MATERIAL UNIT PRICES

| T. | ab | 1 | e | ٠ | 8. | 6 |
|----|----|---|---|---|----|---|
|----|----|---|---|---|----|---|

| Item | | Unit | Unit Price | (Rp.) |
|-------------------------|------------|----------------|---------------------------------------|-------|
| 1. Cement & Concrete Ac | lmixture | | · · · · · · · · · · · · · · · · · · · | |
| 1) Portland cement | | ton | 100,000 | |
| 2) White cement | | ti | 215,000 | · |
| 3) Water Reducing Agent | | kg. | 1,750 | |
| 2. Aggregates & Stones | | 2 | | |
| 1) Sand | | m ³ | 6,500 | |
| 2) Gravel | | v | 7,500 | |
| 3) Masonry stone | | 11 | 6,000 | |
| 4) Cobble & rubble stor | ne . | R | 8,000 | |
| 5) Red cement | | II | 11,000 | |
| 3. Steel Materials | | | | |
| 1) Reinforcement bar (F | Round) | ton | 500,000 | |
| 2) Reinforcement bar (| Deformed) | ton | 550,000 | |
| 3) Structural steel | | ton | 650,000 | |
| 4) Steel plate | | 13 | 530,000 | |
| 5) Steel pipe | | | | |
| Ø 300 mm x 6.0 m | | m , | 33,000 | |
| Ø 150 mm x 6.0 m | | tt | 9,300 | |
| Ø 65 mm × 6.0 m | | H | 2,000 | |
| 6) Steel sheet pile | | | | |
| Type-II, $L = 3 m$ | • | sheet | 76,000 | |
| Type-II, $L = 2m$ | | ES . | 50,000 | |
| Type-III, $L = 8m$ | | II . | 252,000 | |
| 7) Spiral vent pipe, Ø7 | mm 008-001 | m | 35,000 | |
| 8) Gas pipe | | | 100 | |
| Ø 1" | | m | 1,300 | |
| Ø 2" | • | 11 | 3,300 | |
| ø 3 ¹¹ | | tt · | 6,000 | |
| 9) Galvanized pipe | | | | |
| Ø 1 ^H | | m · | 3,000 | |

| | Ø 2 ¹¹ | m | 4,000 |
|-----|---|----------------|-----------|
| | Ø 3" | n' | 6,000 |
| | Ø 4 ¹¹ | m | 7,500 |
| | Ø 8 ¹¹ | 11 | 20,000 |
| 10) | Binding wire (Ø0.9 - 3.2 mm) | kg | 1,000 |
| 11) | Nail | | 900 |
| 12) | Channel, angle | ton | 620,000 |
| 13) | Gabion mattress | | |
| | 1.5m x 3.0m x 0.5m | pc. | 38,000 |
| | 1.0m x 2.0m x 0.3m | 11 | 12,000 |
| 14) | Gabion cylinder | | |
| | Ø 600 nm | m | 5,200 |
| | Ø 450 mm | ii , | 3,800 |
| 15) | Metal form, 300 x 1,500 mm | pc. | 40,000 |
| 16) | Pipe support | Ħ | 26,000 |
| 17) | Rail, 22 kg/m | ton | 1,000,000 |
| 18) | Anchor cap, \emptyset 60mm, $t = 1.2$ | kg | 400 |
| 4. | Wooden Materials | *. | • |
| 1) | Teak (Class - I), Plank | _m 3 | 700,000 |
| | , square | н | 600,000 |
| | , Log | <i>11</i> | 250,000 |
| 2) | Kamper (Class-II) Plank | H | 225,000 |
| | , square | n | 200,000 |
| | , Log | H | 200,000 |
| 3) | Meranti (Class-III), | • | |
| | Plank, square & log | н | 160,000 |
| 4) | Keruwing (Class-IV) | | • |
| ٠. | Plank, square & log | 51 | 150,000 |
| 5) | Plywood, water proof | | ÷ |
| | 900 x 1,800 x 12 mm | sheet | 9,000 |
| | | | |

| | · | | |
|----------|--------------------------|--|---------|
| 5. | Concrete pipe, Ø 200 mm | m | 1,600 |
| | , ø 500 " | It | 6,500 |
| | , Ø 1,000 msn | u | 20,000 |
| | | | |
| 6. | PVC Products | | |
| 1) | PVC Pipe, Ø 1" | , m | 2,000 |
| | , Ø 3" | | 3,600 |
| | , Ø 8" |)) | 10,000 |
| 2) | PVC Water stop, 250 mm | m | 11,800 |
| | , 150 mm | н | 10,600 |
| | | | |
| 7. | Fuel & Lubricant | | 0.4.0 |
| 1) | Light oil | <u>, </u> | 242 |
| 2) | Gasoline | II . | 385 |
| 3) | Engine oil | 11 | 1,100 |
| 4) | Hydraulic oil | 11 | 2,000 |
| 5) | Grease | kg. | 2,000 |
| 6) | Kerosene | ! | 125 |
| 8. | Gas | | : |
| | Oxygen gas | cylinder | 30,000 |
| | | н | 16,000 |
| | Acetylene gas | Kg | 350 |
| 3) | Propane gas | *** | |
| 9. | Explosives & Accessories | | |
| 1) | Dynamite | kg | 5,000 |
| 2) | Detonator w/leg 2.4 m | pc. | 2,000 |
| 3) | An-Fo powder | kg. | 2,000 |
| 4) | Fuse, 500 m roll | m | 600 |
| 5) | Blasting machine | set | 550,000 |
| 10 . n (| A. C. Dod | | |
| | t & Rod | ric. | 32,000 |
| | Cross bit, Ø 36 mm | рс. и | 49,000 |
| 2) | , Ø 65 mm | ** | 64,700 |
| | Insert bit, 22 mm, 1,4 m | P3 | 40,000 |
| | Taper rod, 22mm, 1,4 m | n. | 17,000 |
| . 5) | Metal bit, 46mm, 66mm | n | 26,000 |
| | , comm | | |

| | | | - |
|-----|-----------------------------|-----------|------------|
| 6) | Tube core barrel (S), 46 mm | pc. | 74,000 |
| | (W), 66 mm | 11 | 100,000 |
| 7) | Diamond bit | Carat | 44,000 |
| 8) | Tri Cone bit | pc. | 470,000 |
| 9) | Core lifter | Ð | 2,300 |
| 10) | Rod, crawler drill, 3 m | 17 | 190,000 |
| 11) | Sleeve | 11 | 47,000 |
| 12) | Shank rod | H | 108,000 |
| 13) | Boring rod | li . | 39,000 |
| | | | |
| 11. | Scaffolding | | |
| ` | Main frame | pe. | 21,000 |
| • | Horizontal frame | n | 25,000 |
| 3) | Cross brace | H | 6,000 |
| 4) | Coupling pin | 11 | 1,300 |
| 5) | Arm lock | 11 | 1,000 |
| 6) | Jack base | 11 | 6,600 |
| 12. | Others | | |
| • | Electricity | kWh | 71 |
| | Brick | 1,000 pcs | 17,000 |
| | Lime, plaster | kg. | 60 |
| | Bamboo | pc. | 1,000 |
| | Asphalt | kg. | 350 |
| | Elastic filler, t = 10mm | 2 m | 9,000 |
| | Rubber plate , t = 10mm | 11 | 160,000 |
| | Bentonite | kg. | 570 |
| | Grass for sodding | 2 m | 300 |
| | Terasso tile, 30 x 30 cm | pc. | 650 |
| | Paint on metal. ICI paint | kg. | 3,100 |
| | Paint on timber. | n | 5,600 |
| | | ne. | 1,200 |
| | Sand bag | pc. | 450 |
| | Form tie | pc. | 400 |
| | Washer | 11 | 400 |
| | Corn | н | 500 |
| | Separator Release agent | l | 200 |
| | Welding rod | kg. | 1,500 |
| 17) | Mergring rod | **** | - , |

PERCENTAGE OF FOREIGN AND DOMESTIC Table 8.7 CURRENCY COMPONENTS ON CONST. MATERIALS

F.C : Foreign currency
I.F.C : Indirect foreign currency
D.C : Domestic currency

| | (| Unit : % |) |
|--|----------------|---------------|----------|
| Const. Materials | F.C | I.F.C | D.C |
| 1. Cement & Concrete Admixture | | | |
| 1) Portland cement | | 65.0 | 35.0 |
| 2) White cement | _ | - | _ |
| Water reducing agent | | | _ |
| 2. Aggregates & Stones | | | |
| 1) Aggregates by plant | | 55.0 | 45.0 |
| 2) Sand | ~- | 0 | 100.0 |
| 3) Gravel | ~ | . 0 | 100.0 |
| 4) Masonry stone | _ | . 0 | 100.0 |
| 5) Cobble & rubble stone | - | 0 | 100.0 |
| 6) Red cement | | · | → |
| 3. Steel Materials | | | |
| 1) Re-bar, round | _ | 85.0 | 15.0 |
| 2) " , deformed | _ | 85.0 | 15.0 |
| 3) Structural steel | _ | 85.0 | 15.0 |
| 4) Steel plate | - | 85.0 | 15.0 |
| 5) Steel pipe | | 85.0 | 15.0 |
| 6) Steel sheet pile | ** | 100.0 | 0 |
| 7) Spiral vent pipe | _ | | _ |
| 8) Gas pipe | | 85.0 | 15.0 |
| 9) Galvernaized pipe | | 85.0 | 15.0 |
| 10) Binding wire | _ | 85.0 | 15.0 |
| 11) Nail | | 85.0 | 15.0 |
| 12) Channel, angle | - | 85.0 | 15.0 |
| 13) Gabion mattress | _ | 85.0 | 15.0 |
| 14) Gabion cylinder | - | 85.0 | 15.0 |
| 15) Metal form | | 85.0 | 15.0 |
| 16) Pipe support | • - | 85.0 | 15.0 |
| 17) Rail, 22 kg/m | - | 100.0 | 0 |
| 18) Anchor cap | - . | 85.0 | 15.0 |
| 4. Wooden Materials | | | |
| 1) Teak((class-1), plank, square & log | | 18.0 | 82.0 |
| 2) Kamper (class-2) " | | 18.0 | 82.0 |
| 3) Meranti (class-3) " | - | 18.0 | 82.0 |
| 4) Keruwing (class-4) | Nee | 18.0 | 82.0 |
| 5) Plywood, water proof | . | 18.0 | 82.0 |
| 5. Concrete Pipe | _ | • | <u>·</u> |
| | | | |

6. PVC Products

| 6. | PVC Products | | | |
|-----|---------------------------------------|---|----------------|--------------|
| | 1) PVC pipe | una | 65.0 | 35.0 |
| | 2) PVC: water stop | ⊷ | 85.0 | 15.0 |
| | | | | |
| 7. | Fuel & Lubricants | | | |
| | 1) Light 0 : 1 | | 65.0 | 35.0 |
| | 2) Gasoline | *** | 65.0 | 35.0 |
| | 3) Engine 0 : 1 | · - | 65.0 | 35.0 |
| | 4) Hydraulic 0 : 1 | - | 65.0 | 35.0 |
| | 5) Grease | - | 65.0 | 35.0 |
| | 6) Koresene | | _ | |
| 8. | Gas | | | |
| | 1) Oxygen gas | | | |
| | 2) Acetylene gas | * ** | - | *** |
| | 3) Propan gas | | | |
| 0 | Barata a taran 6 Angaran antara | | | |
| 9. | Explosives & Accessories | | 20.0 | 10.0 |
| | 1) Dynamite | | 90.0 | 10.0 |
| | 2) Detonator w/leg | | 90.0 90.0 | 10.0 10.0 |
| | 3) An-Fo powder 4) Fuse | | 85.0 | 15.0 |
| | 5) Blasting machine | - | 100.0 | 0 |
| | 3 | | | |
| 10. | Bit & Rod | | | |
| | l) Cross bit | · | 100.0 | 0 |
| | 2) Insert bit | •• | 100.0 | 0 |
| | 3) Taper rod | . - | 100.0 | 0 |
| | 4) Metal bit | _ | 100.0 | 0 |
| | 5) Tube core barrel 6) Diamond bit | | 100.0 100.0 | 0 |
| | 7) Tri cone bit | - | 100.0 | . 0 |
| | 8) Core lifter | _ | 100.0 | Ö |
| | 9) Rod, crawler drill, 3m | - | 100.0 | Ö |
| 1 | 0) Sleeve | - | 100.0 | 0 |
| | 1) Shank rod | _ | 100.0 | 0 |
| 1 | 2) Boring rod | | 100.0 | 0 |
| 11. | Scaffolding | | 0 | 100.0 |
| 12. | Others | | | |
| | 1) Electricity | | | nd-di |
| | 2) Brick | | 0 | 100.0 |
| | 3) Lime, plaster | | - | _ |
| | 4) Bamboo | | 0 | 100.0 |
| | 5) Asphalt | -, . | 50.0 | 50.0 |
| | 6) Elastic filler | , - | | - , . |
| | 7) Rubber plate | · - | - | |
| | 8) Bentonite | - . | | |
| | 9) Grass for sodding | · - | . 0 | 100.0 |
| | 0) Terasso tile | ••• · · · · · · · · · · · · · · · · · · | | EO 0 |
| 1 | 1) Paint on metal | _ | 50.0 | 50.0 |

| 12) Paint on timber | . News | 50.0 | 50.0 |
|---------------------|------------|---------------|-------|
| | | O | 100.0 |
| 13) Sand bag | | Ů | 200.4 |
| 14) Form tie | - | _ | - |
| 15) Washer | _ | | . — |
| 16) Separator | | 85.0 | 15.0 |
| 17) Release agent | | . | |
| 18) Welding rod | - . | | - |
| | | • | |

Table 8.8 UNIT COST OF MAJOR WORKS (Flood Control & Drainage Improvement)

| | | Unit | Foreign (US\$) | Indirect Foreign (US\$) | Domestic (Rp) |
|----------|--------------------------|------------------|-------------------|-------------------------------|------------------|
| | | , | · | (004) | (Np) |
| 1. | Dredging Lower Widas | . _m 3 | 1.158 | 0.164 | 746 |
| | Upper Widas & Lower Ulo | | 1.358 | 0.193 | 874 |
| | | | | | |
| 2. | Kedungsoko Excavation | | 1.237 | 0.175 | 796 |
| ۷. | H.W. Channel | | 0.513 | 0.108 | 272 |
| 3. | Embankment | | 1.004 | 0.500 | 786 |
| | | | 0.904 | 0.450 | 707 |
| 4. 5. | Embankment, Heightening | | 0.798 | 0.223 | 457 |
| | Backfill of Old Channel | | | the second second | 370 |
| 6. | Land Reclamation | | 0.544 | 0.223 | 370 |
| 7. | Wet Masonry | m ³ | | | 10.002 |
| | W.M | | 0.0 | 0.233 | 10,083 |
| | Gabion | m3 | 0.0 40 | 6.988 341 | 16,101 517 |
| 8. | Bridge Highway | m ² | 21 | 163 | 206 |
| | National | m² | 20 | 87 | 132 |
| | Provincial | m² m² | | • | 292 |
| | Rural | դո∠ ա2 | 26 | 194 | 66 |
| | Footpath | | 10 | 51 | - |
| | Bridge Railway | m. | 169 | 1,541 | 1,526 |
| 9. | Drainage Culvert | | | | |
| | Type I | | 3,799 | 12,472 | 19,683,000 |
| | Type II | | 5,807 | 30,742 | 40,149,000 |
| | Type III | | 6,330 | 44,841 | 57,814,000 |
| 0. | Drainage Sluice | | | | |
| | Туре І | • | 3,799.0 | 15,685.0 | 20,098,000 |
| | Type II | | 5,807.0 | 45,022.0 | 41,997,000 |
| 1. | Siphon, Kuncir | No | 32,582.0 | 62,417.0 | 95,791.0 |
| | F.D. Channel | No | 40,278.0 | 70,319.0 | 115,346,000 |
| | Ulo | No | 27,161.0 | 55,969.0 | 80,329.0 |
| 2. | Drop Structure | No | 7,357.0 | 6,636.0 | 18,693,000 |
| 3. | Drainage Sluice | | | | |
| | Widas | • | 29,382 0 | 321,380.0 | 297,179,000 |
| | Ulo | | 12,573 | 139,666,000 | 136,497,000 |
| | K. Soko | | 22,279.0 | 124,333.0 | 167,211,000 |
| 4. | Side Overflow Weir | m | 23.7 | 397.7 | 747,200 |
| 5. | Diversion Weir | M | 110,954.0 | 266,723.0 | 393,100,000 |
| 6. | Irrigation Head Works | | 110,934.0 | 200,723.0 | 333,100,000 |
| ٠. | Tiripan | | 25 172 0 | 394,229.0 | 393,919.0 |
| | | | 35,112.0 | · . | |
| | Malangsaki | | 18,144.0 | 615,640.0 | 541,212.0 |
| | Kranat | | 13,108.0 | 158,523.0 | 196,567.0 |
| | Kapas | 3 | 18,687.0 | 286,971.0 | 265,430,000 |
| 7. | Drainage Channel | m3 | 1.237 | 0.1756 | 796 |
| .8. | Al Canal Levee | m3 | 0.904 | 0.450 | 707 |

Table 8.9 BILL OF QUANTITY DAM & IRRIGATION SCHEME (1/6)

| | | | | 70704 | 200000000000000000000000000000000000000 | 144.400.4 | TO YOU | Domestin | Domostic Currency |
|------|---|--------|----------------------|--------------|---|--------------|--------------|--------------|-------------------|
| Item | | | | SSU USŞ | SSI CECTOR INC. | Currency | | (R) | (Rp.) |
| No. | COSC ITEM | UBIE | Quantity Quantity | Unit Cost | Amount (103) | Unit Cost | Amount (103) | Unit Cost | Amount (103) |
| | | | | | | | | | |
| i. | Kedungwarak Weir | | | | - | | | | |
| T.1 | Prepaparatory works | | | | | | | | |
| | 1. Improvement, Access road | ı | L.S | ı | 1.36 | 1 | 1.36 | l | 2,000 |
| | | 1 | L.S | ı | 13.63 | 1 | 13,63 | 1 | 20,000 |
| • | | | | | (14.99) | | (14.99) | 1 | (22,000) |
| 1.2 | Civil works | • | | | | | | | |
| | 1. Excavation weathered rock | ۳ ع | 20,300 | 1.68 | 34.10 | 1.27 | 25.78 | 1,750 | 35,525 |
| | 2. Earthfill dam | = | 1,600 | 1.35 | 2.16 | 1.02 | 1.63 | 1,400 | 2,240 |
| | 3. Concrete w/re-bore form | = | 000,6 | 18.18 | 163.62 | 68.18 | 613.62 | 45,000 | 405,000 |
| | • | Ξ | 4,700 | 0.67 | 3.15 | 0.51 | 2.40 | 200 | 3,290 |
| | 5. Masonry, dam | = | 009 | 5.45 | 3.27 | 8.18 | 4.91 | 15,000 | 9,000 |
| | 6. Rock riprap | : | 250 | 1.91 | 0.48 | 16.1 | 0.48 | 2,800 | 700 |
| | 7. Grouting crutain | E | 1,000 | 14.55 | 14.55 | 36.36 | 36,36 | 24,000 | 24,000 |
| | 8. Metal works | ij | 1.5 | 909.09 | 1.36 | 2,272.73 | 3.41 | 1,500,000 | 2,250 |
| | 9. Exca, relocation road | E = 3 | 14,800 | 0.84 | 12.43 | 0.64 | 6.47 | 875 | 12,950 |
| | 10. Embank, relocation road | = (| 2,700 | 1.01 | 2.73 | 0.76 | 2.05 | 1,050 | 2,835 |
| | 11. Bridges, relocation road | 7 E | 250 | 23.16 | 5.79 | 192.6 | 48.15 | 428,000 | 107,000 |
| | 12. Miscellaneous works | i | L.S | ı | 1 | ŀ | l | . 1 | . 624,06 |
| | 10% of DC for 1.2 | | | | | | | | |
| | Sub-Total | | | | 243.64 | | 748.26 | 604.79 | O. |
| | Total | | | | 258.63 | | 763.24 | 626.79 | 6 |
| | 4 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | ; | | | | | | | |

le 8.9 _BILL OF QUANTITY FOR DAM & IRRIGATION SCHEME (2/6)

| Item | + | t1 | (1) the Culture of the | Foreign Cuuss | oreign Currency US\$ | Indirect Fore Currency US\$ | Foreign y US\$ | Domestic Cu | Currency () |
|------|---|----------------|------------------------|---------------|---------------------------|--------------------------------|-------------------|--------------|---------------------------|
| 2 | | 7 1 | לממוונדר | Unit Cost | Amount (10 ³) | Unit Cost | Amount (103) | Unit Cost | Amount (10 ³) |
| II. | Trans Basin Tunnel | | | | | · | | | |
| II.1 | Preparatory works | | | | | · | | | |
| | 1. Access roads w/bridges | . 1 | L.S | 1 | 4.09 | l | 4.09 | ı | 9,000 |
| | 2. Power, water & air supply | 1 | L S | ı | 32.73 | ı | 32.73 | I | 18,000 |
| | 3. Other temporary facilities | 1 | Ľ.S | | 8.18 | ı | 81.8 | i | 12,000 |
| | Sub-Total | | | ٠ | 45.00 | | 45.00 | | 36,000 |
| II.2 | Civil works | 1 | | | | | | | |
| | 1. Excavation, common, open | m Ε | 53,000 | | • | 0.89 | | 1,225 | 64,925 |
| ÷ | Excavation, tunnel | Ε | 7,400 | ∞ | 134.53 | 14.55 | 107.67 | 4,000 | 29,600 |
| | 3. Concrete, tunnel | Ξ | 2,650 | | • | 29.09 | | 8,000 | 21,200 |
| | 4. Concrete, w/re-bar & form, open | E | 700 | ά | ς, | 68.18 | | 45,000 | 31,500 |
| | 5. Support | Ţ | 190 | 90.91 | \sim | 636,36 | \circ | 200,000 | 38,000 |
| | 6. Re-bar | = ' | 130 | 82.73 | \sim | 579.09 | S | 182,000 | 23,660 |
| | 7. Form | m ₂ | 250 | 60.6 | 2.27 | 63.64 | 15.91 | 20,000 | 5,000 |
| | 8. Backfill grout | e E | 200 | 27.27 | √ † | 68.18 | (r) | 45,000 | 000,6 |
| | 9. Metal works | ц | 15 | 60 606 | S | 2,272.73 | √ 7 | 1,500,000 | 22,500 |
| | 10. Miscellaneous works | t | L.S | : 1 | 1 | ı | ł | ı | 49,077 |
| | 20% of DC for II-2 | | | | | | | | |
| | Sub-Total | | | | 355,53 | | 539.5 | | 294,462 |
| | TO+01 | | | | 400.53 | | 584.5 | | 330,462 |
| | TOOK | | | | | | | | |

Table 8.9 BILL OF QUANTITY FOR DAM & IRRIGATION SCHEME (3/6)

| | | | | | | : | | | |
|-------------------|--|---------|----------|-------------------|-------------------------|--------------|--|---------------|----------------|
| Item | | ! | | Foreign C US\$ | oreign Currency US\$ | Indirect | Foreign v USS | Domestic Curr | Currency) |
| No. | Cost Item | Unit | Quantity | Unit Cost | Amount (103) | Unit Cost | A 10 CT 10 C | Unit Cost | Amount (103) |
| | | | | | | | | | |
| III. Ketandan | ın dam | | | | | | | | |
| III.1 Prepars | Preparatory works | | | | | | | | |
| 1. Acce | Access, New & Improvement | l | • | 1 | ۲, | i | 8.1 | 1 | 100,000 |
| | Temporary buildings | i | | 1 | 0.6 | ŀ | 2 | | 000,09 |
| | Power, Air & Water supply | 1 | L S | ı | ~ | ţ | 2.7 | ı | 40,000 |
| | | 1 | • | 1 | ۲. | 1 | 2.7 | | 4,000 |
| | Plant installation | 1 | | ı | 4.5 | ı | 3.6 | ł | 30,000 |
| 6. Prep | Preparatory work, others | 1. | | l | 40.91 | 1 | 40.91 225 46 | l | 60,000 |
| , | יים ביים ביים ביים ביים ביים ביים ביים | | | | | | r • | | , |
| III.2 Civíl works | vorks | | | | | | | | |
| (Divers | (Diversion works) | + (| | | | | | | |
| 1. Exce | Excavation, ipen, w/rock | E 3 | ന | 1.68 | 0.5 | 1.27 | ο. Ο. | 1,750 | ó |
| 2. Exce | Excavation, tunnel | Ξ | 2,000 | 8.1 | ن | 3 | 29.10 | 4,000 | 8,00 |
| 3. Conc | Concrete tunnel | E | 750 | - | 1.1 | 4.5 | ٠. و | 15,000 | ,25 |
| 4. Concl | Concrete, w/re-bar & form | = | 50 | 8 | o, | ₩. | 4 | 45,000 | ,25 |
| 5. Supp | Support, tunnel | ι. (| 36 | φ. | .2 | 6.3 | o, | | ζ, |
| 6. Forn | Form, tunnel | , E | 130 | 60 6 | Τ. | 63.64 | 8.2 | 20,000 | 0 |
| | Backfill grout | E | 100 | .7 | 2.73 | 8.1 | 6.82 | • | 4,500 |
| | Sub-Total | | | | 0 | * = | ٠, | | ∞, |
| (Main Dam) | Jam) | ٠ : | | | - | | | | |
| | | · 日: | 355,000 | 7.51 | 536.05 | 1.15 | 408.25 | 1,575 | 559,125 |
| 9. Emba coff | Embankment earth including coffee dams | Ξ | ຕົ | ŭ | 83.7 | ô | 76.8 | \sim | 46,86 |
| 10. Filter | дe: | Ξ | 27,000 | 1.85 | 6.67 | 2.15 | 58.0 | 1,100 | 9,70 |
| 11. Rock | Rock Riprap | = | ထ် | .35 | 137 | .74 | 160 | ,400 | 81,760 |
| | Sub-local | | | | 0.00 | | ۲۰۰۰ | | 7 , 1 1 |
| | | | | | | | | | |

(continued)

| | | | | | | | | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |
|----------------------|--------------|----------------------|---------------|--------------------------|---------------|------------------|---------------------|---|
| 2,262,325 | | | 2,652.51 | | 2,40,863 | | | Total |
| 1,968,325 | | | 2,427.05 | | 2,010.44 | | | 10% of DC for ill-2 Sub-Total |
| 178,900 | | ı | ı | i | ı | Ľ.S | ı | 25. Miscellaneous works |
| 1,200 | 1,200,000 | 1.82 | 1,818.18 | 0.73 | 727.27 | \leftarrow | ħ | 24. Metal works Sub-Total |
| 30,000 | ı | 27.27 | I . | 218.18 | 1 | ғ ⊣ | set | 23. Power, Equipment, Auxiliry & building |
| 1,200 | 60,000 | 1.82 | 16.06 | 0.73 | 36.36 | 20 | = . | 22. Concrete, open, w/re-bar & form |
| 11,700 | 000,06 | 17.73 | 136,36 | 7.09 | 54.55 | | = | |
| 2,890 | 8,500 | 10.51 | 30.91 1.27 | 13.14 | 38.64 1.68 | 340 | ო # # | Excavatio Excavatio |
| 119,715 | | 180.14 | | 73.11 | | | | Sub-Total |
| 3,840 79,500 | 24,000 | 5.82 | 36.36 | 2.33 | 14.55 | 160 | = H | 17. Plug concrete 18. Metal Works |
| 34,800 | 000,09 | 52.73 | 16.06 | 21.09 | 36.36 | 580 | = ' | <pre>16. Concrete includ. re-bar & form</pre> |
| 1,575 | 1,750 | 1.14 | 1.27 | 1.51 | 1.68 | 006 | r | (Intake Structure) 15. Excavation w-rock |
| 554,250 | - | 761.03 | | 279.37 | | | | Sub-Total |
| 3,850 | 700 | 2.81 | 0.51 | 3.69 | 0.67 | 5,500 | = | 14. Backfill |
| 95,900 454,500 | 1,750 | 69.60 688.62 | 1.27 | 92.06 183.62 | 1.68 | 54,800 10,100 | E : | 12. Excavation, w/rock 13. Concrete including form |
| | | | | | | | r | (Spilway) |
| Amount (103) | Unit Cost | Amount (103) | Unit Cost | Amount (103) | Unit Cost | (damency | 3 4 10 0 | No. |
| ic Currency (Rp.) | Domest | t Foreign cy US\$ | Indirect | Foreign Currency US\$ | Foreign U | , 1 | 4 5 1 | Item |
| | | | | | | | | |

Table 8.9 BILL OF QUANTITY FOR DAM & IRRIGATION SCHEME (4/6)

| Item | | Unit Quon | Quantity | Foreign US | Currency \$ | Indirec Currenc | t Foreign y US\$ | Domestic (Rp | Currency |
|-------|--|----------------|----------|---------------|------------------------------|--------------------|------------------------------|-----------------|------------------------------|
| No. | Cost Item | Unic | | Unit Cost | Amount (10 ³) | Unit Cost | Amount (10 ³) | Unit Cost | Апоunt (10 ³) |
| IV | Bangle Headworks | | | | | | | | |
| I V-1 | Preparatory works | | | | | | | | |
| | 1. Access, improvement | L.S | | · - | 5.45 | - | 5.45 | | 8,000 |
| | 2. Temporary buildings | r.2 | | - | 1.36 | - | 4.09 | - | 9,000 |
| | 3. Power supply | L.S | | - | 7.27 | - | 7.27 | - | 4,000 |
| | Sub-Total | | | | 14.08 | | 16.81 | | 21,000 |
| IV-2 | Civil works | _ | | | | | | | ٠. |
| | 1. Excavation, common | _m 3 | 7,800 | 1.18 | 9.20 | 0.89 | 6.94 | 1,225 | 9,555 |
| | 2. Embankment | 11 | 1,200 | 1.35 | 1.62 | 1.02 | 1.22 | 1,400 | 1,680 |
| | 3. Masonry | 11 | 2,200 | 5.45 | 11.99 | 8.18 | 18.00 | 15,000 | 33,000 |
| | 4. Concrete w/form & re-bar | " | 7 | 18.18 | 0.13 | 90.91 | 0.64 | 80,000 | 560 |
| | 5. Sod facing | _m 2 | 700 | 0.03 | 0.02 | 0.05 | 0.04 | 210 | 147 |
| | 6. Gravel metalling | _m 3 | 500 | 1.35 | 0.68 | 1.56 | 0.78 | 800 | 400 |
| | 7. Miscellaneous Works 10% of DC for IV-2 | L.S | | | | | | | 4,530 |
| | Sub-Total | | | 23.60 | | 27.62 | | | 49,872 |
| | Total | | | 37.72 | | 44.43 | | | 70,872 |

Table 8.9 BILL OF QUANTITY FOR DAM & IRRIGATION SCHEME (5/6)

| Item | Cook The- | lls. | Quantite | Foreign US | Currency | Indirect Currency | Foreign USS | | c Currency |
|------|---|-------------------------|----------|---------------|------------------------------|----------------------|------------------------------|--------------|---------------------------|
| No. | COST LIEM | Unit | Quantity | Unit Cost | Amount (10 ³) | l'nit Cost | Amount (10 ³) | Unit Cost | Amount (10 ³) |
| V | Canals & Structures | | | | | | | | |
| V-1 | Preparatory works | | | | | | | | |
| | Improve, access roads & bridges | L.S | | | 9.55 | - | 9.55 | | 14,000 |
| | 2. Temporary buildings | L.S | | - | 1.36 | - | 4.09 | | 9,000 |
| | Sub-Total | | | | 10.91 | | 13.64 | | 23,000 |
| V-2 | Civil works (M.C & S.C with structure) | | | | | • | | | |
| | 1. Clearing & Stripping | m ² | 150,000 | 0.17 | 25.00 | 0.13 | 19.50 | 175 | 26,250 |
| | 2. Excavation, common | _m 3 | 164,500 | 0.67 | 110.22 | 0.78 | 128.31 | 400 | 65,800 |
| | 3. Embankment | " | 118,600 | 0.84 | 99.62 | 0.98 | 116.23 | 500 | 59,300 |
| | 4. Backfill | 11 | 22,400 | 0.67 | 15.01 | 0.78 | 17.47 | 400 | 8,960 |
| | 5. Masonry | | 16,600 | 8.18 | 135.79 | 10.91 | 181.11 | 9,000 | 149,400 |
| | 6. Sod facing | m ² | 206,900 | 0.03 | 6.21 | 0.05 | 10.35 | 210 | 43,449 |
| | 7. Concrete pipes | m. | 2,012 | 1.82 | 3.66 | 10.00 | 20.12 | 7,000 | 14,084 |
| - | 8. Reinforced concrete (TC, QC, DC with/structure | m ³ . es) | 90 | 9.09 | 0.82 | 59.09 | 5.32 | 25,000 | 2,250 |
| | Sub-Total | | | | 396.83 | | 498.41 | | 369,493 |
| | 9. Clearing & stripping | m ² | 400,000 | 0.17 | 68.00 | 0.13 | 52.00 | 175 | 70,000 |
| | 10. Excavation, common | m ³ | 144,400 | 0.84 | 121.30 | 0.98 | 141.51 | 500 | 72,200 |
| | 11. Embankment | 11 | 179,900 | 1.01 | 181.70 | 1.17 | 210.48 | 600 | 107,940 |
| | 12. Backfill | 11 | 2,400 | 0.67 | 1.61 | 0.51 | 1.22 | 700 | 1,680 |
| | 13. Sod facing | m ² | 765,500 | 0.03 | 22.97 | 0.05 | 38.28 | 210 | 160,755 |
| : | 14. Concrete pipe | m | 1,380 | 0.55 | 0.76 | 3.00 | 4.14 | 2,100 | 2,898 |
| | 15. Reinforced concrete | m ³ | 50 | 9.09 | 0.45 | 59.09 | 2.95 | 25,000 | 1,250 |
| • • | 16. Concrete panel for canal lining | m ² | 103,500 | 0.27 | 27.95 | 1.64 | 169.74 | 900 | 93,150 |
| | 17. Mortar for lining | _m 3 | 3,100 | 2.73 | 8.46 | 8.18 | 25.36 | 18,000 | 55,800 |
| : | Filter for lining (Inspection road) | , | 5,200 | 0.55 | 2.86 | 1.64 | 8.53 | 3,600 | 18,720 |
| | Sub-Total | | | | 436.06 | | 654.21 | ٠. | 584,393 |
| ٠. | 19. Clearing & stripping | m ² | 50,000 | 0.17 | 8.50 | 0.13 | 6.50 | 175 | 8,750 |
| : | 20. Embankwent | m ³ | 54,400 | 0.84 | 45.70 | 0.98 | 53.31 | 500 | 27,200 |
| : | 21. Gravel metalling | 11 | 3,800 | 1.35 | 5.13 | 1.56 | 5.93 | 800 | 3,040 |
| ; | 22. Sod facing | m ² | 61,300 | 0.03 | 1.84 | 0.05 | 3.07 | 210 | 12,873 |
| | 23. Excavation, drain | m ³ | 99,200 | 0.23 | 22.82 | 0.45 | 44.64 | 1,750 | 173,600 |
| : | 24. Masonry | 11 | 480 | 8.18 | 3.93 | 10.91 | 5.24 | 9,000 | 4,320 |
| | Sub-Total | | | | 87.92 | | 118.69 | | 229,783 |
| - : | 25. Miscellaneous works 10% of DC for V-2 | L.S | | | ٠ | | | | 118,370 |
| | Sub-Total | • | | ű. | 920.81 | | 1,271.31 | | 1,248,039 |
| | Total | | | | 931.72 | | 1,284.95 | ÷ | 1,271,039 |

Table 8.9 BILL OF QUANTITY FOR DAM & IRRIGATION SCHEME (6/6)

| Tem No. Cost Item Unit Quantity Unit Amount Cost (10 ³) Cost (10 ³) | | | | | | 4 1 | | | |
|--|------|--|--------------|----------------|------------------------------|------------|----------|--------------|------------------------------|
| No. Cost Item Unit Quantity Unit Amount Cost (103) VI Ngluvu Pumping Station VI-1 Preparatory works L.S | Item | | | 110 | | | | | Currency |
| VI-1 Preparatory works I.S VI-2 No. 1 station (Q=0.058 m³/sm H=24m, L=600m) 1. Civil work including L.S - 1.36 - 2.73 erection 2. Pumping equipment, pipes & auxiliaries w/building VI-3 No. 2 station (Q=0.114m³/s, H=25m, L=1,100m) 3. Civil works incl. L.S - 2.27 - 4.55 erection 4. Pumping equipment, L.S - 40.91 - 32.73 pipes & auxiliaries w/building 5. Miscellaneous L.S | | Cost Item | Oute Gnavere | Unit | Amount (10 ³) | | | Unit Cost | Amount (10 ³) |
| VI-2 No. 1 station (Q=0.058 m³/sm H=24m, L=600m) 1. Civil work including L.S - 1.36 - 2.73 erection 2. Pumping equipment, L.S - 27.27 - 21.82 pipes & auxiliaries w/building VI-3 No. 2 station (Q=0.114m³/s, H=25m, L=1,100m) 3. Civil works incl. L.S - 2.27 - 4.55 erection 4. Pumping equipment, L.S - 40.91 - 32.73 pipes & auxiliaries w/building 5. Miscellaneous L.S (10% of DC vor VI-2 & 3) | VI | Ngluvu Pumping Station | | | | | | | |
| (Q=0.058 m³/sm H=24m, L=600m) 1. Civil work including L.S - 1.36 - 2.73 erection 2. Pumping equipment, L.S - 27.27 - 21.82 pipes & auxiliaries w/building VI-3 No. 2 station (Q=0.114m³/s, H=25m, L=1,100m) 3. Civil works incl. L.S - 2.27 - 4.55 erection 4. Pumping equipment, L.S - 40.91 - 32.73 pipes & auxiliaries w/building 5. Miscellaneous L.S (10% of DC vor VI-2 & 3) | VI-1 | Preparatory works | L.S | - | <u>.</u> | - . | | - | 5,000 |
| erection 2. Pumping equipment, L.S - 27.27 - 21.82 pipes & auxiliaries w/building VI-3 No. 2 station (Q=0.114m³/s, H=25m, L=1,100m) 3. Civil works incl. L.S - 2.27 - 4.55 erection 4. Pumping equipment, L.S - 40.91 - 32.73 pipes & auxiliaries w/building 5. Miscellaneous L.S (10% of DC vor VI-2 & 3) | VI-2 | $(Q=0.058 \text{ m}^3/\text{sm H}=24\text{m},$ | | | | | | | |
| pipes & auxiliaries w/building VI-3 No. 2 station (Q=0.114m³/s, H=25m, L=1,100m) 3. Civil works incl. L.S - 2.27 - 4.55 erection 4. Pumping equipment, L.S - 40.91 - 32.73 pipes & auxiliaries w/building 5. Miscellaneous L.S | | | L.S | - | 1.36 | | 2.73 | - - | 10,500 |
| (Q=0.114m ³ /s, H=25m, L=1,100m) 3. Civil works incl. L.S - 2.27 - 4.55 erection 4. Pumping equipment, L.S - 40.91 - 32.73 pipes & auxiliaries w/building 5. Miscellaneous L.S (10% of DC vor VI-2 & 3) | | pipes & auxiliaries | L.S | . - | | - | 21.82 | | 6,000 |
| 3. Civil works incl. L.S - 2.27 - 4.55 erection 4. Pumping equipment, L.S - 40.91 - 32.73 pipes & auxiliaries w/building 5. Miscellaneous L.S (10% of DC vor VI-2 & 3) | vI-3 | $(Q=0.114m^3/s, H=25m,$ | | | | · . | | | |
| pipes & auxiliaries w/building 5. Miscellaneous L.S (10% of DC vor VI-2 & 3) | | 3. Civil works incl. | L.S | - | 2.27 | _ | 4.55 | · <u>-</u> | 17,500 |
| (10% of DC vor VI-2 & 3) | | pipes & auxiliaries | L.S | - | 40.91 | - | 32.73 | | 9,000 |
| | | | L.S | . - | - | - | → | - | 4,800 |
| Total 71.81 61.83 | | Total | | | 71.81 | | 61.83 | | 52,800 |

| No. | Description | · | Car | acity | Quant | ty |
|-----|--|-----|-------|--------------------------|-------|-----|
| 1. | Crushing plant | • | 30 | t/h | : 1 | |
| 2. | Batcher plant | | 10 | m3/h | 1 | |
| 3. | Bulldozer, w/ripper | | 30 | t | 2 | |
| 4. | Bulldozer, w/ripper | | 20 | t | 5 | |
| 5. | Bulldozer, | | 11 | t | . 3 | |
| 6. | Bulldozer, swamp | | 7 | t | 3 | |
| 7. | Backhoe | | 0.6 | m ³ | . 5 | |
| 8. | Backhoe, swamp | | 0.3 | | . 6 | |
| 9. | Tractor shovel | • | 1.0 | m 3 | 7 | |
| 10. | Tractor shovel | • | 0.5 | 3 | 3 | |
| 11. | | | | m3 | 3 | |
| | | | 2.0 | | | |
| 12. | Dump truck | | 10 | t | 15 | |
| 13. | Dump truck | | 6 | t | 10 | |
| 14. | Dump truck | | 4 | t | 5 | |
| 15. | Tire roller | | 20 | t | 2 | |
| 16. | Vibration roller | | 5 | t | 2 | |
| 17. | Vibration roller | | 1 | t ₃ | • 6. | |
| 18. | Port-concrete mixer | | 0.4 | m3 m3 | 2 | |
| 19. | Port-concrete mixer | | 0.2 | m ³ | 7 | + |
| 20. | Agitator truck | | 2.5 | m^3 | -5 | |
| 21. | Concrete pump | | 20 | m^3/h | 1 | |
| 22. | Air leg hammer | | 30 | kg | 8 | |
| 23. | Rock drill | | 30 | kg | 2 | |
| 24. | Air compressor | | 7 | m ³ /mir | | |
| 25. | Muck loader | | 0.1 | | . 3 | |
| 26. | Muck car | • | 0.5 | m3 m | 15 | |
| 27. | Battery locomotive | | 3 | t | 3 | |
| 28. | Boring machine | | 100 | | | |
| 29. | | | | m | 1 | • |
| 30° | Grout pump & mixer Water tanker | | 200 | 1 | 2 | |
| 31. | | | 6 | kl | 5 | |
| | Diesel generator | | 100 | kvA | 2 | |
| 32. | Diesel generator | | 50 | kvA | 4 . | |
| 33. | Diesel generator | | 30 | kvA | 2 | |
| 34. | Truck crane | 1 1 | 20 | t | 2 | |
| 35. | The state of the s | | · · · | | 2 s | ets |
| | Fuel tanker | | 6 | k1 | 3 | • |
| 37. | Grease car | | 6 | t | 2 | |
| 38. | Mobile work shop | | . 6 | t | 2 | |
| 39. | Motor grader | | 3.1 | m | 2 | |
| 40. | Road roller | | 2 | t | 2 | |
| 41. | Ordinary truck, w/crane | | 6 | t | 3 | • |
| 42. | Asphalt sprayer | 1 | 200 | 1 | 1 | |
| 43. | Asphalt finisher | | 2.5 | m T | 1 | |
| 44. | Pump | | 4 | | | |
| 45. | Contra fan | | | ø m ³ /min | 20 | |
| 46. | Welder | | 50 | | | |
| | | | 270 | Α | 3 | - |
| 47. | | | 30 | t | 1 | |

Table 8.11 UNIT COST LIST FOR MAJOR ITEMS

| Dam | & Irrigation Scheme | Unit | Cost |
|-----|---|-------------------|-----------|
| | Items | Unit Cost | (Rp) |
| 1. | Excavation, w.rock, Kedungwarak | 5,000 | / m3 |
| 2. | Concrete with form & re-bar, Kedungwarak | 200,000 | If . |
| 3. | Excavation, T Basin Tunnel | 40,000 | f1 |
| 4. | Concrete diversion Tunnel, Dam, w/out form & re-bar | 150,000 | tt |
| 5. | Excavation, w.rock, Ketandan dam | 4,500 | 11 |
| 6. | Embankment, Ketandan dam (Earthfill) | 4,100 | ır |
| 7. | Concrete, Ketandan dam (with form & re-bar) | 150,000 | tt |
| 8. | Masonry, Bangle Headworks | 30,000 | an . |
| 9. | Excavation, common, main canal by equipment | 2,000 | $/ m^3$ |
| 10. | Excavation, common, T.Canal by man-power | 2,500 | 11 |
| 11. | Embankment, main canal | 2,500 | FI |
| 12. | Metal works | 4.0×10^6 | / t |

This ANNEX presents risk-resultant matrixes, and assessment and, intensities of environmental impacts of the proposed flood control and drainage project and dam and irrigation development project.

ANNEX - 9

LIST OF TABLES

| 9.1 | RRM (1/13 - 13/13) | 9.1 |
|-----|---------------------------------|------|
| 9.2 | INTENSITY OF NEGATIVE IMPACT | 9.14 |
| 9.3 | INTENSITY OF NEUTRAL IMPACT | 9.19 |
| 0.4 | THERMOTERY OF POSTERIAL THROUGH | 0 22 |

Table 9.1 RRM FOR PHYSICAL WORKS AREA CHANNEL IMPROVEMENT OF THE EXISTING RIVERS INCLUDING RIVER STRUCTURES

Eco-system Area : Area of Physical Works (1/13)

K. Widas, K. Ulo, K. Kuncir, K. Kedungsoko (dredging area, embankment, cutoff) Construction Operation Sectors/Time Period Non-renewable Resources 1. Geological features n 0 0 Mineral resources <u>+</u> M.A 3. Topography - S.A 0 4. Soil 0 0 5. Sedimentation 0 n 6. Climate, Including hydrology n Archaeology and historical remains n Renewable Resources l. Air 0 - S.A 2. Water : quality - M.A 0 quantity 0 distribution through time eutrophication including aquatic weeds 0 Land use patterns M.A Forests, including hydrological function 0 O 0 5. Native flora 0 n Native fauna + L.A + L.A 7. Public works facilities Technology 0 Construction methods 0 0 Operating rule of reservoir 0 0 3. Externalities to agriculture O Externalities to small-scale industry, home industry, and handicrafts Externalities to medium and large scale industry 5. 0 Externalities to every-day life and activities 0 O Ruman Environment Demography Economic activities 0 0 agriculture + S.A small-scale trade and services small-scale industry, home industry and o handicrafts 0 medium and large-scale industry + M.A Land tenure relations food production - M.A 0 Ś. Other agricultural production 0 Health 6. Other social infrastructure : education, 0 productive skills, community institutions, etc. 0 Anthropology and culture, including incidence of of urbanization

RRM FOR BENEFITED AREA CHANNEL IMPROVEMENT OF THE EXISTING RIVERS INCLUDING RIVER STRUCTURES

Eco-system Area : Benefited Area (2/13 Inundated area (around Nganjuk and Lengkong) Construction Operation Sectors/Time Period

| Α. | Non | -renewable Resources | | | | | |
|----|-----|---|---|-----|----|--------|---|
| | ١. | Geological features | | 0 | | . 0 | |
| | 2. | Mineral resources | | 0 | | 0 | |
| | 3. | Topography | | 0 | | 0 | |
| | 4 | Soil | | 0 | | 0, | |
| | 5. | Sedimentation | • | 0 | • | 0 | |
| | 6. | Climate, Including hydrology | | 0 | | 0 | |
| | 7. | Archaeology and historical remains | | 0 | | , 0 | |
| в. | Ren | newable Resources | | | | • | |
| | 1, | Air | | 0 | | 0 | |
| | 2. | Water : quality | | 0 | - | 0 | |
| | | quantity | | 0 | • | 0 | |
| | | distribution through time | | 0 | | 0 | |
| | | eutrophication including aquatic weeds | | 0 | | 0 | |
| | 3. | Land use patterns | | 0 | | 0 | |
| | 4. | Forests, including hydrological function | | 0 | | 0 | |
| | 5. | Native flora | | 0 | | 0 | |
| | 6, | Native fauna | | 0 | | . 0 | |
| | 7. | Public works facilities | | 0 | | 0 | |
| c. | Tec | hnology | | | | | |
| | ì. | Construction methods | | 0 | | . 0 | |
| | 2. | Operating rule of reservoir | | 0 | | 0 | |
| | 3. | Externalities to agriculture | | 0 | - | 0 | |
| | 4. | Externalities to small-scale industry, home industry, and handicrafts | | 0 . | | 0 | |
| | 5. | Externalities to medium and large scale industry | | 0 | | 0 | |
| | 6. | Externalities to every-day life and activities | | 0 | | 0 | • |
| D. | Hua | an Environment | | | | | |
| | 'n | Demography | | 0 | | 0 | • |
| | 2. | Economic activities | | | | | |
| | | agriculture | | 0 | | + L.A | |
| | | small-scale trade and services | | 0 | | + M.A | |
| | | small-scale industry, home industry and handicrafts | | 0 | | + M.A | |
| | | medium and large-scale industry | | 0 | | + M.A | |
| | 3. | Land tenure relations | | 0 | | 0 | |
| | 4 | Food production | | 0 | | + L.A | |
| | 5, | Other agricultural production | | 0 | ٠. | + M.A | |
| | 6 | Health | | o i | | + L .A | |
| | 7. | Other social infrastructure: education, productive skills, community institutions, etc. | | 0 . | | 0 | |
| | 8. | Anthropology and culture, including incidence of of urbanization | | 0 | | + M.A | - |
| | | | | | | | |

Table 9.1 RRM FOR PHYSICAL WORKS AREA (FLOOD DIVERSION CHANNEL)

Eco-system Area: Area of Physical Works (3/13)

| | | Sectors/Time Period | Construction | Operation |
|----|------------|---|-----------------------|-----------|
| • | Non | -renewable Resources | | |
| | 1. | Geological features | 0 | 0 |
| | 2. | Mineral resources | 0 - | 0 |
| | 3. | Topography | + S.A | 0 |
| | 4. | Soil | - S.A | 0 |
| ٠. | 5. | Sedimentation | 0 | 0 |
| | 6. | Climate, Including hydrology | 0 | 0 |
| | 7. | Archaeology and historical remains | . 0 | 0 |
| | Ren | ewable Resources | | • |
| | 1. | Air | - S.A | . 0 |
| | 2. | Water : quality | 0 | 0 |
| | | quantity | - S.B | - S.B |
| | | distribution through time | 0 | 0 |
| | | eutrophication including aquatic weeds | 0 | 0 |
| | 3. | Land use patterns | <u>+</u> S.A | 0 |
| | 4. | Forests, including hydrological function | 0 | 0 |
| | 5. | Native flora | 0 ; | 0 |
| | 6. | Native fauna | o | 0 |
| | 7. | Public works facilities | + L.A | + L.A |
| | Tec | hnology | | |
| | 1. | Construction methods | 0 | 0 |
| | 2. | Operating rule of reservoir | 0. | 0 |
| | 3. | Externalities to agriculture | 0 | . 0 |
| | 4, | Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| | 5. | Externalities to medium and large scale industry | 0 | 0 |
| | 6. | Externalities to every-day life and activities | 0 | 0 |
| | Hum | an Environment | | |
| | 1 | Demography | 0 | 0 |
| | 2. | Economic activities | | |
| | | agriculture | o | 0 |
| | | small-scale trade and services | + 5.A | . 0 |
| | | small-scale industry, home industry and handicrafts | 0 | 0 |
| | | medium and large-scale industry | . 0 | 0 |
| | 3 · | Land tenure relations | + S.A | 0 |
| | 3. | | <u>+</u> S.A - S.A | 0 |
| | 4. | Food production | 0 | 0 |
| | 5. | Other agricultural production | 0 | 0 |
| | 6. 7. | Health Other social infrastructure : education, | - S.A | - S. |
| | _ | productive skills, community institutions, etc. | W 144 | |
| | 8. | Anthropology and culture, including incidence of of urbanization | 0 | О |

Table 9.1 NRM FOR BENEFITED AREA (FLOOD DIVERSION CHANNEL)

Eco-system Area: Benefited Area (4/13)

| | Sectors/Time Period | | Construction | Operation |
|---|---|---|--------------|------------|
| | Non-renewable Resources | همارن ده ۱۹۵۰ (۱ ۰ هـ م. با که به دخه « خديب ر يام موسطه پيسامه <u>ديمو د يا د که دانه چه پرهم پيپوسي</u> | | |
| | l. Geological features | | 0 | 0 |
| | 2. Mineral resources | | 0 | 0 |
| | 3. Topography | | 0 | 0 |
| | 4. Soil | • | 0 . | 0 |
| | 5. Sedimentation | | 0 | 0 |
| | 6. Climate, Including hydrolog | у | 0 | 0 |
| | 7. Archaeology and historical | remains | 0 | 0 |
| | Renewable Resources | | · . | |
| | 1. Air | | 0 | 0 |
| | 2. Water : quality | • | 0 | 0 |
| | quantity | | 0 | 0 . |
| | distribution throug | h time | 0 | 0 |
| | eutrophication incl | uding aquatic weeds | 0 | 0 |
| | 3. Land use patterns | | 0 | 0 |
| | 4. Forests, including hydrolog | ical function | 0 | 0 |
| | 5. Native flora | • | 0 | 0 |
| | 6. Native fauna | | 0 | 0 |
| | 7. Public works facilities | | 0 | 0 |
| | Technology | | | |
| | 1. Construction methods | | 0 | 0 |
| | 2. Operating rule of reservoir | | 0 | . 0 |
| | 3. Externalities to agricultur | e | 0 | 0 |
| | Externalities to small-scal industry, and handicrafts | e industry, home | 0 | . 0 |
| | 5. Externalities to medium and | large scale industry | 0 | 0 |
| | 6. Externalities to every-day | life and accivities | 0 | 0 |
| | Human Environment | • | | |
| | l Demography | | 0 | 0 |
| | 2. Economic activities | | 0 | 0 |
| | agriculture | | 0 ., | + L.A |
| | small-scale trade a | nd services | 0 | -+ M.A |
| | small-scale industr handicrafts | y, home industry and | 0 | + M.A |
| | medium and large-sc | ale industry | 0 | + M.A |
| : | 3. Land renure relations | | 0 | ; 0 |
| | 4. Food production | | 0 | + L.A |
| | 5. Other agricultural production | on | 0 | + M.A |
| | 6. Health | | 0 . | + L.A |
| | 7. Other social infrastructure productive skills, community | | 0 | 0 |
| | 8. Anthropology and culture, is of urbanization | | 0 | + M.A |

Table 9.1 RRM FOR PHYSICAL WORKS AREA (CONTROLLABLE RETARDING)

Eco-system Area : Area of Physical Works (5/13)

| _ | Sectors/Time Period | Construction | Operation |
|------|--|--------------|-----------|
| ۸. ا | lon-renewable Resources | | |
| | . Ceological features | . 0 | 0 |
| | . Mineral resources | 0 | . 0 |
| | 3. Topography | ± S.A | 0 |
| | . Soil | - S.A | 0 |
| • : | . Sedimentation | 0 | 0 |
| t | . Climate, Including hydrology | 0 | Ο · |
| | . Archaeology and historical remains | 0 | 0 |
| . 1 | denewable Resources | | |
| | . Air | 0 | 0 |
| : | . Water : quality | 0 | 0 |
| | quantity | 0 | 0 |
| | distribution through time | 0 | 0 |
| | eutrophication including aquatic weeds | 0 | 0 |
| : | . Land use patterns | + S.A | 0 |
| 4 | . Forests, including hydrological function | 0 | 0 |
| : | . Native flora | 0 | 0 |
| (| . Native fauna | 0 | 0 |
| ; | . Public works facilities | + S.A | + S.A |
| . 7 | 'echnology | | _ |
| • | . Construction methods | 0 | . 0 |
| 7 | . Operating rule of reservoir | 0 | 0 |
| | . Externalities to agriculture | 0 | 0 |
| 1 | Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| - | . Externalities to medium and large scale industry | 0 | 0 |
| 6 | . Externalities to every-day life and activities | 0 | 0 |
| i | luman Environment | | |
| | Demography | . 0 | 0 |
| 2 | . Economic activities | . 0 | |
| | agriculture | 0 | 0 |
| | small-scale trade and services | + S.A | 0 |
| | small-scale industry, home industry and handicrafts | 0 | . 0 |
| | medium and large-scale industry | 0 | 0 |
| 3 | . Land tenure relations | <u>+</u> S.A | 0 |
| 4 | . Food production | - S.A | 0 |
| . 5 | . Other agricultural production | 0 | 0 |
| (| . Realth | 0 | 0 |
| 7 | . Other social infrastructure : education, productive skills, community institutions, etc. | 0 | , 0 |
| ٤ | . Anthropology and culture, including incidence of of urbanization | Ó | 0 |
| | the first program of the second secon | - | |

Table 9.1 RRM FOR BENEFITED AREA (CONTROLLABLE RETARDING)

Eco-system Area: Benefited Area (6/13)

| | Sectors/Time Period | Construction | Operation |
|--------|---|--------------|-----------|
| . 1 | Non-renewable Resources | | |
| 1 | I. Geological features | 0 | 0 |
| 2 | . Mineral resources | 0 | . 0 |
| 3 | 3. Topography | 0 | 0 |
| - 4 | . Soil | 0 | . 0 |
| 5 | . Sedimentation | . 0 | 0 |
| ί | . Climate, Including hydrology | 0 | 0 |
| 7 | . Archaeology and historical remains | 0 | 0 |
| | denewable Resources | | |
| . 1 | . Air | 0 | 0 |
| 2 | . Water : quality | 0 | 0 |
| | quantity | 0 | . 0 |
| | distribution through time | 0 | 0 |
| | eutrophication including aquatic weeds | 0 | 0 |
| 3 | . Land use patterns | 0 | 0 |
| L, | . Forests, including hydrological function | 0 | O |
| 5 | . Native flora | 0 | 0 |
| 6 | . Native fauna | 0 | 0 |
| 7 | . Public works facilities | 0 | 0 |
| 7 | echnology | · | |
| | . Construction methods | 0 | 0 |
| 2 | . Operating rule of reservoir | . 0 | 0 |
| 3 | . Externalities to agriculture | 0 | . 0 |
| . 4 | . Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| 5 | . Externalities to medium and large scale industry | 0 | 0 |
| | . Externalities to every-day life and activities | O | O. |
| 11 | uman Environment | | |
| H 1 | Demography | 0 | 0 |
| 9 | . Economic activities | | |
| _ | agriculture | 0 | + L.A |
| | small-scale trade and services | 0 | . 0 |
| | small-scale industry, home industry and | 0 | 0 |
| | handicrafts medium and large-scale industry | 0 - | 0 |
| • | | 0 | 0 |
| 3 | | 0 | |
| 4 | | | + L.A |
| 5 | | 0 | 0 |
| 6 | | 0 | + L.A |
| . 7 | . Other social infrastructure: education, productive skills, community institutions, etc. | 0 | 0 |
| 8 | . Anthropology and culture, including incidence of | 0. | 0 |

Table 9.1 RRM FOR PHYSICAL WORKS AREA (KEDUNGWARAK) Eco-system Area: Area of Physical Works (7/13)

weir site, reservoir, borrow and quarry area, canal, pump station

| | Sectors/Time Period | Construction | Operation |
|------|---|--------------|--------------|
| . No | n-renewable Resources | | |
| 1. | Geological features | 0 | 0 |
| 2. | Mineral resources | 0 | 0 |
| 3. | Topography | <u>+</u> S.A | + M.A |
| 4. | Soil | - S.A | <u>+</u> M.A |
| 5. | Sedimentation | 0 | . 0 |
| . 6. | Climate, Including hydrology | 0 | 0 |
| 7. | Archaeology and historical remains | 0 | . 0 |
| . Re | newable Resources | | |
| 1. | Air | - S.B | 0 |
| 2. | Water : quality | - S.A | 0. |
| ٠ | quantity | 0 | 0 |
| | distribution through time | 0 | ± L.A |
| | eutrophication including aquatic weeds | 0 | - S.D |
| 3. | Land use patterns | <u>+</u> M.A | <u>+</u> M.A |
| 4 | Forests, including hydrological function | - S.A | + S.A |
| 5. | Native flora | 0 | 0 |
| 6. | Native fauna | 0 | + S.C |
| 7. | Public works facilities | + L.A | + L.A |
| Te | chnology | | |
| 1. | Construction methods | 0 | 0 |
| 2. | Operating rule of reservoir | .0 | 0 |
| 3. | Externalities to agriculture | 0 | 0 |
| 4. | Externalities to small-scale industry, home | | |
| | industry, and handicrafts | . 0 | . 0 |
| 5. | Externalities to medium and large scale industry | 0 | 0 |
| 6. | Externalities to every-day life and activities | 0 | 0 |
| Hu | nan Environment | | • |
| 1 | Demography | . 0 | 0 |
| 2. | Economic activities | | |
| - | agriculture | 0 | 0 |
| | small-scale trade and services | + S.A | 0 |
| | small-scale industry, home industry and handicrafts | 0 | 0 |
| | medium and large-scale industry | 0 | 0 |
| | | + M.A | . 0 |
| 3. | Land tenure relations | | |
| 4. | Food production | 0 | - M.A |
| 5. | Other agricultural production | 0 0 | - S.A |
| 6. | Health | | v |
| 7. | Other social infrastructure: education, productive skills, community institutions, etc. | 0 | - s.A |
| 8. | Anthropology and culture, including incidence of of urbanization | 0 | 0 |

Table 9.1 RRM FOR BENEFITED AREA (KEDUNGWARAK)

Eco-system Area : Benefited Area (8/13)

| | Sectors/Time Period | Construction | Operation |
|------|---|--------------|-----------|
| . No | n-renewable Resources | , | |
| 1. | Geological features | 0 % | 0 |
| 2, | Mineral resources | 0 | . 0 |
| 3. | Topography | 0 | 0 |
| 4. | Soil | 0 | 0 |
| - 5. | Sedimentation | . 0 | 0 |
| 6. | Climate, Including hydrology | 0 | 0 |
| 7. | Archaeology and historical remains | 0 | o |
| | | | |
| . Re | newable Resources | . : | |
| ١. | Air | 0 | 0 |
| 2. | Water : quality | 0 | - S.C |
| | quantity | 0 | + L.A |
| | distribution through time | 0 | + L.A |
| | eutrophication including aquatic weeds | 0 | 0 |
| 3. | Land use patterns | 0 | 0 |
| 4. | Forests, including hydrological function | 0 | 0 |
| 5. | Native flora | 0 | 0 |
| 6. | Native fauna | 0 | 0 |
| 7. | Public works facilities | 0 | 0 |
| . Te | chnology | | |
| 1. | Construction methods | 0 . | 0 |
| 2. | Operating rule of reservoir | 0 | 0 |
| 3, | Externalities to agriculture | 0 | . 0 |
| 4. | Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| 5. | Externalities to medium and large scale industry | 0 | 0 |
| 6. | Externalities to every-day life and activities | 0 | 0 |
| Hu | man Environment | • | |
| 1 | Demography | 0 | 0 |
| 2. | Economic activities | 0 . | 0 |
| | agriculture | .0 | + L.A |
| | small-scale trade and services | 0 | . 0 |
| | small-scale industry, home industry and handicrafts | 0 | Ó |
| | medium and large-scale industry | . 0 | 0 |
| 3. | Land tenure relations | 0 | 0 |
| 4 | Food production | 0 | + L.A |
| 5. | Other agricultural production | 0 | 0 |
| 6. | Health | 0 | - S.D |
| 7. | Other social infrastructure: education, productive skills, community institutions, etc. | 0 | 0 |
| | Anthropology and culture, including incidence of | 0 | . 0 |

Table 9.1 RRM FOR SURROUNDING AREA (KEDUNGWARAK)

Eco-system Area: Surrounding Area (9/13)

Catchment area of K.Kedungwarak

| | Sectors/Time Period | Construction | Operation |
|----|---|--------------|-----------|
| ١. | Non-renewable Resources | | |
| | 1. Geological features | 0 | 0 |
| | 2. Mineral resources | 0 | 0 |
| | 3. Topography | 0 | 0 |
| | 4. Soil | 0 | 0 |
| ٠. | 5. Sedimentation | 0 | 0 |
| | 6. Climate, Including hydrology | 0 | 0 |
| | 7. Archaeology and historical remains | 0 | 0 |
| | Renewable Resources | | |
| | 1. Air | 0 | 0 |
| | 2. Water : quality | 0 | . 0 |
| | quantity | 0 | 0 |
| | distribution through time | 0 | + S.A |
| | eutrophication including aquatic weeds | 0 | 0 |
| | 3. Land use patterns | 0 | 0 |
| ٠ | 4. Forests, including hydrological function | 0 | . 0 |
| | 5. Native flora | 0 | 0 |
| | 6. Native fauna | 0 | 0 |
| | 7. Public works facilities | 0 | 0 |
| | Technology | | |
| | 1. Construction methods | 0 | 0 |
| | 2. Operating rule of reservoir | 0 | 0 |
| | 3. Externalities to agriculture | 0 | 0 |
| | Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| | 5. Externalities to medium and large scale industr | гу 0 | 0 |
| | 6. Externalities to every-day life and activities | 0 | 0 |
| | Human Environment | | |
| | l Demography | 0 | 0 |
| | 2. Economic activities | | |
| | agriculture | 0 | 0 |
| | small-scale trade and services | 0 | 0 |
| | small-scale industry, home industry and handicrafts | nd | 0 |
| | medium and large-scale industry | 0 | 0 |
| | 3. Land tenure relations | . 0 | 0 |
| | 4. Food production | 0 | 0 |
| | 5. Other agricultural production | 0 | 0 |
| | 6. Health | 0 | . 0 |
| | 7. Other social infrastructure : education, productive skills, community institutions, etc. | | 0 |
| | 8. Anthropology and culture, including incidence of urbanization | | 0 |

Table 9.1 RRM FOR PHYSICAL WORKS AREA (KETANDAN)

Eco-system Area: Area of Physical Works (10/13)

dam site, reservoir, borrow and quarry area, access road

| | | Sectors/Time Period | Construction | Operation |
|----|------|---|--------------|--------------|
| Α. | Non | -renewable Resources | | |
| | 1. | Geological features | . 0 | 0 |
| | 2. | Mineral resources | 0 | 0 |
| | 3. | Topography | <u>+</u> S.A | + M.A |
| | 4. | Soil | - S.A | + M.A |
| | 5. | Sedimentation | 0 . | O |
| | 6. | Climate, Including hydrology | 0 | 0 |
| | 7. | Archaeology and historical remains | 0 | 0 |
| В. | Ren | newable Resources | | |
| | 1. | Air | 0 | 0 |
| | 2. | Water : quality | - S.A | 0 |
| | | quantity | 0 | 0 |
| | | distribution through time | 0 | ± L.A |
| | | eutrophication including aquatic weeds | . 0 | - S.D |
| | - 3. | Land use patterns | <u>+</u> M.A | <u>+</u> M.A |
| | 4. | Forests, including hydrological function | - M.A | + M.A |
| | 5. | Native flora | 0 | 0 |
| | 6. | Native fauna | 0 | + s.c |
| | 7. | Public works facilities | + S.A | + S.A |
| c. | Tec | chnology | | |
| | 1. | Construction methods | 0 | 0 |
| | 2. | Operating rule of reservoir | 0 | 0 |
| | 3. | Externalities to agriculture | O . | 0 |
| | 4. | Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| | 5. | Externalities to medium and large scale industry | 0 | 0 |
| | 6. | Externalities to every-day life and activities | 0 | 0 |
| υ. | Hum | an Environment | | · . |
| | 1 | Demography | 0 | 0 |
| | 2. | Economic activities | | |
| | | agriculture | 0 | 0 |
| | | small-scale trade and services | + S.A | 0 |
| | | small-scale industry, home industry and handicrafts | 0 | 0 |
| | | medium and large-scale industry | 0 | 0 . |
| | 3. | Land tenure relations | + S.A | 0 |
| | 4 | Food production | _ 0 | 0 |
| | 5. | Other agricultural production | 0 | 0: • |
| | 6. | Health | 0 | 0 |
| | 7. | Other social infrastructure: education, productive skills, community institutions, etc. | o , | 0 |
| | 8. | Anthropology and culture, including incidence of of urbanization | o | 0 |

Table 9.1 RRM FOR BENEFITED AREA (KETANDAN: WIDAS EXTENSION AREA)

Eco-system Area: Benefited Area (11/13)

Widas Extension Area

| | Sectors/Time Period | Construction | Operation |
|------|---|--------------|-----------|
| ۱. ۱ | lon-renewable Resources | | |
| 1 | . Geological features | 0 | 0 |
| 2 | . Mineral resources | 0 | 0 |
| 3 | . Topography | 0 | 0 |
| 4 | Soil | 0 | 0 |
| 5 | . Sedimentation | 0 | 0 |
| 6 | . Climate, Including hydrology | . 0 | 0 |
| 7 | . Archaeology and historical remains | . 0 | 0 |
| , F | enewable Resources | | |
| . 1 | Air | 0 | 0 |
| 2 | . Water : quality | 0 | - \$.C |
| | quantity | 0 | + L.A |
| | distribution through time | 0 | + L.A |
| | eutrophication including aquatic weeds | 0 | 0 |
| 3 | . Land use patterns | 0 | 0 |
| 4 | · Forests, including hydrological function | 0 | .0 |
| 5 | . Native flora | 0 | 0 |
| 6 | . Native fauna | 0 | 0 |
| 7 | . Public works facilities | 0 | 0 |
| . 1 | echnology | | |
| 1 | . Construction methods | 0 | . 0 |
| 2 | . Operating rule of reservoir | 0 | 0 |
| 3 | . Externalities to agriculture | 0 | 0 |
| Ą | Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| 5 | Externalities to medium and large scale industry | 0 | 0 |
| 6 | . Externalities to every-day life and activities | 0 | 0 |
| . н | uman Environment | | . * |
| 1 | Demography | . 0 | 0 |
| 2 | . Economic activities | | |
| | agriculture | 0 | + L.A |
| | small-scale trade and services | 0 | 0 |
| | small-scale industry, home industry and handicrafts | 0 | 0 |
| | medium and large-scale industry | 0 | 0 |
| 3 | . Land tenure relations | 0 | . 0 |
| | · Food production | 0 | + L.A |
| | Other agricultural production | 0 | 0 |
| 6 | | 0 | - S.D |
| | Other social infrastructure: education, productive skills, community institutions, etc. | . 0 | ó |
| . 8 | . Anthropology and culture, including incidence of of urbanization | 0 | 0 |

Table 9.1 RRM FOR SURROUNDING AREA (KETANDAN)

Eco-system Area: Surrounding Area (12/13)

catchment area of K. Ketandan

| . Non-renewable Resources | | |
|---|----------|------------|
| | | |
| 1. Geological features | 0 | 0 |
| 2. Mineral resources | 0 | 0 |
| 3. Topography | 0 | 0 |
| 4. Soil | 0 | 0 |
| 5. Sedimentation | 0 | 0 |
| 6. Climate, Including hydrology | 0 | 0 |
| 7. Archaeology and historical remains | 0 | 0 |
| . Renewable Resources | | |
| 1. Air | 0 | 0 |
| 2. Water : quality | 0 | 0 |
| quantity | 0 | 0 |
| distribution through time | 0 | + S.A |
| eutrophication including aquatic weeds | 0 | 0 |
| 3. Land use patterns | 0 | 0 |
| 4. Forests, including hydrological function | 0 | • 0 |
| 5. Native flora | 0 | 0 |
| 6. Native fauna | 0 . | |
| 7. Public works facilities | 0 | 0 |
| Technology | | |
| 1. Construction methods | 0 | 0 |
| 2. Operating rule of reservoir | 0 | 0 |
| 3. Externalities to agriculture | 0 | 0 |
| Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| 5. Externalities to medium and large scale industry | 0 | 0 |
| 6. Externalities to every-day life and activities | 0 |) 0 |
| Human Environment | | |
| 1 Demography | 0 | U |
| 2. Economic activities | . | ^ |
| agriculture | . 0 | 0 |
| small-scale trade and services | 0 | U |
| small-scale industry, home industry and handicrafts | . 0 | 0 |
| medium and large-scale industry | 0 | 0 |
| 3. Land tenure relations | 0 | 0 |
| 4. Food production | 0 | 0 |
| 5. Other agricultural production | 0 . | 0 |
| 6. Health | 0 | 0 |
| Other social infrastructure: education, productive skills, community institutions, etc. | 0 | 0 |
| | | |

Table 9.1 RRM FOR PHYSICAL WORKS AREA (TRANSBASIN TUNNEL)

Eco-system Area: Area of Physical Works (13/13)

tunnel access road

| Sectors/Time Period | Construction | Operation |
|---|--------------|--------------|
| Non-renewable Resources | | |
| 1. Geological features | 0 | 0 |
| 2. Mineral resources | 0 | 0 |
| 3. Topography | <u>+</u> S.A | 0 |
| 4. Soil | ~ S.A | <u>+</u> S.A |
| 5. Sedimentation | 0 | 0 |
| 6. Climate, Including hydrology | 0 | 0 |
| 7. Archaeology and historical remains | . 0 | 0 |
| Renewable Resources | | |
| 1. Air | 0 | 0 |
| 2. Water : quality | 0 | 0 |
| quantity | + S.C | <u>+</u> s.c |
| distribution through time | 0 | <u>+</u> M.A |
| eutrophication including aquatic weeds | 0 | . 0 |
| 3. Land use patterns | ± S.A | . 0 |
| 4. Forests, including hydrological function | 0 | . 0 |
| 5. Native flora | 0 | 0 |
| 6. Native fauna | 0 | 0 |
| 7. Public works facilities | + M.A | + M.A |
| Technology | | |
| 1. Construction methods | 0 | 0 |
| 2. Operating rule of reservoir | 0 | 0 |
| 3. Externalities to agriculture | 0 | 0 |
| Externalities to small-scale industry, home industry, and handicrafts | 0 | 0 |
| 5. Externalities to medium and large scale industry | 0 | 0 |
| 6. Externalities to every-day life and activities | 0 | 0 |
| Human Environment | | |
| 1 Demography | 0 | 0 |
| 2. Economic activities | | |
| agriculture | . 0 | 0 |
| small-scale trade and services | 0 | 0 |
| small-scale industry, home industry and handicrafts | . 0 | 0 |
| medium and large-scale industry | 0 | 0 |
| 3. Land tenure relations | 0 | 0 |
| 4. Food production | 0 | 0 |
| 5. Other agricultural production | 0 | 0 |
| 6. Health | 0 | 0 . |
| 7. Other social infrastructure: education, productive skills, community institutions, etc. | 0 | 0 |
| 8. Anthropology and culture, including incidence of of urbanization | 0 | 0 |

| Criteria | Time Construction | Period Operation |
|---|-------------------------|--------------------------------------|
| A. Total Number of People Affected | CONSTRUCTION | ober actou |
| * Area of Physical Work | | |
| (Channel Improvement) | 0 | 0 |
| <pre>* Benefited Area (Channel Improvement)</pre> | 0 . | 0 |
| * Area of Physical Work (Flood Diversion Channel) | | |
| D.7 other social infrastructure education, productive skills, community institutions, etc. | : difficult to quantify | difficult to quantify |
| * Benefited Area (Flood Diversion Channel) | 0 | 0 |
| * Area of Physical Work (Controllable Retarding) | 0 | 0 |
| * Benefited Area (Controllable Retarding) | 0 | 0 |
| * Area of Physical Work (Kedungwarak) | | |
| D.7. Other social infrastructure education, productive skills, cummunity institutions, etc. | 0 | difficult to quantify |
| * Benefited Area (Kedungwarak) | | |
| B.2 Water quality | 0 | difficult to |
| D.6 Health | 0 | quantify difficult to quantify |
| * Surrounding Area | | |
| (Kedungwarak) | 0 | 0 |
| * Area of Physical Work (Ketandan) | 0 | 0 |
| * Benefited Area (Widas Extension Area) | | |
| B.2 Water quality | 0 | difficult to |
| D.6 Health | 0 | quantify difficult to quantify |
| * Surrounding Area (Ketandan) | 0 | 0 |
| * Area of Physical Work (Transbasin Tunnel) | 0 | 0 |
| | | |
| | | |
| | 9.14 | |
| | e + ±0 ♥ | |

| : | | Time Period | | |
|---------------------------------------|---|--|---------------------------------|--|
| | Criteria | | Operation | |
| В | . Total Area Affected | | | |
| | * Area of Physical Work (Channel Improvement) | | | |
| | A.4 Soil | more than 6,824 ha | 0 | |
| | B.l Air | difficult to quantify | 0 | |
| | B.2.1 Water quality | from physical work are to the confluence with K. Brantas | a | |
| | * Benefited Area | W Standad | | |
| | (Channel Improvement) | 0 | 0 | |
| | * Area of Physical Work (Flood Diversion Channel) | | | |
| | A.4 Soil | about 19.2 ha | 0 | |
| | B.1 Air | difficult to quantify | 0 | |
| | B.2 Water quantity | difficult to quantify | difficult to quantify | |
| | * Benefited Area (Flood Diversion Channel) | 0 | 0 | |
| | <pre>* Area of Physical Work (Controllable Retarding)</pre> | | | |
| | A.4 Soil | about 2070 m (total) | 0 | |
| | <pre>* Benefited Area (Controllable Retarding)</pre> | 0 | 0 | |
| | * Area of Physical Work (Kedungwarak) | | · | |
| | A.4 Soil | about 80 ha | . 0 | |
| | B.1 Air | difficult to quantify | 0 | |
| | B.2.1 Water quality | from weir site to the confluence with K.Wida | 0 s | |
| | B.2.4 Aquatic weeds | 0 | difficult to | |
| | B.4 Forest | about 110 ha | quantify O | |
| | * Benefited Area (Kedungwarak) | | | |
| | B.2.2 Water quality | 0 | 122 ha | |
| | * Surrounding Area (Kedungwarak) | 0 | 0 | |
| | * Area of Physical Work (Ketandan) | | | |
| | A.4 Soil B.2.1 Water quality | about 110 ha from dam site to the confluence with K.Wida | 0 | |
| · · · · · · · · · · · · · · · · · · · | B.2.4 Aquatic weeds | 0 | s 0 difficult to quantify | |
| | B.4 Forest | about 200 ha | 0 | |
| | | | | |

| | | | Time Period | | |
|----|------------------|---------------------------------------|----------------|----------------|--|
| | Crit | eria | Construction | Operation | |
| * | | ted Area Extension Area) | | | |
| | B.2 | Water quality | 0 | 2300 ha | |
| አ | Surrou (Ketan | nding Area dan) | 0 | 0 | |
| * | | f Physical Work basin Tunnel) | | | |
| | A.4 | Soil | 2.7 km | 0 | |
| C. | Length | of The Time Involved | about 5 years | about 50 years | |
| D. | Intens | ity of Impact | | | |
| * | | f Physical Work el Improvement) | | | |
| | A.4 | Soil | - S.A | 0 | |
| | B.1 | Air | - S.A | 0 : | |
| | B.2.1 | | - M.A | 0 | |
| | D.4 | Food Production | - M.A | U | |
| * | | ted Area el Improvement) | 0 | 0 | |
| ĸ | | f Physical Work Diversion Channel) | | | |
| | A.4 | Soil | ~ S.A | 0 | |
| | B.1 | Air | - S.A | 0 | |
| | B.2.2 | Water quantity | - S.B - S.A | - S.B. | |
| | D.4 D.7 | Food Production Other social infrastr | | 0 | |
| | D• 7 | education, productiv | | | |
| | | skills, community | | | |
| | | institutions, etc. | - S.A | - S.A | |
| * | | ted Area Diversion Channel) | 0 | 0 | |
| × | | f Physical Work ollable Retarding) | | | |
| | A.4 | Soi1 | - S.A | 0 | |
| | D.4 | Food Production | - S.A | 0 | |
| * | | ted Area ollable Retarding) | 0 | 0 | |
| * | | f Physical Work gwarak) | | | |
| | A.4 | Soil | - S.A | + M.A | |
| | B. 1 | Air | - S.B | 0 | |
| | B.2.1 | Water quality | - S.A | 0 | |
| | B.2.4 | Aquatic weeds | 0 | - S.D | |
| | B.4 | Forest | - S.A | <u>+</u> S.A | |
| | D.4 | Food Production | 0 | - M.A | |

| Criteria | Time Construction | Period Operation |
|---|------------------------------|------------------------------|
| D.5 Other agriculture production D.7 Other social infrastructure: education, productive skills, community institution, etc. | 0 0 | - S.A - S.A |
| <pre>* Benefited Area (Kedungwarak)</pre> | • | |
| B.2.1 Water quality D.6 Health | 0 | - S.C - S.D |
| * Surrounding Area (Kedungwarak) | 0 | 0 |
| * Area of Physical Work (Ketandan) | | |
| A.4 Soil B.2.1 Water quality B.2.4 Aquatic weeds B.4 Forest | - S.A - S.A O - M.A | + M.A 0 - S.D + M.A |
| * Benefited Area (Widas Extension Area) | | |
| B.2.1 Water quality D.6 Health | 0 | - S.C - S.D |
| * Surrounding Area (Ketandan) | 0 | 0 |
| * Area of Physical Work (Transbasin Tunnel) | | |
| A.4 Soil | - S.A | <u>+</u> S.A |
| E. Number of Components of the Environment Affected | | |
| * Area of Physical Work (Channel Improvement) | 12 % | 0 % |
| <pre>* Benefited Area (Channel Improvement)</pre> | 0 % | 0 % |
| <pre>* Area of Physical Work (Flood Diversion Channel)</pre> | 16 % | 6 % |
| * Benefited Area (Flood Diversion Channel) | 0 % | 0 % |
| <pre>* Area of Physical Work (Controllable Retarding)</pre> | 6 % | 0 % |
| <pre>* Benefited Area (Controllable Retarding)</pre> | 0 % | 0 % |
| * Area of Physical Work (Kedungwarak) | 12 % | 12 % |
| * Benefited Area (Kedungwarak) | 0 % | 6 % |
| | | |
| 9.1 | | |
| 9.1 | L / | |

| | Criteria | | |
|---------------------------------------|--|--------------|--|
| · · · · · · · · · · · · · · · · · · · | the state of the s | Construction | Operation |
| В.2. | 4 Aquatic weeds | 0 | reversible |
| B.4 | Forest | reversible | 0 |
| D.4 | Food Production | 0 | irreversible but |
| • | | | can be replaced elsewhere |
| D.5 | Other agriculture pro- | | |
| | duction | 0 | do |
| D.7 | Other social infra - structure : education, | | |
| | productive skills, community institutions, | etc. 0 | reversible |
| | fited Area ungwarak) | | |
| B. 2. | l Water quality | 0 | reversible |
| D.6 | Health | 0 | reversible |
| | | | |
| | ounding Area | 0 | |
| (Ked | ungwarak) | 0 | 0 |
| | of Physical Work | | |
| (Ket | andan) | | |
| A.4 | Soi1 | reversible | 0 |
| | l Water quality | reversible | 0 |
| | 4 Aquatic weeds | 0 | reversible |
| B.4 | Forest | reversible | 0 |
| | fited Area as Extension Area) | | |
| (MTG | as extension area; | • | |
| | l Water quality | 0 | reversible |
| D.6 | Health | 0 | reversible |
| | ounding Area andan) | 0 | 0 |
| • | | | • |
| | of Physical Work nsbasin Tunnel) | | |
| A.4 | Soil | reversible | 0 |
| | | | the second secon |

| | | Time Period | | |
|-----|--|------------------------------|------------------------------|--|
| ~ | Criteria | Construction | Operation | |
| Α. | Total Number of People Affected | | | |
| 24 | Area of Physical Work (Channel Improvement) | | | |
| | B.3 Land use pattern | 425 families | 0 | |
| | D.3 Land tenure relation | difficult to quantify | 0 | |
| * | Benefited Area (Channel Improvement) | 0 | 0 | |
| * | Area of Physical Work (Flood Diversion Channel) | | | |
| | B.3 Land use pattern | 15 families | 0 | |
| | B.3 Land tenure relation | difficult to quantify | 0 | |
| * | Benefited Area (Flood Diversion Channel) | 0 | 0 | |
| * | Area of Physical Work (Controllable Retarding) | | | |
| | B.3 Land use pattern | not exact data no | w 0 | |
| | D.3 Land tenure relation | difficult to quantify | 0 | |
| * | Benefited Area (Controllable Retarding) | 0 | 0 | |
| ጵ | Area of Physical Work (Kedungwarak) | | | |
| | B.3 Land use pattern | approximately 70 families | approximately 70 families | |
| | B.7 Public work facilities | difficult to quantify | 0 | |
| | D.3 Land tenure relation | difficult to quantify | 0 | |
| År. | Benefited Area (Kedungwarak) | 0 | 0 | |
| × | Surrounding Area (Kedungwarak) | 0 | 0 | |
| * | Area of Physical Work (Ketandan) | | | |

| | Criteria | Construction | Operation | |
|----|---|----------------|----------------|----|
| * | Surrounding Area (Kedungwarak) | 0 % | 0 % | |
| * | Area of Physical Work (Ketandan) | 9 % | 3 % | |
| * | Benefited Area (Widas Extension Area) | 0 % | 6 % | |
| * | Surrounding Area (Ketandan) | 0 % | 0 % | |
| * | Area of Physical Work (Transbasin Tunnel) | 3 % | 0 % | ٠. |
| F. | Cumulative Effect | non-cumulative | non-cumulative | |
| G. | Reversible/Irreversible | | | |
| * | Area of Physical Work (Channel Improvement) | | | |
| | A.4 Soil | reversible | 0 | |
| | B.1 Air | reversible | 0 | |
| | B.2.1 Water quality | reversible | 0 | |
| | D.4 Food Production | reversible | 0 | |
| * | Benefited Area (Channel Improvement) | 0 | 0 | |
| * | Area of Physical Work (Flood Diversion Channel) | | | |
| | A.4 Soil | reversible | 0 | |
| | B.1 Air | reversible | 0 | |
| | B.2.2 Water quantity | reversible | reversible | |
| | D.4 Food Production D.7 Other social infra - structure : education, | reversible | 0 | |
| | productive skills, community institutions, etc. | reversible | reversible | |
| * | Benefited Area (Flood Diversion Channel) | 0 | 0 | |
| × | Area of Physical Work (Controllable Retarding) | | | |
| | A.4 Soil | reversible | 0 | 1 |
| | D.4 Food Production | reversible | 0 | |
| | | FCACEDIDIC | | |
| * | Benefited Area (Controllable Retarding) | 0 | 0 | |
| * | Area of Physical Work (Kedungwarak) | | | |
| | A.4 Soil | reversible | 0 | |
| • | B.1 Air | reversible | 0 | |
| | B.2.1 Water quality | reversible | 0 | |
| | | | t e e | |

Time Period Construction Operation Criteria n about 10 house B.3 Land use pattern holds Ω difficult to Land tenure relation D.3 quantify Benefited Area 0 (Widas Extension Area) 0 Surrounding Area 0 0 (Ketandan) Area of Physical Work (Transbasin Tunnel) B.2.2 Water quantity difficult to quantify Land use pattern no exact data now B. Total Area Affected Area of Physical Work (Channel Improvement) difficult to 0 A.3 Topography calculate more than 6,824Ha в. 3 Land use pattern 0 difficult to 0 D.3 Land tenure relation quantify Benefited Area 0 (Channel Improvement) * Area of Physical Work (Flood Diversion Channel) A.3 more than 19.2 ha Topography 0 B.3 Land use pattern more than 19.2 ha 0 more than 19.2 ha D.3 Land tenure relation Benefited Area (Flood Diversion Channel) 0 0 * Area of Physical Work (Controllable Retarding) about 2070 m 0 A.3 Topography (total) about 2070 m 0 B.3 Land use pattern (total) about 2070 m D.3 Land tenure relation

(total)

Time Period

| | | Time Period | | |
|---|--|-----------------------|--|--|
| - | Criteria | Construction | Operation | |
| * | Benefited Area (Controllable Retarding) | 0 | 0 | |
| * | Area of Physical Work (kedungwarak) | | | |
| | A.3 Topography | about 80 ha | about 156 ha | |
| | A.4 Soil | 0 | about 80 ha | |
| | B.2.3 Distribution through time | 0 | from weir site to the confluence with K. Widas | |
| | B.3 Land use pattern | about 80 ha | about 156 ha | |
| | B.4 Forest | 0 . | about 110 ha | |
| | B.7 Public work facilities | about 3 km | 0 | |
| | D.3 Land tenure relation | difficult to quantify | 0 | |
| * | Benefited Area (Kedungwarak) | 0 | 0 | |
| * | Surrounding Area (Kedungwarak) | 0 | 0 | |
| * | Area of Physical Work (Ketandan) | | | |
| | A.3 Topography | about 110 ha | about 165 ha | |
| | A.4 Soil | 0 | about 110 ha | |
| | B.2.3 Distribution through time | 0 | from weir site to the confluence with K. Widas | |
| | B.3 Land use pattern | about 275 ha | about 275 ha | |
| | B.4 Forest | 0 | about 200 ha | |
| | D.3 Land tenure relation | no exact data now | : 0 | |
| * | Benefited Area (Widas Extension Area) | 0 | 0 | |
| * | Surrounding Area (Ketandan) | 0 | 0 . | |
| * | Area of Physical Work (Transbasin Tunnel) | | | |
| | A.3 Topography | about 2.7 km | about 2.7 km | |
| | A.4 Soil | 0 | about 2.7 km | |
| • | B.2.2 Water quantity | difficult to quantify | difficult to quantify | |

Time Period Operation Construction Criteria from Kedungwarak B.2.3 Distribution through time weir to Ketandan dam Land use pattern about 2.7 km about 2.7 km B.3 C. Length of Time Involved about 5 years about 50 years D. Intensity of Impact * Area of Physical Work (Channel Improvement) 0 A.3 Topography + M.A 0 B.3 Land use pattern + M.A D. 3 Land tenure relation + M.A Benefited Area 0 0 (Channel Improvement) * Area of Physical Work (Flood Diversion Channel) 0 + S.A A.3 Topography B.3 + S.A 0 Land use patterns D.3 0 Land tenure relations + S.A Benefited Area 0 (Flood Diversion Channel) 0 * Area of Physical Work (Controllable Retarding) 0 A.3 Topography + S.A B.3 Land use patterns + S.A 0 D.3 0 Land tenure relation + S.A * Benefited Area 0 0 (Controllable Retarding) Area of Physical Works (Kedungwarak) A.3 + M.A Topography + S.A A.4 Soil - S.A + M.A B.2.3 Distribution through time + L.A B.3 Land use pattern + M.A + M,A B.4 - S.A Forest + S.A B.7 Public work facilities + L.A + L.A D.3 Land tenure relation

+ M.A

| | | Time Period | |
|----|--|--------------|--------------|
| | Criteria | Construction | Operation |
| * | Benefited Area (Kedungwarak) | 0 | 0 |
| * | Surrounding Area (Kedungwarak) | 0 | 0 |
| * | Area of Physical Work (Ketandan) | | |
| | A.3 Topography | + S.A | <u>+</u> M.A |
| | A.4 Soil | - S.A | + M.A |
| | B.2.3 Distribution through time | 0 | ± L.A |
| | B.3 Land use pattern | <u>+</u> M.A | + M.A |
| | B.4 Forest including hydrolo- gical function | - M.A | <u>+</u> M.A |
| | D.3 Land tenure relations | <u>+</u> S.A | 0 |
| * | Benefited Area (Widas Extension Area) | 0 | 0 |
| * | Surrounding Area (Ketandan) | 0 | 0 |
| * | Area of Physical Work (Transbasin Tunnel) | | |
| | A.3 Topography | <u>+</u> S.A | 0 |
| | A.4 Soil | - S.A | <u>+</u> S.A |
| | B.2.2 Water quantity | <u>+</u> S.C | <u>+</u> S.C |
| | B.2.3 Distribution through time | 0 | <u>+</u> M.A |
| | B.3 Land use patterns | <u>+</u> S.A | 0 |
| Ε. | Number of Component of the Environment Affected | | |
| × | Area of Physical Work (Channel Improvement) | 9 % | 0 % |
| * | Benefited Area (Channel Improvement) | 0 % | 0 % |
| * | Area of Physical Work (Flood Diversion Channel) | 9 % | 0 % |
| * | Benefited Area (Flood Diversion Channel) | 0 % | 0 % |
| * | Area of Physical Work (Controllable Retarding) | 9 % | 0 % |
| * | Benefited Area (Controllable Retarding) | 0 % | 0 % |
| * | Area of Physical Work (Kedungwarak) | 12 % | 15 % |

| Criteria | Time Period Construction Operation | |
|--|------------------------------------|--|
| * Benefited Area | COLIO OT GO TION | Andrew State of the State of th |
| (Kedungwarak) | 0 % | 0 % |
| * Surrounding Area (Kedungwarak) | 0 % | 0 % |
| * Area of Physical Work (Ketandan) | 9 % | 15 % |
| * Benefited Area(Widas Extension Area) | 0 % | 0 % |
| * Surrounding Area (Ketandan) | 0 % | 0 % |
| * Area of Physical Work (Transbasin Tunnel) | 9 % | 9 % |
| F. Cumulative | non-cumulative | non-cumulative |
| G. Reversible / Irreversible | | |
| <pre>* Area of Physical Work (Channel Improvement)</pre> | | |
| A.3 Topography | irreversible | 0 |
| B.3 Land use pattern | irreversible | 0 |
| D.3 Land tenure relation | reversible | 0 |
| * Benefited Area (Channel Improvement) | 0 | 0 |
| <pre>* Area of Physical Work (Flood Diversion Channel)</pre> | | |
| A.3 Topography | irreversible | 0 |
| B.3 Land use patterns | irreversible | 0 |
| D.3 Land tenure relations | reversible | 0 |
| * Benefited Area (Flood Diversion Channel) | 0 | 0 |
| * Area of Physical Work (Controllable Retarding) | | |
| A.3 Topography | irreversible | 0 |
| B.3 Land use patterns | irreversible | . 0 |
| D.3 Land tenure relations | reversible | 0 |
| * Benefited Area (Controllable Retarding) | 0 | 0 |
| * Area of Physical Work | | • |

| Criter | tá :: | Time Pe | riod Operation | |
|----------------------------------|----------------------|--------------|--|---|
| * Area of Phys (Kedungwarak) | | | Annual Confession of the Confe | |
| A.3 Topogra | | irreversible | irreversible | |
| A.4 Soil | F7 | 0 | irreversible | |
| | oution through time | 0 | reversible | • |
| | se pattern | irreversible | irreversible | |
| B.4 Forest | | 0 | irreversible | |
| | work facilities | reversible | 0 | |
| | enure relation | reversible | 0 | |
| * Benefited Are (Kedungwarak | ea | 0 | 0 | |
| * Surrounding A (Kedungwarak) | | 0 | ; 0 | |
| * Area of Phys (Ketandan) | ical Work | | | |
| A.3 Topogra | aphy | irreversible | irreversible | |
| A.4 Soil | | 0 | irreversible | ÷ |
| B.2.3 Distrib | oution through time | 0 | reversible | • |
| B.3 Land us | se pattern | irreversible | irreversible | |
| B.4 Forest | | 0 | irreversible | |
| D.3 Land to | enure relation | reversible | 0 | • |
| * Benefited Are (Widas Extens | | 0 | 0 | |
| * Surrounding A (Ketandan) | irea | 0 | 0 | |
| * Area of Phys (Transbasin ' | ical Work Tunnel) | | | |
| A.3 Topogra | aphy | irreversible | 0 | |
| A.4 Soil | | 0. | irreversible | |
| B.2 Water | quantity | reversible | reversible | |
| B.2.3 Distrib | oution through time | 0 | reversible | • |
| B.3 Land us | se pattern | irreversible | . 0 | |
| | | | | |
| | · | | | |
| | · | | | |
| | | | • . | · |
| | | | | |
| | | 9.26 | | |

| | | Critaria | | lime Period |
|----|--|---|-----------------------|----------------------------|
| | | Criteria | Construction | on Operation |
| ١. | Total | Number of People Affected | | |
| * | | of Physical Work nel Improvement) | | |
| | B.7 | Public work facilities | difficult to quantify | to difficult to quantify |
| | D.2 | Economic activities - small-scale trade & services | - do - | 0 |
| * | | ited Area nel Improvement) | | |
| | D.2 - | Economic activities agriculture | 0 | difficult t quantify |
| | | small-scale trade and services small-scale industry, home | 0 | - do - |
| | | industry and handicrafts | 0 | – do – |
| | _ | medium and large-scale industry | v 0 | - do - |
| | D.6 | Health | 0 | - do - |
| | D.8 | Anthropology and culture, | | |
| | <i>D</i> • • • • • • • • • • • • • • • • • • • | including incidence of urba- nization | 0 | - do - |
| × | | of Physical Work d Diversion Channel) | | |
| | B.7 | | difficult quantify | to difficult t quantify |
| | D.2 | Economic activities small-scale trade & services | - do - | 0 |
| * | | ited Area d Diversion Channel) | | |
| | D.2 | Economic activites | | • |
| | _ | agriculture | 0 | difficult t |
| | | | | quantify |
| | | small-scale trade and services small-scale industry, home in- | 0 | - do - |
| | | dustry and hadicrafts | C | – do – |
| | | medium and large-scale industry | y 0 | - do - |
| | D.6 | Health | 0 | - do - |
| | D.8 | Anthropology and culture, inclu | 1 d - | |
| | | ing incidence of urbanization | 0 | - do - |
| 'n | | of Physical Work rollable Retarding) | | |
| | в.7 | Public work facilities | difficult 1 | to difficult t |
| | D.2 | Economic activities | quantify | quantify |
| | | small-scale trade and services | - do - | 0 |
| * | | ited Area rollable Retarding) | | |

| | | • | Time Per | d od |
|----|----------------|--|---|---|
| | | Criteria | Construction | Operation |
| | | The state of the s | | |
| | D.2 | Economic activities agriculture | 0 | difficult to quantify |
| | D.6 | Health | 0 | - do - |
| * | | of Physical Works ngwarak) | · | |
| | в.7 | Public works facilities | 0 | difficult to quantify |
| | D.2 | Economic activities small-scale trade & services | difficult to quantify | 0 |
| * | | ited Area ngwarak) | | |
| | D. 2 | Economic activities | | $\mathcal{L}_{\mathcal{L}} = \mathcal{L}_{\mathcal{L}}$ |
| : | | agriculture | 0 | difficult to quantify |
| * | | unding area ngwarak) | 0 | · 0 |
| * | | of Physical Work ndan) | | |
| | B.7 | Public work facilities | difficult to | difficult to |
| | D.2 | Economic activities | quantity | quantity |
| * | | small-scale trade & services ited Area ndan) | - do - | – do – |
| | D.2 | Economic activities | | |
| | D. 2 | - Agriculture | 0 | difficult to quantity |
| * | Surro (Keta | unding Area ndan) | 0 | . 0 |
| * | | of Physical Work sbasin Tunnel) | | |
| | B.7 | Public work facilities | difficult to quantity | difficult to quantity |
| В. | Total | Area Affected | | · |
| * | | of Physical Work nel Improvement) | | |
| | B.7 | Public work facilities | about 30 bridges and access road and difficult to quantity | about 30 bridges and access road and difficult to quantity |
| | D.2 | Economic activities - Small-scale trade and services | difficult to quantity | 0 |

| | Crite | ria | Time Construction | Period Operation |
|----|-------|---|-------------------------------------|--|
| rk | | ited Area nel Improvement) | | · |
| | D.2 | Economic activities - Agriculture | 0 | difficult to quantity |
| | | - Small-scale trade and services | 0 | - do - |
| | | - Small-scale industry, home industry and handicrafts | 0 | do |
| | ٠. | - Medium and large-scale industry | 0 | - do - |
| ٠ | D.4 | Food production | 0 | - do - |
| | D.5 | Other agricultural production | 0 | - do - |
| * | | of Physical Work d diversion Channel) | | |
| | В.7 | Public work facilities | 6 bridge, and difficult to quantity | 6 bridge and difficult to quantity |
| | D.2 | Economic activities - Small-scale trade and services | difficult to quantity | 0 |
| * | | ited Area od Diversion Channel) | | |
| | D.2 | Economic activities - Agriculture | 0 | difficult to quantity |
| | | - Small-scale trade and services | 0 | - do |
| | | - Small-scale industry, home industry and handicraft | 0 | - do - |
| | | - Medium and large-scale industry | 0 | - do - |
| | D.4 | Food production | 0 | - do - |
| | D.5 | Other agricultural production | 0. | - do - |
| * | | of Physical Work rollable Retarding) | : | |
| | B.7 | Public work facilities | access roads | access roads |
| | D.2 | Economic facilities - Small-scale trade and services | difficult to quantity | 0 |
| * | | ited Area crollable Retarding) | | |
| | D.2 | Economic activities | | |

| | | Time Period | | |
|-------|--|--------------------------|--|--|
| Crite | eria | Construction | Operation | |
| | - Agriculture | 0 | difficult to quantity | |
| D.4 | Food production | 0 | - do - | |
| | of Physical Work Ingwarak) | | | |
| в.6 | Native fauna | 0 | the largest of the reservoir | |
| в.7 | Public work facilities | 0 | about 3 km, and difficult to quantity | |
| D.2 | Economic activities - Small-scale trade and services | difficult to quantity | . 0 | |
| | ited Area ungwarak) | | | |
| В.2.2 | Water quantity | 0 | 122 ha | |
| B.2.3 | B Distribution through time | . 0 | 122 ha | |
| D.2 | Economic activities - Agriculture | 0 | difficult to quantity | |
| D.4 | Food production | 0 | 122 ha | |
| | ounding Area ungwarak) | | | |
| в.2.3 | 3 Distribution through time | 0 | from weir site to the confluence with K. Widas | |
| | of Physical Work andan) | | | |
| в.6 | Native fauna | 0 | the largest of the reservoir | |
| B.7 | Public works facilities | about 3 km | about 3 km | |
| D.2 | Economic activities - Small-scale trade and services | difficult to quantity | 0 | |
| | ited Area s Extension Area) | | | |
| B.2.2 | ! Water quantity | 0 | 2300 ha | |
| B.2.3 | B Distribution through time | . 0 | 2300 ha | |
| D.2 | Economic activities - Agriculture | 0 | difficult to quantity | |

Time Period

| | | | Time Per | riod |
|-----------|-------|---|------------------------|--|
| <u></u> - | Crite | eria | Construction | Operation |
| | D.4 | Food production | 0 | 2300 ha |
| * | | ounding Area undan) | | |
| | B.2.3 | B Distribution through time | 0 | from weir site to the confluence with K. Widas |
| ĸ | | of Physical Work sbasin Tunnel) | | |
| - | B.7 | Public work facilities | access roads 2,7 km | access roads, 2,7 km |
| C. | Leng | of Time Involved | about 5 years | about 50 years |
| D. | Inten | sity of Impact | | |
| * | | of Physical Work mel Improvement) | | |
| | B.7 | Public work facilities | + L.A | + L.A |
| | D.2 | Economic activities - Small-sacle ade and services | + S.A | 0 |
| * | | ited Area nel Improvement) | | |
| | D.2 | Economic activities - Agriculture - Small-scale trade and | 0 | + L.A |
| | | services | 0 | + M.A |
| | | Small-scale idustry, home industry and handicraftsMedium and large-scale | 0 | + M.A |
| | | industry | 0 | + M.A |
| | D.4 | Food production | 0 | + L.A |
| | D.5 | Other agricultural production | 0 | + M.A |
| | D.6 | Health | . 0 | + L.A |
| | D.8 | Anthropology and culture, including incidence of urbanization | 0 | + M.A |
| * | | of Physical Work d Diversion Channel) | | |
| | B.7 | Public work facilities | + L.A | + L.A |
| | D.2 | Economic activities - Small-scale trade and | | |
| | | services | + S.A | 0 |

Tiem Period

| | Crite | ria | Constructio | n | Operati | on |
|---|-------|---|--------------|---|----------------|----|
| * | | ited Area d Diversion Channel) | | • | | |
| | D.2 | Economic activities - Agriculture - Small-sacle trade and services | 0 | | + L.A + M.A | |
| | | Small-scale industry, home industry and handicraftsMedium and large-scale industry | 0 | | + M.A + M.A | |
| | D.4 | Food production | 0 | | + L.A | |
| | D.5 | Other agricultural production | 0 | | + M.A | |
| | D.6 | Health | 0 | | + L.A | |
| | D.8 | Anthropology and culture, including incidence of urbanization | 0 | · | + M.A | |
| * | | of Physical Work rollable Retarding) | | | | |
| | B.7 | Public work facilities | + S.A | | + S.A | |
| | D.2 | Economic activities - Small-scale trade and services | + S.A | | 0 | |
| * | | ited Area rollable | | | | |
| | D.2 | Economic activities - Agriculture | 0 | | + L.A | |
| | D.4 | Food production | . 0 | | + L.A | |
| | D.6 | Health | 0 | | + L.A | |
| * | | of Physical Work ngwarak) | | ٠ | | |
| | B.6 | Native fauna | O | | + S.C | |
| | B.7 | Public work facilities | <u>+</u> L.A | | + L.A | |
| | D.2 | Economic activities - Small-scale trade and services | + S.A | | 0 | • |
| × | | ited Area ngwarak) | | | | |
| | в.2.2 | Water quantity | 0 | | + L.A | |
| - | B.2.3 | Distribution through time | 0 | | + L.A | |
| | D.2 | Economic activities - Agriculture | 0 | | + L.A | ٠ |
| | | | | | | |

Time Period Construction Operation D.4 Food production + L.A Surrounding Area (Kedungwarak) B.2.3 Distribution through time + S.A Area of Physical Work (Ketandan) B.6 Native fauna 0 + S.C B.7 Public work facilities + S.A + S.A D.2 Economic activities 0 - Small-scale trade and + S.A services Benefited Area (Widas Extension Area) B.2.2 Water quantity 0 + L.A B.2.3 Distribution through time 0 + L.A D.2 Economic activities - Agriculture 0 + L.A 0 D.4 Food production + L.A Surrounding Area (Ketandan) B.2.3 Distribution through time + S.A Area of Physical Work (Transbasin Tunnel) B. 7 Public work facilities + M.A + M.A E. Number of Component of The Environment Affected * Area of Physical Work (Channel Improvement) 6 % 3 % Benefited Area (Channel Improvement) 0 % 24 % Area of Physical Work (Flood Diversion Channel) 6 % 3 % Benefited Area (Flood Diversion Channel) 0 % 24 % Area of Physical Work (Controllable Retarding) 6 % 3 %

0 %

9 %

Benefited Area

(Controllable Retarding)

| | | | Time Period | | |
|-----|--|---|----------------|----------------|--|
| | Crite | eria | Construction | Operation | |
| × | | of Physical Work ungwarak) | 3 % | 6 % | |
| ጵ | | ited Area Ingwarak) | 0 % | 12 % | |
| * | | ounding Area ungwarak) | 0 % | 3 % | |
| * | | of Physical Work andan) | 6 % | 6 % | |
| ን⁄ና | | Fited Area as Extension Area) | 0 % | 12 % | |
| * | Surrounding Area (Ketandan) | | 0 % | 3 % | |
| * | Area of Physical Work (Transbasin Tunnel) | | 3 % | 3 % | |
| F. | Cumulative Effect | | non-cumulative | non-cumulative | |
| G | Rever | rsible/Irreversible | • | | |
| * | Area of Physical Work (Channel Improvement) | | | | |
| | в.7 | Public work facilities | reversible | reversible | |
| | D.2 | Economic activities - Small-scale trade and services | reversible | 0 | |
| * | | ited Area nnel Improvement) | | | |
| | D.2 | Economic activities - Agriculture - Small-scale trade and | 0 | reversible | |
| | | services - Small-sacle industry, home | 0 | - do - | |
| | | industry and handicrafts - Medium and large-scale | 0 | - do - | |
| | | industry | 0 | - do - | |
| | D.4 | Food production | 0 | - do - | |
| | D.5 | Other agricultural production | 0 | - do - | |
| | D.6 | Health | 0 | - do - | |
| | D.8 | Anthropology and culture, including incidence of urbanization | 0 | - do - | |

Time Period

| | Crite | ria | Construction | Operation |
|---|--|--|--------------|------------|
| k | Area of Physical Work (Flood Dievrsion Channel) | | | |
| | B.7 | Public work facilities | reversible | reversible |
| | D.2 | Economic activities - Small-scale trade and services | reversible | 0 |
| * | | ited Area d Diversion Channel) | | |
| | D.2 | Economic activities - Agriculture - Small-scale trade and | 0 | reversible |
| | | services | o o | - do - |
| | | Small-scale industry, home industry and handicraftsMedium and large-scale | 0 | - do - |
| | | industry | 0 | - do - |
| | D.4 | Food production | 0 | - do - |
| | D.5 | Other agricultural production | 0 | - do - |
| | D.6 | Health | 0 | - do - |
| | D.8 | Anthropology and culture, including incidence of urbanization | 0 | - do - |
| * | | of Physical Work rollable Retarding) | | · |
| | B.7 | Public Work facilities | reversible | reversible |
| | D.2 | Economic activities - small-scale trade and services | reversible | 0 |
| * | | ited Area rollable Retarding) | | |
| | D.2 | Economic activities - agriculture | 0 | reversible |
| | D.4 | Food production | 0 | - do - |
| | D.6 | Health | 0 | - do - |
| × | Area of Physical Work (Kedungwarak) | | | |
| | B.6 | Native fauna | 0 | reversible |
| | B.7 | Public work facilities | 0 | reversible |
| | D.2 | Economic activities - small-scale trade and services | reversible | 0 |

| | | | | \$ |
|---|-----------------|--|--------------|------------|
| | | Criteria | Time | Period |
| | · | Oriteria | Construction | Operation |
| × | | ited Area ngwarak) | | |
| | B.2.2 | Water quantity | 0 | reversible |
| | B.2.3 | Distribution through time | 0 | - do - |
| | D.2 | Economic activities - agriculture | 0 | - do - |
| | D.4 | Food production | 0 | - do - |
| * | | unding Area ngwarak) | | |
| | B.2.3 | Distribution through time | 0 | reversible |
| × | Area ((Keta | of Physical Work ndan) | | |
| | B.6 | Native fauna | 0 | reversible |
| | B.7 | Public work facilities | reversible | reversible |
| | D.2 | Economic activities - small-scale trade and services | reversible | 0 |
| * | | ited Area s Extension Area) | | |
| | B.2.2 | Water quantity | 0 | reversible |
| | B.2.3 | Distribution through time | 0 | - do - |
| | D.2 | Economic activities - agriculture | 0 | - do - |
| | D.4 | Food production | 0 | - do - |
| * | Surrou (Keta | unding Area ndan) | | |
| | B.2.3 | Distribution through time | 0 | reversible |
| * | | of Physical Work sbasin Tunnel) | | |
| | в.7 | Public work facilities | reversible | reversible |
| | | | | |

