
2. Civil Works							
2.1 Waterway							
(1) Clearing and stripping	m2	165,800	1,210	690	200,618,000	114,402,000	
(2) Excavation, Spoil bank (1 km)							
1) Common	m3	577,500	3,700	1,600	2,136,750,000	924,000,000	
2) Soft rock	m3	219,700	6,320	2,740	1,388,504,000	601,978,000	
(3) Excavation, Stock pile (0.5 km)							
1) Common	m3	52,000	3,350	1,470	174,200,000	76,440,000	
2) Soft rock	m3	26,800	5,740	2,510	153,832,000	67,268,000	
(4) Excavation, Stock pile (3.5 km)							
1) Common	m3	39,200	6,110	2,560	239,512,000	100,352,000	
2) Soft rock	m3	29,400	6,630	3,920	194,922,000	115,248,000	
(5) Embankment	m3	148,900	4,100	1,850	610,490,000	275,465,000	
(6) Slope protection with sod facing	m2	249,600	270	2,950	67,392,000	736,320,000	
(7) Slope protection with shotcrete	m2	62,600	26,180	12,840	1,638,868,000	803,784,000	
(8) Backfill, Random material	m3	69,400	4,080	2,320	283,152,000	161,008,000	
(9) Gravel for drain	m3	18,900	17,860	7,510	337,554,000	141,939,000	
(10) Gravel bedding for canal in embankment	m3	4,500	18,950	9,660	85,275,000	43,470,000	
(11) Structural concrete (210 kg/cm2)	m3	114,500	106,700	54,610	12,217,150,000	6,252,845,000	
(12) Levelling concrete (150 kg/cm2)	m3	12,400	102,160	51,340	1,266,784,000	636,616,000	
(13) Form	m3	431,400	8,780	19,280	3,787,692,000	8,317,392,000	
(14) Reinforcing bar	ton	11,700	1,064,770	691,240	12,457,809,000	8,087,508,000	
(15) PVC water stop (B=20cm)	m	32,300	23,390	8,300	755,497,000	268,090,000	
(16) Joint filler (t=10mm)	m2	4,000	23,390	8,300	93,560,000	33,200,000	
(17) Perforated PVC pipe for drain (D=0.2m)	m	28,000	47,970	13,250	1,343,160,000	371,000,000	
(18) Others (5 %)	L.S.				1,971,636,050	1,406,416,250	
Sub-total					41,404,357,050	29,534,741,250	
2.2 Aqueduct							
(1) Clearing and stripping	m2	1,300	1,210	690	1,573,000	897,000	
(2) Steel sheet pile coffering and dewatering	L.S.				180,293,580	51,065,720	
(3) Excavation, common	m3	4,100	4,680	2,370	19,188,000	9,717,000	
(4) Backfill	m3	3,500	4,080	2,320	14,280,000	8,120,000	
(5) Gravel bedding	m3	70	18,950	9,660	1,326,500	676,200	
(6) Structural concrete (210 kg/cm2)	m3	750	106,700	54,610	80,025,000	40,957,500	
(7) Levelling concrete (150 kg/cm2)	m3	40	102,160	51,340	4,086,400	2,053,600	
(8) Form	m2	870	8,780	19,280	7,638,600	16,773,600	
(9) Reinforcing bar	ton	67	1,064,770	691,240	71,339,590	46,313,080	
(10) Gabion mattress	m3	50	32,960	17,650	1,648,000	882,500	
(11) Concrete pile including piling (D=0.5m)	m	980	96,530	82,270	94,599,400	80,624,600	
(12) Temporary bridge	L.S.				1,951,521,580	216,835,730	
(13) Others (5 %)	L.S.				121,375,983	23,745,827	
Sub-total					2,548,895,633	498,662,357	
2.3 Syphon							
(1) Coffering and dewatering	L.S.				988,929,780	256,705,200	
(2) Cleaning and stripping	m2	12,500	1,210	690	15,125,000	8,625,000	
(3) Excavation, common	m3	30,500	4,680	2,370	142,740,000	72,285,000	
(4) Backfill	m3	20,900	4,080	2,320	85,272,000	48,488,000	
(5) Embankment	m3	12,100	4,100	1,850	49,610,000	22,385,000	
(6) Gravel bedding	m3	150	18,950	9,660	2,842,500	1,449,000	
(7) Slope protection with sod facing	m2	9,000	270	2,950	2,430,000	26,550,000	
(8) Structural concrete (210 kg/cm2)	m3	4,100	106,700	54,610	437,470,000	223,901,000	
(9) Levelling concrete (150 kg/cm2)	m3	330	102,160	51,340	33,712,800	16,942,200	
(10) Form	m2	7,100	8,780	19,280	62,338,000	136,888,000	
(11) Reinforcing bar	ton	400	1,064,770	691,240	425,908,000	276,496,000	

Table 20 CONSTRUCTION COST FOR KSCS IN PHASE IIA (2/5)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
(12) Joint filler (t=10mm)	m2	400	23,390	8,300	9,356,000	3,320,000
(13) PVC waterstop (B=20cm)	m	840	23,390	8,300	19,647,600	6,972,000
(14) Miscellaneous metal work (screen and etc.)	ton	10	9,246,270	1,027,360	92,462,700	10,273,600
(15) Revetment with concrete block	m2	4,400	70,470	58,490	310,068,000	257,356,000
(16) Gabion mattress	m3	410	32,960	17,650	13,513,600	7,236,500
(16) Others (5 %)	L.S.				134,571,299	68,793,625
Sub-total					2,825,997,279	1,444,666,125
2.4 Railway Crossing at Tenjo						
(1) Clearing and Stripping	m2	600	1,210	690	726,000	414,000
(2) Slope protection with concrete block	m2	400	70,470	58,490	28,188,000	23,396,000
(3) Slope protection with sod facing	m2	800	270	2,950	216,000	2,360,000
(4) Excavation, underground	m3	1,200	105,770	56,130	126,924,000	67,356,000
(5) Structural concrete (210 kg/cm2)	m3	490	106,700	54,610	52,283,000	26,758,900
(6) Form	m2	2,000	8,780	19,280	17,560,000	38,560,000
(7) Reinforcing bar	ton	48	1,064,770	691,240	51,108,960	33,179,520
(8) Preparation work and construction with Forward jack pulling method	L.S.				5,676,033,000	1,419,008,000
(9) Waterstop (surface type)	m	160	66,600	9,460	10,656,000	1,513,600
(10) Miscellaneous metal work (screen and etc.)	t	0.4	9,246,270	1,027,360	3,698,508	410,944
(11) Others (5 %)	L.S.				298,369,673	80,647,848
Sub-total					5,988,757,181	1,501,580,392
2.5 Road Crossing						
(1) Clearing and stripping	m2	8,700	1,210	690	10,527,000	6,003,000
(2) Excavation, common	m3	127,400	4,680	2,370	596,232,000	301,938,000
(3) Embankment	m3	157,500	4,100	1,850	645,750,000	291,375,000
(4) Gravel bedding	m3	800	18,950	9,660	15,160,000	7,728,000
(5) Slope protection with sod facing	m2	79,200	270	2,950	21,384,000	233,640,000
(6) Structural concrete (210 kg/cm2)	m3	6,400	106,700	54,610	682,880,000	349,504,000
(7) Levelling concrete (150 kg/cm2)	m3	400	102,160	51,340	40,864,000	20,536,000
(8) Form	m2	15,700	8,780	19,280	137,846,000	302,696,000
(9) Reinforcing bar	ton	640	1,064,770	691,240	681,452,800	442,393,600
(10) Joint filler (t=10mm)	m2	640	23,390	8,300	14,969,600	5,312,000
(11) PVC waterstop (B=20cm)	m	1,300	23,390	8,300	30,407,000	10,790,000
(12) Miscellaneous metal work (screen and etc.)	ton	10	9,246,270	1,027,360	92,462,700	10,273,600
(13) Surface course (t=50mm, asphalt)	m2	10,000	7,340	6,100	73,400,000	61,000,000
(14) Base course (t=200mm, crushed stone)	m3	1,830	46,520	21,170	85,131,600	38,741,100
(15) Sub-base course (t=300mm, crushed stone)	m3	2,800	41,870	19,050	117,236,000	53,340,000
(16) Sub-grade (t=500mm, sand)	m3	4,500	18,950	9,660	85,275,000	43,470,000
(17) Guard rail	m	2,800	81,810	20,450	229,068,000	57,260,000
(18) Others (5 %)	L.S.				178,002,285	111,800,015
Sub-total					3,738,047,985	2,347,800,315
2.6 Spillway at Cicinta						
(1) Clearing and stripping	m2	840	1,210	690	1,016,400	579,600
(2) Excavation, common	m3	2,700	4,680	2,370	12,636,000	6,399,000
(3) Backfill	m3	1,200	4,080	2,320	4,896,000	2,784,000
(4) Gravel bedding	m3	110	18,950	9,660	2,084,500	1,062,600
(5) Slope protection with sod facing	m2	540	270	2,950	145,800	1,593,000
(6) Structural concrete (210 kg/cm2)	m3	610	106,700	54,610	65,087,000	33,312,100
(7) Levelling concrete (150 kg/cm2)	m3	50	102,160	51,340	5,108,000	2,567,000
(8) Form	m2	1,400	8,780	19,280	12,292,000	26,992,000
(9) Reinforcing bar	ton	60	1,064,770	691,240	63,886,200	41,474,400
(10) Gravel for drain	m3	130	17,860	7,510	2,321,800	976,300
(11) Perforated PVC pipe for drain (D=0.2m)	m	180	47,970	13,250	8,634,600	2,385,000
(12) Joint filler (t=10mm)	m2	40	23,390	8,300	935,600	332,000
(13) PVC waterstop (B=20cm)	m	90	23,390	8,300	2,105,100	747,000
(14) Gabion mattress	m3	90	32,960	17,650	2,966,400	1,588,500
(15) Miscellaneous metal work (hand rail, etc.)	t	1.1	7,705,220	856,140	8,475,742	941,754
(16) Others (5 %)	L.S.				9,629,557	6,186,713
Sub-total					202,220,699	129,920,967
2.7 Inspection Road						
(1) Sub-grade (t=500mm, sand)	m3	5,500	18,950	9,660	104,225,000	53,130,000
(2) Base course (t=250mm, crushed stone)	m3	25,100	46,520	21,170	1,167,652,000	531,367,000

Table 21 CONSTRUCTION COST FOR KSCS IN PHASE IIA (3/5)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
(3) Surface course(t=150mm, gravel metalling)	m3	16,200	44,630	20,260	723,006,000	328,212,000
(4) Shoulder(t=250mm,Rock/stone)	m3	14,200	29,430	7,360	417,906,000	104,512,000
(5) Road drainage(U-300x300)	m	30,800	44,460	48,350	1,369,368,000	1,489,180,000
(6) Others (5 %)	L.S.				189,107,850	125,320,050
Sub-total					3,971,264,850	2,631,721,050
2.8 Foot Path						
(1) Structural concrete (210 kg/cm2)	m3	210	106,700	54,610	22,407,000	11,468,100
(2) Levelling concrete (150 kg/cm2)	m3	20	102,160	51,340	2,043,200	1,026,800
(3) Form	m2	710	8,780	19,280	6,233,800	13,688,800
(4) Joint filler (t=10mm)	m2	210	23,390	8,300	4,911,900	1,743,000
(5) Waterstop (B=20cm)	m	440	23,390	8,300	10,291,600	3,652,000
(6) Gravel bedding	m3	30	18,950	9,660	568,500	289,800
(7) Reinforcing bar	ton	21	1,064,770	691,240	22,360,170	14,516,040
(8) Miscellaneous metal work (hand rail etc.)	ton	8	7,705,220	856,140	61,641,760	6,849,120
(9) Others (5 %)	L.S.				6,522,897	2,661,683
Sub-total					136,980,827	55,895,343
2.9 Cross Drain						
(1) Clearing and stripping	m2	2,200	1,210	690	2,662,000	1,518,000
(2) Excavation, common	m3	4,900	4,680	2,370	22,932,000	11,613,000
(3) Backfill	m3	500	4,080	2,320	2,040,000	1,160,000
(4) Gravel bedding	m3	190	18,950	9,660	3,600,500	1,835,400
(5) Slope protection with sod facing	m2	1,100	270	2,950	297,000	3,245,000
(6) Structural concrete (210 kg/cm2)	m3	950	106,700	54,610	101,365,000	51,879,500
(7) Levelling concrete (150 kg/cm2)	m3	100	102,160	51,340	10,216,000	5,134,000
(8) Form	m2	2,900	8,780	19,280	25,462,000	55,912,000
(9) Reinforcing bar	ton	94	1,064,770	691,240	100,088,380	64,976,560
(10) Concrete pipe (D=0.8m)	m	30	181,220	128,030	5,436,600	3,840,900
(11) Concrete pipe (D=1.0m)	m	80	290,470	204,400	23,237,600	16,352,000
(12) Concrete pipe (D=1.5m)	m	200	553,270	386,910	110,654,000	77,382,000
(13) Wet cobble masonry (t=500mm)	m2	1,700	22,290	18,530	37,893,000	31,501,000
(14) Gabion mattress	m3	480	32,960	17,650	15,820,800	8,472,000
(15) Miscellaneous metal work (hand rail etc.)	t	0.6	7,705,220	856,140	4,623,132	513,684
(16) Others (5 %)	L.S.				23,316,401	16,766,752
Sub-total					489,644,413	352,101,796
2.10 Purungpanjang Pump Station						
(1) Cleaning and stripping	m2	8,500	1,210	690	10,285,000	5,865,000
(2) Embankment	m3	36,400	4,100	1,850	149,240,000	67,340,000
(3) Backfill	m3	2,700	4,080	2,320	11,016,000	6,264,000
(4) Gravel bedding	m3	250	18,950	9,660	4,737,500	2,415,000
(5) Slope protection with sod facing	m2	3,500	270	2,950	945,000	10,325,000
(6) Structural concrete (210 kg/cm2)	m3	1,500	106,700	54,610	160,050,000	81,915,000
(7) Levelling concrete (150 kg/cm2)	m3	130	102,160	51,340	13,280,800	6,674,200
(8) Form work	m2	2,400	8,780	19,280	21,072,000	46,272,000
(9) Reinforcing bar	ton	150	1,064,770	691,240	159,715,500	103,686,000
(10) Joint filler	m2	66	23,390	8,300	1,543,740	547,800
(11) Waterstop (B=20cm)	m	180	23,390	8,300	4,210,200	1,494,000
(12) Concrete pile including driving (D=0.40m)	m	2,000	61,780	52,650	123,560,000	105,300,000
(13) Fence	m	90	195,890	27,220	17,630,100	2,449,800
(14) Architectural work for pump house	m2	720	1,996,000	533,000	1,437,120,000	383,760,000
(15) Electrical work for pump house	m2	720	909,990	409,280	655,192,800	294,681,600
(16) Others (5 %)	L.S.				138,479,932	55,949,470
Sub-total					2,908,078,572	1,174,938,870
2.11 Pipeline						
(1) Stripping	m2	151,600	1,210	690	183,436,000	104,604,000
(2) Excavation, Common, Spoil bank (1 km)	m3	20,800	3,700	1,600	76,960,000	33,280,000
(3) Excavation, Common, Stock pile (0.5 km)	m3	348,400	3,350	1,470	1,167,140,000	512,148,000
(4) Steel sheet pile for excavation	m2	10,000	70,640	18,340	706,400,000	183,400,000
(5) Embankment	m3	167,100	4,100	1,850	685,110,000	309,135,000
(6) Sod facing	m2	61,500	270	2,950	16,605,000	181,425,000
(7) Backfilling	m3	149,300	4,080	2,320	609,144,000	346,376,000
(8) Sand and gravel bedding	m3	50,900	18,950	9,660	964,555,000	491,694,000
(9) Concrete pipe (D= 2.20 m)	m	10,300	1,690,380	1,122,200	17,410,914,000	11,558,660,000

Table 22 CONSTRUCTION COST FOR KSCS IN PHASE IIA (4/5)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
(10) Form	m2	930	8,780	19,280	8,165,400	17,930,400
(11) Structural concrete (210 kg/cm2)	m3	1,100	106,700	54,610	117,370,000	60,071,000
(12) Reinforcing bar	ton	22	1,064,770	691,240	23,424,940	15,207,280
(13) Sub-grade (t=500mm,sand)	m3	18,400	18,950	9,660	348,680,000	177,744,000
(14) Sub-base course (t=300mm,crushed stone)	m3	1,200	41,870	19,050	50,244,000	22,860,000
(15) Base course (t=250mm,crushed stone)	m3	9,100	46,520	21,170	423,332,000	192,647,000
(16) Gravel metalling (t=150mm,crushed stone)	m3	5,000	44,630	20,260	223,150,000	101,300,000
(17) Surface course (t=50mm,asphalt)	m2	2,400	7,340	6,100	17,616,000	14,640,000
(18) Side ditch(U-300x300)	m	16,700	44,460	48,350	742,482,000	807,445,000
(19) Detouring work of existing railway at Parungpanjang	L.S.				283,357,000	70,840,000
(20) Others (5 %)	L.S.				1,202,904,267	760,070,334
Sub-total					25,260,989,607	15,961,477,014
Total of Item 2					89,475,234,095	55,633,505,479
3. Metal Works						
3.1 Aquaduct						
(1) Steel pipe (D= 2.20 m)	ton	190	9,631,530	1,070,170	1,829,990,700	203,332,300
(2) Other metal works (Ring support, expansion joint, inspection path, valve, etc.)	ton	23	15,410,450	1,712,270	354,440,350	39,382,210
(3) Others (5 %)	L.S.				109,221,553	12,135,726
Sub-total					2,293,652,603	254,850,236
3.2 Syphon						
(1) Steel pipe, valve, step, manhole cover, etc. (for 4 manholes in 3 syphon)	ton	6	9,631,530	1,070,170	57,789,180	6,421,020
(2) Others (5 %)	L.S.				2,889,459	321,051
Sub-total					60,678,639	6,742,071
3.3 Spillway at Cicinta						
(1) Gate (2.20 x 3.20) and electric hoist including related metal works	ton	7	15,410,450	1,712,270	107,873,150	11,985,890
(2) Stoplog (2.20 x 3.20) and movable hoist including related metal works	ton	4	15,410,450	1,712,270	61,641,800	6,849,080
(3) Others (5 %)	L.S.				8,475,748	941,749
Sub-total					177,990,698	19,776,719
3.4 Division Structure at Tenjo						
(1) Gate (1.00 x 1.00) and manual hoist including related metal works	ton	2	15,410,450	1,712,270	30,820,900	3,424,540
(2) Gate (5.30 x 3.20) and electric hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
(3) Gate (3.75 x 3.20) and electric hoist including related metal works	ton	6	15,410,450	1,712,270	92,462,700	10,273,620
(4) Gate (5.40 x 3.20) and electric hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
(5) Others (5 %)	L.S.				18,492,540	2,054,724
Sub-total					388,343,340	43,149,204
3.5 Division structure at Parung panjang						
(1) Gate (5.40 x 2.50) and electric hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
(2) Gate (3.65 x 2.50) and electric hoist including related metal works	ton	5	15,410,450	1,712,270	77,052,250	8,561,350
(3) Others (5 %)	L.S.				10,016,793	1,112,976
Sub-total					210,352,643	23,372,486
3.6 Pump Station at Parungpanjang						
(1) Centrifugal pump(head=30m,3m3/sec) and electric motor (1200 kw)	set	3	6,771,910,000	752,434,000	20,315,730,000	2,257,302,000
(2) Generator (1200kw)	set	2	1,537,659,000	170,851,000	3,075,318,000	341,702,000
(3) Overhead crane (32 ton, 12 m.L.)	set	1	1,079,600,000	119,956,000	1,079,600,000	119,956,000
(4) Air chamber (dia=5.00m,h=7.00m)	ton	100	15,410,450	1,712,270	1,541,045,000	171,227,000

Table 23 CONSTRUCTION COST FOR KSCS IN PHASE IIA (5/5)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)		Unit price
			FC	LC	FC	LC	
(5) Miscellaneous metal work for pumps	L.S.				6,304,277,000	700,475,000	
(6) Gate (1.00 x 1.00) and electric hoist including related metal works	ton	2	15,410,450	1,712,270	30,820,900	3,424,540	
(7) Flap gate (1.50 x 1.50) and electric hoist including related metal works	ton	2	15,410,450	1,712,270	30,820,900	3,424,540	
(8) Syphon (B=1.00, H=2.65, L=2.45)	set	5	13,484,140	1,498,240	67,420,700	7,491,200	
(9) Others (5 %)	L.S.				1,622,251,625	180,250,114	
Sub-total					34,067,284,125	3,785,252,394	
3.7 Pipeline							
(1) Steel pipe (D= 2.20 m)	ton	1,260	9,631,530	1,070,170	12,135,727,800	1,348,414,200	
(2) Others (5 %)	L.S.				606,786,390	67,420,710	
Sub-total					12,742,514,190	1,415,834,910	
Total of Item 3					49,940,816,237	5,548,978,019	

Table 24 CONSTRUCTION COST FOR KSCS IN PHASE IIC-a (1/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
1 Preparation Works						
1.1 Access Road (Improvement of existing village road)	km	5	866,671,990	389,461,480	4,333,359,950	1,947,307,400
1.2 Base Camp (Office and quarters)	L.S.				1,829,188,330	4,486,428,000
1.3 Other Works (2% of Item 2)	L.S.				1,578,907,011	936,921,596
Total of Item 1					7,741,455,291	7,370,656,996
2 Civil Works						
2.1 Waterway						
1 Clearing and stripping	m2	231,200	1,210	690	279,752,000	159,528,000
2 Excavation, Spoil bank (1 km)						
1) Common	m3	518,500	3,700	1,600	1,918,450,000	829,600,000
2) Soft rock	m3	221,800	6,320	2,740	1,401,776,000	607,732,000
3 Excavation, Stock pile (0.5 km)						
1) Common	m3	142,900	3,350	1,470	478,715,000	210,063,000
2) Soft rock	m3	87,800	5,740	2,510	503,972,000	220,378,000
4 Excavation, Stock pile (3.5 km)						
1) Common	m3	20,000	6,110	2,560	122,200,000	51,200,000
2) Soft rock	m3	15,100	6,630	3,920	100,113,000	59,192,000
5 Embankment	m3	246,600	4,100	1,850	1,011,060,000	456,210,000
6 Slope protection with sod facing	m2	157,000	270	2,950	42,390,000	463,150,000
7 Slope protection with shotcrete	m2	39,400	26,180	12,840	1,031,492,000	505,896,000
8 Backfill, Random material	m3	30,200	4,080	2,320	123,216,000	70,064,000
9 Gravel for drain	m3	10,900	17,860	7,510	194,674,000	81,859,000
10 Gravel bedding for canal in embankme	m3	5,000	18,950	9,660	94,750,000	48,300,000
11 Structural concrete (210 kg/cm2)	m3	92,800	106,700	54,610	9,901,760,000	5,067,808,000
12 Levelling concrete (150 kg/cm2)	m3	13,500	102,160	51,340	1,379,160,000	693,090,000
13 Form	m3	266,100	8,780	19,280	2,336,358,000	5,130,408,000
14 Reinforcing bar	ton	9,400	1,064,770	691,240	10,008,838,000	6,497,656,000
15 PVC water stop (B=20cm)	m	25,900	23,390	8,300	605,801,000	214,970,000
16 Joint filler (t=10mm)	m2	3,200	23,390	8,300	74,848,000	26,560,000
17 Perforated PVC pipe for drain (D=0.2m)	m	16,100	47,970	13,250	772,317,000	213,325,000
18 Others (5 %)	L.S.				1,619,082,100	1,080,349,450
Sub-total					34,000,724,100	22,687,338,450
2.2 Aqueduct						
1 Clearing and stripping	m2	1,300	1,210	690	1,573,000	897,000
2 Steel sheet pile coffering and dewaterin	L.S.				180,293,580	51,065,720
3 Excavation, common	m3	4,100	4,680	2,370	19,188,000	9,717,000
4 Backfill	m3	3,500	4,080	2,320	14,280,000	8,120,000
5 Gravel bedding	m3	70	18,950	9,660	1,326,500	676,200
6 Structural concrete (210 kg/cm2)	m3	750	106,700	54,610	80,025,000	40,957,500
7 Levelling concrete (150 kg/cm2)	m3	40	102,160	51,340	4,086,400	2,053,600
8 Form	m2	870	8,780	19,280	7,638,600	16,773,600
9 Reinforcing bar	ton	67	1,064,770	691,240	71,339,590	46,313,080
10 Gabion mattress	m3	50	32,960	17,650	1,648,000	882,500
11 Concrete pile including piling (D=0.5mm)		980	96,530	82,270	94,599,400	80,624,600
12 Temporary bridge	L.S.				1,951,521,580	216,835,730
13 Others (5 %)	L.S.				121,375,983	23,745,827
Sub-total					2,548,895,633	498,662,357
2.3 Syphon						
1 Coffering and dewatering	L.S.				593,357,870	154,023,120
2 Cleaning and stripping	m2	7,100	1,210	690	8,591,000	4,899,000
3 Excavation, common	m3	24,400	4,680	2,370	114,192,000	57,828,000
4 Backfill	m3	16,500	4,080	2,320	67,320,000	38,280,000
5 Embankment	m3	5,500	4,100	1,850	22,550,000	10,175,000
6 Gravel bedding	m3	150	18,950	9,660	2,842,500	1,449,000
7 Slope protection with sod facing	m2	4,100	270	2,950	1,107,000	12,095,000
8 Structural concrete (210 kg/cm2)	m3	2,900	106,700	54,610	309,430,000	158,369,000
9 Levelling concrete (150 kg/cm2)	m3	220	102,160	51,340	22,475,200	11,294,800
10 Form	m2	8,600	8,780	19,280	75,508,000	165,808,000
11 Reinforcing bar	ton	290	1,064,770	691,240	308,783,300	200,459,600

Table 25 CONSTRUCTION COST FOR KSCS IN PHASE IIC-a (2/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
12 Joint filler (t=10mm)	m2	290	23,390	8,300	6,783,100	2,407,000
13 PVC waterstop (B=20cm)	m	590	23,390	8,300	13,800,100	4,897,000
14 Miscellaneous metal work (screen and	ton	4	9,246,270	1,027,360	36,985,080	4,109,440
15 Revetment with concrete block	m2	3,100	70,470	58,490	218,457,000	181,319,000
16 Gabion mattress	m3	330	32,960	17,650	10,876,800	5,824,500
16 Others (5 %)	L.S.				90,652,948	50,661,873
Sub-total					1,903,711,898	1,063,899,333
2.4 Railway Crossing at Tenjo						
1 Clearing and Stripping	m2	600	1,210	690	726,000	414,000
2 Slope protection with concrete block	m2	400	70,470	58,490	28,188,000	23,396,000
3 Slope protection with sod facing	m2	800	270	2,950	216,000	2,360,000
4 Excavation, underground	m3	2,500	105,770	56,130	264,425,000	140,325,000
5 Structural concrete (210 kg/cm2)	m3	990	106,700	54,610	105,633,000	54,063,900
6 Form	m2	2,800	8,780	19,280	24,584,000	53,984,000
7 Reinforcing bar	ton	100	1,064,770	691,240	106,477,000	69,124,000
8 Preparation work and construction with Forward jack pulling method	L.S.				5,676,033,000	1,419,008,000
9 Waterstop (surface type)	m	160	66,600	9,460	10,656,000	1,513,600
10 Miscellaneous metal work (screen and	t	0.4	9,246,270	1,027,360	3,698,508	410,944
11 Others (5 %)	L.S.				311,031,825	88,229,972
Sub-total					6,531,668,333	1,852,829,416
2.5 Road Crossing						
1 Clearing and stripping	m2	6,000	1,210	690	7,260,000	4,140,000
2 Excavation, common	m3	47,200	4,680	2,370	220,896,000	111,864,000
3 Embankment	m3	74,000	4,100	1,850	303,400,000	136,900,000
4 Gravel bedding	m3	570	18,950	9,660	10,801,500	5,506,200
5 Slope protection with sod facing	m2	5,500	270	2,950	1,485,000	16,225,000
6 Structural concrete (210 kg/cm2)	m3	4,500	106,700	54,610	480,150,000	245,745,000
7 Levelling concrete (150 kg/cm2)	m3	290	102,160	51,340	29,626,400	14,888,600
8 Form	m2	8,600	8,780	19,280	75,508,000	165,808,000
9 Reinforcing bar	ton	450	1,064,770	691,240	479,146,500	311,058,000
10 Joint filler (t=10mm)	m2	450	23,390	8,300	10,525,500	3,735,000
11 PVC waterstop (B=20cm)	m	800	23,390	8,300	18,712,000	6,640,000
12 Miscellaneous metal work (screen and	ton	7	9,246,270	1,027,360	64,723,890	7,191,520
13 Surface course (t=50mm, asphalt)	m2	8,000	7,340	6,100	58,720,000	48,800,000
14 Base course (t=200mm, crushed stone)	m3	1,540	46,520	21,170	71,640,800	32,601,800
15 Sub-base course (t=300mm, crushed stone)	m3	2,400	41,870	19,050	100,488,000	45,720,000
16 Sub-grade (t=500mm, sand)	m3	3,900	18,950	9,660	73,905,000	37,674,000
17 Guard rail	m	2,400	81,810	20,450	196,344,000	49,080,000
18 Others (5 %)	L.S.				110,166,630	62,178,856
Sub-total					2,313,499,220	1,305,755,976
2.6 Inspection Road						
1 Sub-grade (t=500mm, sand)	m3	4,800	18,950	9,660	90,960,000	46,368,000
2 Base course (t=250mm, crushed stone)	m3	17,700	46,520	21,170	823,404,000	374,709,000
3 Surface course (t=150mm, gravel metal)	m3	10,600	44,630	20,260	473,078,000	214,756,000
4 Shoulder (t=250mm, Rock/stone)	m3	10,100	29,430	7,360	297,243,000	74,336,000
5 Road drainage (U-300x300)	m	21,300	44,460	48,350	946,998,000	1,029,855,000
6 Others (5 %)	L.S.				131,584,150	87,001,200
Sub-total					2,763,267,150	1,827,025,200
2.7 Foot Path						
1 Structural concrete (210 kg/cm2)	m3	310	106,700	54,610	33,077,000	16,929,100
2 Levelling concrete (150 kg/cm2)	m3	20	102,160	51,340	2,043,200	1,026,800
3 Form	m2	870	8,780	19,280	7,638,600	16,773,600
4 Joint filler (t=10mm)	m2	310	23,390	8,300	7,250,900	2,573,000
5 Waterstop (B=20cm)	m	540	23,390	8,300	12,630,600	4,482,000
6 Gravel bedding	m3	40	18,950	9,660	758,000	386,400
7 Reinforcing bar	ton	31	1,064,770	691,240	33,007,870	21,428,440
8 Miscellaneous metal work (hand rail et	ton	7	7,705,220	856,140	53,936,540	5,992,980
9 Others (5 %)	L.S.				7,517,136	3,479,616
Sub-total					157,859,846	73,071,936
2.8 Cross Drain						

Table 26 CONSTRUCTION COST FOR KSCS IN PHASE IIC-a (3/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	I.C	FC	I.C
1 Clearing and stripping	m2	2,300	1,210	690	2,783,000	1,587,000
2 Excavation, common	m3	7,000	4,680	2,370	32,760,000	16,590,000
3 Backfill	m3	480	4,080	2,320	1,958,400	1,113,600
4 Gravel bedding	m3	250	18,950	9,660	4,737,500	2,415,000
5 Slope protection with sod facing	m2	1,200	270	2,950	324,000	3,540,000
6 Structural concrete (210 kg/cm2)	m3	1,310	106,700	54,610	139,777,000	71,539,100
7 Levelling concrete (150 kg/cm2)	m3	130	102,160	51,340	13,280,800	6,674,200
8 Form	m2	4,000	8,780	19,280	35,120,000	77,120,000
9 Reinforcing bar	ton	131	1,064,770	691,240	139,484,870	90,552,440
10 Concrete pipe (D=0.8m)	m	30	181,220	128,030	5,436,600	3,840,900
11 Concrete pipe (D=1.0m)	m	60	290,470	204,400	17,428,200	12,264,000
12 Concrete pipe (D=1.2m)	m	50	366,520	257,560	18,326,000	12,878,000
13 Concrete pipe (D=1.5m)	m	100	553,270	386,910	55,327,000	38,691,000
14 Wet cobble masonry (t=500mm)	m2	1,800	22,290	18,530	40,122,000	33,354,000
15 Gabion mattress	m3	520	32,960	17,650	17,139,200	9,178,000
16 Miscellaneous metal work (hand rail et t		0.8	7,705,220	856,140	6,164,176	684,912
17 Others (5 %)	L.S.				26,508,437	19,101,108
Sub-total					556,677,183	401,123,260
2.9 Purungpanjang Pump Station						
1 Cleaning and stripping	m2	8,500	1,210	690	10,285,000	5,865,000
2 Embankment	m3	36,400	4,100	1,850	149,240,000	67,340,000
3 Backfill	m3	2,700	4,080	2,320	11,016,000	6,264,000
4 Gravel bedding	m3	250	18,950	9,660	4,737,500	2,415,000
5 Slope protection with sod facing	m2	3,500	270	2,950	945,000	10,325,000
6 Structural concrete (210 kg/cm2)	m3	1,500	106,700	54,610	160,050,000	81,915,000
7 Levelling concrete (150 kg/cm2)	m3	130	102,160	51,340	13,280,800	6,674,200
8 Form work	m2	2,400	8,780	19,280	21,072,000	46,272,000
9 Reinforcing bar	ton	150	1,064,770	691,240	159,715,500	103,686,000
10 Joint filler	m2	66	23,390	8,300	1,543,740	547,800
11 Waterstop (B=20cm)	m	180	23,390	8,300	4,210,200	1,494,000
12 Concrete pile including driving (D=0.4 m		2,000	61,780	52,650	123,560,000	105,300,000
13 Fence	m	90	195,890	27,220	17,630,100	2,449,800
14 Architectural work for pump house	m2	720	1,996,000	533,000	1,437,120,000	383,760,000
15 Electrical work for pump house	m2	720	909,990	409,280	655,192,800	294,681,600
16 Others (5 %)	L.S.				138,479,932	55,949,470
Sub-total					2,908,078,572	1,174,938,870
2.10 Pipeline						
1 Stripping	m2	151,600	1,210	690	183,436,000	104,604,000
2 Excavation, Common, Spoil bank (1 km3		20,800	3,700	1,600	76,960,000	33,280,000
3 Excavation, Common, Stock pile (0.5 km3		348,400	3,350	1,470	1,167,140,000	512,148,000
4 Steel sheet pile for excavation	m2	10,000	70,638	18,336	706,380,000	183,360,000
5 Embankment	m3	167,100	4,100	1,850	685,110,000	309,135,000
6 Sod facing	m2	61,500	270	2,950	16,605,000	181,425,000
7 Backfilling	m3	149,300	4,080	2,320	609,144,000	346,376,000
8 Sand and gravel bedding	m3	50,900	18,950	9,660	964,555,000	491,694,000
9 Concrete pipe (D= 2.20 m)	m	10,300	1,690,380	1,122,200	17,410,914,000	11,558,660,000
10 Form	m2	930	8,780	19,280	8,165,400	17,930,400
11 Structural concrete (210 kg/cm2)	m3	1,100	106,700	54,610	117,370,000	60,071,000
12 Reinforcing bar	ton	22	1,064,770	691,240	23,424,940	15,207,280
13 Sub-grade (t=500mm,sand)	m3	18,400	18,950	9,660	348,680,000	177,744,000
14 Sub-base course (t=300mm,crushed sto	m3	1,200	41,870	19,050	50,244,000	22,860,000
15 Base course (t=250mm,crushed stone)	m3	9,100	46,520	21,170	423,332,000	192,647,000
16 Gravel metalling (t=150mm,crushed st	m3	5,000	44,630	20,260	223,150,000	101,300,000
17 Surface course (t=50mm,asphalt)	m2	2,400	7,340	6,100	17,616,000	14,640,000
18 Side ditch(U-300x300)	m	16,700	44,460	48,350	742,482,000	807,445,000
19 Detouring work of existing railway at Parungpanjang	L.S.				283,357,000	70,840,000
20 Others (5 %)	L.S.				1,202,903,267	760,068,334
Sub-total					25,260,968,607	15,961,435,014
Total of Item 2					78,945,350,541	46,846,079,811
3 Metal Works						

Table 27 CONSTRUCTION COST FOR KSCS IN PHASE IIC-a (4/4)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
3.1 Aquaduct						
1 Steel pipe (D= 2.20 m)	ton	190	9,631,530	1,070,170	1,829,990,700	203,332,300
2 Other metal works (Ring support, expansion joint, inspection path, valve, etc.)	ton	23	15,410,450	1,712,270	354,440,350	39,382,210
3 Others (5 %)	L.S.				109,221,553	12,135,726
Sub-total					2,293,652,603	254,850,236
3.2 Syphon						
1 Steel pipe, valve, step, manhole cover, etc. (for 4 manholes in 3 syphon)	ton	6	9,631,530	1,070,170	57,789,180	6,421,020
2 Others (5 %)	L.S.				2,889,459	321,051
Sub-total					60,678,639	6,742,071
3.3 Division Structure at Tenjo						
1 Gate (1.00 x 1.00) and manual hoist including related metal works	ton	2	15,410,450	1,712,270	30,820,900	3,424,540
2 Gate (5.30 x 3.20) and electric hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
3 Gate (3.75 x 3.20) and electric hoist including related metal works	ton	6	15,410,450	1,712,270	92,462,700	10,273,620
4 Gate (5.40 x 3.20) and electric hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
5 Others (5 %)	L.S.				18,492,540	2,054,724
Sub-total					388,343,340	43,149,204
3.4 Division structure at Parung panjang						
1 Gate (5.40 x 2.50) and electric hoist including related metal works	ton	8	15,410,450	1,712,270	123,283,600	13,698,160
2 Gate (3.65 x 2.50) and electric hoist including related metal works	ton	5	15,410,450	1,712,270	77,052,250	8,561,350
3 Gate (2.70 x 2.50) and electric hoist including related metal works	ton	4	15,410,450	1,712,270	61,641,800	6,849,080
4 Others (5 %)	L.S.				13,098,883	1,455,430
Sub-total					275,076,533	30,564,020
3.5 Pump Station at Parungpanjang						
1 Centrifugal pump(head=30m, 3m ³ /sec) and electric motor (1200 kw)	set	3	6,771,910,000	752,434,000	20,315,730,000	2,257,302,000
2 Generator (1200kw)	set	2	1,537,659,000	170,851,000	3,075,318,000	341,702,000
3 Overhead crane (32 ton, 12 mL))	set	1	1,079,600,000	119,956,000	1,079,600,000	119,956,000
4 Air chamber (dia=5.00m, h=7.00m)	ton	100	15,410,450	1,712,270	1,541,045,000	171,227,000
5 Miscellaneous metal work for pumps	L.S.				6,304,277,000	700,475,000
6 Gate (1.00 x 1.00) and electric hoist including related metal works	ton	2	15,410,450	1,712,270	30,820,900	3,424,540
7 Flap gate (1.50 x 1.50) and electric hoist including related metal works	ton	2	15,410,450	1,712,270	30,820,900	3,424,540
8 Syphon(B=1.00, H=2.65, L=2.45)	set	5	13,484,140	1,498,240	67,420,700	7,491,200
9 Others (5 %)	L.S.				1,622,251,625	180,250,114
Sub-total					34,067,284,125	3,785,252,394
3.6 Pipeline						
1 Steel pipe (D= 2.20 m)	ton	1,260	9,631,530	1,070,170	12,135,727,800	1,348,414,200
2 Others (5 %)	L.S.				606,786,390	67,420,710
Sub-total					12,742,514,190	1,415,834,910
Total of Item 3					49,827,549,429	5,536,392,834

Table 28 CONSTRUCTION COST FOR KSCS IN PHASE IIC-b (1/3)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)		
			FC	LC	FC	LC	
1. Preparation Works							
1.1 Access Road (Improvement of existing village road)	km	6	866,671,990	389,461,480	5,200,031,940	2,336,768,880	
1.2 Base Camp (Office and quarters)	L.S.				1,005,010,140	2,285,248,680	
1.3 Other Works (2% of Item 2)	L.S.				502,719,704	354,604,957	
Total of Item 1					6,707,761,784	4,976,622,517	
2. Civil Works							
2.1 Waterway							
(1) Clearing and stripping	m2	93,000	1,210	690	112,530,000	64,170,000	
(2) Excavation, Spoil bank (1 km)							
1) Common	m3	227,900	3,700	1,600	843,230,000	364,640,000	
2) Soft rock	m3	105,400	6,320	2,740	666,128,000	288,796,000	
(3) Excavation, Stock pile (0.5 km)							
1) Common	m3	38,700	3,350	1,470	129,645,000	56,889,000	
2) Soft rock	m3	23,600	5,740	2,510	135,464,000	59,236,000	
(4) Excavation, Stock pile (3.5 km)							
1) Common	m3	26,500	6,110	2,560	161,915,000	67,840,000	
2) Soft rock	m3	19,900	6,630	3,920	131,937,000	78,008,000	
(5) Embankment	m3	106,700	4,100	1,850	437,470,000	197,395,000	
(6) Slope protection with sod facing	m2	149,600	270	2,950	40,392,000	441,320,000	
(7) Slope protection with shotcrete	m2	37,500	26,180	12,840	981,750,000	481,500,000	
(8) Backfill, Random material	m3	36,900	4,080	2,320	150,552,000	85,608,000	
(9) Gravel for drain	m3	8,000	17,860	7,510	142,880,000	60,080,000	
(10) Gravel bedding for canal in embankment	m3	2,100	18,950	9,660	39,795,000	20,286,000	
(11) Structural concrete (210 kg/cm2)	m3	52,300	106,700	54,610	5,580,410,000	2,856,103,000	
(12) Levelling concrete (150 kg/cm2)	m3	5,100	102,160	51,340	521,016,000	261,834,000	
(13) Form	m3	208,200	8,780	19,280	1,827,996,000	4,014,096,000	
(14) Reinforcing bar	ton	5,320	1,064,770	691,240	5,664,576,400	3,677,396,800	
(15) PVC water stop (B=20cm)	m	14,500	23,390	8,300	339,155,000	120,350,000	
(16) Joint filler (t=10mm)	m2	1,800	23,390	8,300	42,102,000	14,940,000	
(17) Perforated PVC pipe for drain (D=0.2m)	m	11,900	47,970	13,250	570,843,000	157,675,000	
(18) Others (5 %)	L.S.				925,989,320	668,408,140	
Sub-total					19,445,775,720	14,036,570,940	
2.2 Syphon							
(1) Coffering and dewatering	L.S.				197,785,960	51,341,040	
(2) Cleaning and stripping	m2	7,900	1,210	690	9,559,000	5,451,000	
(3) Excavation, common	m3	14,600	4,680	2,370	68,328,000	34,602,000	
(4) Backfill	m3	10,200	4,080	2,320	41,616,000	23,664,000	
(5) Embankment	m3	8,500	4,100	1,850	34,850,000	15,725,000	
(6) Gravel bedding	m3	60	18,950	9,660	1,137,000	579,600	
(7) Slope protection with sod facing	m2	6,400	270	2,950	1,728,000	18,880,000	
(8) Structural concrete (210 kg/cm2)	m3	2,300	106,700	54,610	245,410,000	125,603,000	
(9) Levelling concrete (150 kg/cm2)	m3	170	102,160	51,340	17,367,200	8,727,800	
(10) Form	m2	7,100	8,780	19,280	62,338,000	136,888,000	
(11) Reinforcing bar	ton	220	1,064,770	691,240	234,249,400	152,072,800	
(12) Joint filler (t=10mm)	m2	210	23,390	8,300	4,911,900	1,743,000	
(13) PVC waterstop (B=20cm)	m	460	23,390	8,300	10,759,400	3,818,000	
(14) Miscellaneous metal work (screen and	ton	2	9,246,270	1,027,360	18,492,540	2,054,720	
(15) Revetment with concrete block	m2	1,300	70,470	58,490	91,611,000	76,037,000	
(16) Gabion mattress	m3	200	32,960	17,650	6,592,000	3,530,000	
(16) Others (5 %)	L.S.				52,336,770	33,035,848	
Sub-total					1,099,072,170	693,752,808	
2.3 Spillway at Cicinta							
(1) Clearing and stripping	m2	840	1,210	690	1,016,400	579,600	
(2) Excavation, common	m3	2,700	4,680	2,370	12,636,000	6,399,000	
(3) Backfill	m3	1,200	4,080	2,320	4,896,000	2,784,000	
(4) Gravel bedding	m3	110	18,950	9,660	2,084,500	1,062,600	
(5) Slope protection with sod facing	m2	540	270	2,950	145,800	1,593,000	
(6) Structural concrete (210 kg/cm2)	m3	610	106,700	54,610	65,087,000	33,312,100	
(7) Levelling concrete (150 kg/cm2)	m3	50	102,160	51,340	5,108,000	2,567,000	

Table 29 CONSTRUCTION COST FOR KSCS IN PHASE IIC-b (2/3)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
(8) Form	m2	1,400	8,780	19,280	12,292,000	26,992,000
(9) Reinforcing bar	ton	60	1,064,770	691,240	63,886,200	41,474,400
(10) Gravel for drain	m3	130	17,860	7,510	2,321,800	976,300
(11) Perforated PVC pipe for drain (D=0.2m)	m	180	47,970	13,250	8,634,600	2,385,000
(12) Joint filler (t=10mm)	m2	40	23,390	8,300	935,600	332,000
(13) PVC waterstop (B=20cm)	m	90	23,390	8,300	2,105,100	747,000
(14) Gabion mattress	m3	90	32,960	17,650	2,966,400	1,588,500
(15) Miscellaneous metal work (hand rail, etc)	t	1.1	7,705,220	856,140	8,475,742	941,754
(16) Others (5 %)	L.S.				9,629,557	6,186,713
Sub-total					202,220,699	129,920,967
2.4 Division Structure at Tenjo (Spillway)						
(1) Clearing and stripping	m2	8,700	1,210	690	10,527,000	6,003,000
(2) Excavation, common	m3	18,500	4,680	2,370	86,580,000	43,845,000
(3) Backfill	m3	300	4,080	2,320	1,224,000	696,000
(4) Gravel bedding	m3	20	18,950	9,660	379,000	193,200
(5) Slope protection with sod facing	m2	4,600	270	2,950	1,242,000	13,570,000
(6) Structural concrete (210 kg/cm2)	m3	110	106,700	54,610	11,737,000	6,007,100
(7) Levelling concrete (150 kg/cm2)	m3	10	102,160	51,340	1,021,600	513,400
(8) Form	m2	150	8,780	19,280	1,317,000	2,892,000
(9) Reinforcing bar	ton	11	1,064,770	691,240	11,712,470	7,603,640
(10) Gravel for drain	m3	30	17,860	7,510	535,800	225,300
(11) Perforated PVC pipe for drain (D=0.2m)	m	40	47,970	13,250	1,918,800	530,000
(12) Joint filler (t=10mm)	m2	210	23,390	8,300	4,911,900	1,743,000
(13) PVC waterstop (B=20cm)	m	20	23,390	8,300	467,800	166,000
(14) Wet cobble masonry (t=500mm)	m2	6,100	22,290	18,530	135,969,000	113,033,000
(15) Miscellaneous metal work (hand rail, etc)	t	0.5	7,705,220	856,140	3,852,610	428,070
(16) Others (5 %)	L.S.				13,669,799	9,872,436
Sub-total					287,065,779	207,321,146
2.5 Road Crossing						
(1) Clearing and stripping	m2	3,400	1,210	690	4,114,000	2,346,000
(2) Excavation, common	m3	85,600	4,680	2,370	400,608,000	202,872,000
(3) Embankment	m3	94,300	4,100	1,850	386,630,000	174,455,000
(4) Gravel bedding	m3	320	18,950	9,660	6,064,000	3,091,200
(5) Slope protection with sod facing	m2	30,800	270	2,950	8,316,000	90,860,000
(6) Structural concrete (210 kg/cm2)	m3	2,700	106,700	54,610	288,090,000	147,447,000
(7) Levelling concrete (150 kg/cm2)	m3	160	102,160	51,340	16,345,600	8,214,400
(8) Form	m2	8,300	8,780	19,280	72,874,000	160,024,000
(9) Reinforcing bar	ton	270	1,064,770	691,240	287,487,900	186,634,800
(10) Joint filler (t=10mm)	m2	270	23,390	8,300	6,315,300	2,241,000
(11) PVC waterstop (B=20cm)	m	600	23,390	8,300	14,034,000	4,980,000
(12) Miscellaneous metal work (screen and	ton	4	9,246,270	1,027,360	36,985,080	4,109,440
(13) Surface course (t=50mm, asphalt)	m2	3,400	7,340	6,100	24,956,000	20,740,000
(14) Base course (t=200mm, crushed stone)	m3	650	46,520	21,170	30,238,000	13,760,500
(15) Sub-base course (t=300mm, crushed stone)	m3	970	41,870	19,050	40,613,900	18,478,500
(16) Sub-grade (t=500mm, sand)	m3	1,700	18,950	9,660	32,215,000	16,422,000
(17) Guard rail	m	1,100	81,810	20,450	89,991,000	22,495,000
(18) Others (5 %)	L.S.				87,293,889	53,958,542
Sub-total					1,833,171,669	1,133,129,382
2.6 Inspection Road						
(1) Sub-grade (t=500mm, sand)	m3	3,300	18,950	9,660	62,535,000	31,878,000
(2) Base course (t=250mm, crushed stone)	m3	10,700	46,520	21,170	497,764,000	226,519,000
(3) Surface course (t=150mm, gravel metal)	m3	7,600	44,630	20,260	339,188,000	153,976,000
(4) Shoulder (t=250mm, Rock/stone)	m3	6,100	29,430	7,360	179,523,000	44,896,000
(5) Road drainage (U-300x300)	m	14,700	44,460	48,350	653,562,000	710,745,000
(6) Others (5 %)	L.S.				86,628,600	58,400,700
Sub-total					1,819,200,600	1,226,414,700
2.7 Foot Path						
(1) Structural concrete (210 kg/cm2)	m3	42	106,700	54,610	4,481,400	2,293,620
(2) Levelling concrete (150 kg/cm2)	m3	3	102,160	51,340	306,480	154,020
(3) Form	m2	160	8,780	19,280	1,404,800	3,084,800
(4) Joint filler (t=10mm)	m2	42	23,390	8,300	982,380	348,600
(5) Waterstop (B=20cm)	m	100	23,390	8,300	2,339,000	830,000

Table 30 CONSTRUCTION COST FOR KSCS IN PHASE IIC-b (3/3)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)		Unit
			FC	LC	FC	LC	
(6) Gravel bedding	m3	7	18,950	9,660	132,650	67,620	
(7) Reinforcing bar	ton	4	1,064,770	691,240	4,259,080	2,764,960	
(8) Miscellaneous metal work (hand rail et	ton	3	7,705,220	856,140	23,115,660	2,568,420	
(9) Others (5 %)	L.S.				1,851,073	605,602	
Sub-total					38,872,523	12,717,642	
2.8 Cross Drain							
(1) Clearing and stripping	m2	800	1,210	690	968,000	552,000	
(2) Excavation, common	m3	3,300	4,680	2,370	15,444,000	7,821,000	
(3) Backfill	m3	300	4,080	2,320	1,224,000	696,000	
(4) Gravel bedding	m3	180	18,950	9,660	3,411,000	1,738,800	
(5) Slope protection with sod facing	m2	400	270	2,950	108,000	1,180,000	
(6) Structural concrete (210 kg/cm2)	m3	860	106,700	54,610	91,762,000	46,964,600	
(7) Levelling concrete (150 kg/cm2)	m3	90	102,160	51,340	9,194,400	4,620,600	
(8) Form	m2	2,600	8,780	19,280	22,828,000	50,128,000	
(9) Reinforcing bar	ton	86	1,064,770	691,240	91,570,220	59,446,640	
(10) Concrete pipe (D=0.8m)	m	30	181,220	128,030	5,436,600	3,840,900	
(11) Concrete pipe (D=1.0m)	m	60	290,470	204,400	17,428,200	12,264,000	
(12) Concrete pipe (D=1.2m)	m		366,520	257,560			
(13) Concrete pipe (D=1.5m)	m	200	553,270	386,910	110,654,000	77,382,000	
(14) Wet cobble masonry (t=500mm)	m2	100	22,290	18,530	2,229,000	1,853,000	
(15) Gabion mattress	m3	430	32,960	17,650	14,172,800	7,589,500	
(16) Miscellaneous metal work (hand rail et	t	0.6	7,705,220	856,140	4,623,132	513,684	
(17) Others (5 %)	L.S.				19,552,668	13,829,536	
Sub-total					410,606,020	290,420,260	
Total of Item 2					25,135,985,179	17,730,247,844	
3. Metal Works							
3.1 Syphon							
(1) cover, etc.							
(for 3 manholes in 2 syphon)	ton	5	9,351,000	1,039,000	46,755,000	5,195,000	
(2) Others (5 %)	L.S.				2,337,750	259,750	
Sub-total					49,092,750	5,454,750	
3.2 Spillway at Cicinta							
(1) Gate (2.20 x 3.20) and electric hoist including related metal works	ton	7	15,410,450	1,712,270	107,873,150	11,985,890	
(2) Stoplog (2.20 x 3.20) and movable hoist including related metal works	ton	4	15,410,450	1,712,270	61,641,800	6,849,080	
(3) Others (5 %)	L.S.				8,475,748	941,749	
Sub-total					177,990,698	19,776,719	
3.3 Division Structure at Tenjo							
(1) Syphon (B=1.00, H=2.65, I=2.45)	set	3	13,484,140	1,498,240	40,452,420	4,494,720	
(2) Others (5 %)	L.S.				2,022,621	224,736	
Sub-total					42,475,041	4,719,456	
Total of Item 3					269,558,489	29,950,925	

Table 31 CONSTRUCTION COST FOR KARIAN DAM (1/2)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
1. Preparation Works						
1.1 Access Road by improvement of existing village road	km	5	866,671,870	389,460,960	4,333,359,350	1,947,304,800
1.2 Base Camp	L.S.	1	1,829,188,330	4,486,428,000	1,829,188,330	4,486,428,000
1.3 20 kv Distribution Line for Construction and Operation use	km	5	11,040,570	2,205,360	55,202,850	11,026,800
1.4 Telecommunication System	L.S.	1	3,059,350,290	123,076,800	3,059,350,290	123,076,800
1.5 Other Works (2% of item 2)	L.S.	1			1,755,281,001	697,824,480
Total of Item 1					11,032,381,821	7,265,660,880
2. Civil Works						
2.1 River Diversion Works (Tunnel D= 6.6m, L= 471m and 515m)						
(1) Clearing and Stripping	m2	3,000	1,220	690	3,660,000	2,070,000
(2) Excavation, Common	m3	25,250	3,870	1,830	97,717,500	46,207,500
(3) Excavation, W. Rock	m3	25,250	6,940	3,240	175,235,000	81,810,000
(4) Excavation, Hard Rock	m3	50,500	18,010	6,890	909,505,000	347,945,000
(5) Excavation, Tunnel	m3	51,300	105,770	56,140	5,426,001,000	2,879,982,000
(6) Shotcrete t=10 cm Tunnel	m2	2,400	52,830	18,960	126,792,000	45,504,000
(7) Rock bolt (D=25mm, L=2.5m)	m	4,100	40,900	7,140	167,690,000	29,274,000
(8) Steel support (H-150x150mm)	ton	25	2,666,660	1,066,420	66,666,500	26,660,500
(9) Backfill, Random material	m3	30,300	4,090	2,330	123,927,000	70,599,000
(10) Slope protection with shotcrete t=10cm	m2	2,100	26,190	12,850	54,999,000	26,985,000
(11) Concrete, Open (180 kg/cm2)	m3	3,100	105,840	53,920	328,104,000	167,152,000
(12) Concrete, Tunnel (180 kg/cm2)	m3	18,600	120,730	63,540	2,245,578,000	1,181,844,000
(13) Concrete, Plug (150 kg/cm2)	m3	1,600	113,320	58,910	181,312,000	94,256,000
(14) Form, Open	m2	3,100	8,780	19,290	27,218,000	59,799,000
(15) Form, Tunnel	m2	20,100	46,760	5,630	939,876,000	113,163,000
(14) Re-bar, Open	ton	125	1,064,780	691,240	133,097,500	86,405,000
(15) Re-bar, Tunnel	ton	380	1,107,310	802,610	420,777,800	304,991,800
(16) Curtain grout, Tunnel	m	10,000	183,830	57,930	1,838,300,000	579,300,000
(17) Others (5 %)	L.S.				663,322,815	307,197,390
Total of Item 2.1					13,929,779,115	6,451,145,190
2.2 Cofferdam						
(1) Clearing and Stripping	m2	9,800	1,220	690	11,956,000	6,762,000
(2) Excavation, Common	m3	14,700	3,870	1,830	56,889,000	26,901,000
(3) Excavation, W. Rock	m3	6,300	6,940	3,240	43,722,000	20,412,000
(4) Embankment, Core	m3	13,000	20,120	9,270	261,560,000	120,510,000
(5) Embankment, Filter	m3	11,700	16,840	7,650	197,028,000	89,505,000
(6) Embankment, Rock	m3	87,700	39,500	14,420	3,464,150,000	1,264,634,000
(7) Others (5 %)	L.S.				201,765,250	76,436,200
Total of Item 2.2					4,237,070,250	1,605,160,200
2.3 Main Dam						
(1) Clearing and Stripping	m2	122,400	1,220	690	149,328,000	84,456,000
(2) Excavation, Common	m3	161,000	3,870	1,830	623,070,000	294,630,000
(3) Excavation, W. Rock	m3	69,000	6,940	3,240	478,860,000	223,560,000
(4) Embankment, Core	m3	141,800	20,120	9,270	2,853,016,000	1,314,486,000
(5) Embankment, Filter	m3	128,300	16,840	7,650	2,160,572,000	981,495,000
(6) Embankment, Rock	m3	958,500	39,500	14,420	37,860,750,000	13,821,570,000
(7) Blanket grouting	m	9,200	101,700	33,660	935,640,000	309,672,000
(8) Curtain grouting	m	23,500	183,560	57,840	4,313,660,000	1,359,240,000
(9) Others (5 %)	L.S.				2,468,744,800	919,455,450
Total of Item 2.3					51,843,640,800	19,308,564,450
2.4 Saddle Dam						
(1) Clearing and Stripping	m2	38,300	1,220	690	46,726,000	26,427,000
(2) Excavation, Common	m3	71,400	3,870	1,830	276,318,000	130,662,000
(3) Excavation, W. Rock	m3	30,600	6,940	3,240	212,364,000	99,144,000
(4) Embankment, Core	m3	17,300	20,120	9,270	348,076,000	160,371,000
(5) Embankment, Filter	m3	15,700	16,840	7,650	264,388,000	120,105,000
(6) Embankment, Rock	m3	117,000	39,500	14,420	4,621,500,000	1,687,140,000
(7) Blanket grouting	m	1,100	101,700	33,660	111,870,000	37,026,000
(8) Curtain grouting	m	2,900	183,560	57,840	532,324,000	167,736,000
(9) Others (5 %)	L.S.				320,678,300	121,430,550
Total of Item 2.4					6,413,566,000	2,428,611,000

Table 32 CONSTRUCTION COST FOR KARIAN DAM (2/2)

Work item	Unit	Quantity	Unit price (Rp.)		Amount (Rp.)	
			FC	LC	FC	LC
2.5 Spillway						
(1) Clearing and Stripping	m2	21,600	1,220	690	26,352,000	14,904,000
(2) Excavation, Common	m3	22,000	5,380	2,580	118,360,000	56,760,000
(3) Excavation, W. Rock	m3	56,000	8,640	3,990	483,840,000	223,440,000
(4) Excavation, Hard Rock	m3	180,600	28,230	8,390	5,098,338,000	1,515,234,000
(5) Backfill, Impervious material	m3	10,000	4,340	2,470	43,400,000	24,700,000
(6) Backfill, Pervious material	m3	29,000	17,860	7,510	517,940,000	217,790,000
(7) Slope protection with shotcrete t=210cm	m2	6,000	26,190	12,850	157,140,000	77,100,000
(8) Concrete, Open (210 kg/cm2)	m3	24,000	106,710	54,610	2,561,040,000	1,310,640,000
(9) Form, Open	m2	24,000	8,620	14,410	206,880,000	345,840,000
(10) Re-bar, Open	ton	1,200	1,064,780	691,240	1,277,736,000	829,488,000
(11) Others (5 %)	L.S.				524,551,300	230,794,800
Total of Item 2.5					10,491,026,000	4,615,896,000
2.6 Intake						
(1) Clearing and Stripping	m2	2,100	1,220	690	2,562,000	1,449,000
(2) Excavation, Common	m3	3,000	4,690	2,370	14,070,000	7,110,000
(3) Excavation, W. Rock	m3	4,000	7,410	3,470	29,640,000	13,880,000
(4) Excavation, Hard Rock	m3	7,000	20,120	7,880	140,840,000	55,160,000
(5) Excavation, Tunnel	m3	170	105,770	56,140	17,980,900	9,543,800
(6) Shotcrete, Tunnel	m2	150	52,830	18,960	7,924,500	2,844,000
(7) Rock bolt (D=25mm, L=2.5m)	m	100	40,900	7,140	4,090,000	714,000
(8) Steel support (H-125x125mm)	ton	2	2,666,660	1,066,420	5,333,320	2,132,840
(9) Slope protection with shotcrete	m2	1,500	26,190	12,850	39,285,000	19,275,000
(10) Concrete, Open (180 kg/cm2)	m3	3,080	105,840	53,920	325,987,200	166,073,600
(11) Concrete, Tunnel (180 kg/cm2)	m3	120	120,730	63,540	14,487,600	7,624,800
(12) Form, Open	m2	3,080	8,780	19,290	27,042,400	59,413,200
(13) Form, Tunnel	m2	120	46,760	5,630	5,611,200	675,600
(14) Re-bar, Open	ton	160	1,064,780	691,240	170,364,800	110,598,400
(15) Re-bar, Tunnel	ton	3	1,107,310	802,610	3,321,930	2,407,830
(16) Others (5 %)	L.S.				40,427,043	22,945,104
Total of Item 2.6					848,967,893	481,847,174
Total of Item 2					87,764,050,058	34,891,224,014
3. Metal Works						
3.1 Spillway						
(1) Radial gate (12.5m*12.5m*2sets)	ton	270	16,373,610	1,819,290	4,420,874,700	491,208,300
(2) Stoplogs (12.5m*12.5m*1set)	ton	160	15,410,450	1,712,280	2,465,672,000	273,964,800
Total of Item 3.1					6,886,546,700	765,173,100
3.2 Intake						
(1) Trash racks	ton	140	9,246,270	1,027,370	1,294,477,800	143,831,800
(2) Steel pipe	ton	10	9,631,530	1,070,170	96,315,300	10,701,700
(3) Hollow jet valve Dia. 2.0m	set	1	963,153,000	107,017,000	963,153,000	107,017,000
(4) Intake gate	ton	8	15,410,450	1,712,280	123,283,600	13,698,240
(5) Stop logs	ton	125	15,410,450	1,712,280	1,926,306,250	214,035,000
(6) Inspection bridge	ton	13	7,705,230	856,140	100,167,990	11,129,820
Total of Item 3.2					4,503,703,940	500,413,560
Total of Item 3					11,390,250,640	1,265,586,660
Construction Cost (Total of Items 1 to 3)					110,186,682,519	43,422,471,554
(Rounded up to)					110,186,683,000	43,422,472,000

Note : 1) Price level : August, 1994

2) Exchange Rate : Yen 1.00 = Rp. 21.84, US\$ 1.00 = Rp. 2,177.25