# SURVEY AND STUDY FOR THE DEVELOPMENT OF SALA RIVER BASIN

## REVISION OF SUPPORTING REPORT, PART-TWO "FLOOD CONTROL AND RIVER IMPROVEMENT"

BENGAWAN SALA SURVEY TEAM

O.T.C.A., JAPAN

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"FLOOD CONTROL AND RIVER IMPROVEMENT"

The Section II-3 and II-4 of the captioned report shall be replaced by the following revised papers.

(1) II-3 Estimate of Flood Damage at Present on page 79, instead of the first sentence, the following paragraphs shall be inserted:

Judging from 3-day continuous rainfall over the upper basin of Surakarta, the magnitude of the 1966 flood is estimated to have frequency of occurrence once 30-year/1. For estimating average annual flood damage in the Upper Sala Basin, therefore, such weighted method was applied to the flood damages in the past 10 years, as to give a weight of 1/30 to the flood damages in 1966 and to give that of $\frac{29}{30} \times \frac{1}{9}$ to the flood damages in other nine years respectively.

(2) On page 83, Section 3-3, "Total damage", (a) Direct flood damage, the second paragraph and table shall be replaced by the following.

Average annual inundation area, numbers of damageable house and amount of direct flood damage are summarized as shown below.

| | Upper Sala Basin | Madium Basin | Lower Sala Basin | Whole Basin |
|---|---|---|---|---|
| Inundation area (ha) | 13,200 | 6,500 | 72,600 | 92,300 |
| Nos. of damageable house | 11,400 | 4,300 | 34,200 | 49,900 |
| Amount of damage ($10^3$US$) | 3,240 | 2,590 | 9,420 | 15,250 |
| House damage ( " ) | 1,980 | 1,940 | 2,580 | 6,500 |
| Crop damage ( " ) | 1,260 | 650 | 6,840 | 8,750 |

/1: Refer to IV-5, Supporting Report, PART-ONE.

(3) On page 84, Section II-4-3, Total average annual flood damage, table shall be replaced by the following revised one.

(Unit: $10^3$ US$)

| | | Upper Sala Basin | Madiun Basin | Lower Sala Basin | Whole Basin |
|---|---|---|---|---|---|
| At present | House damage | 1,980 | 1,940 | 2,580 | 6,500 |
| | Crop damage | 1,260 | 650 | 6,840 | 8,750 |
| | T o t a l | 3,240 | 2,590 | 9,420 | 15,250 |
| After 10 years | House damage | 2,800 | 2,700 | 3,600 | 9,100 |
| | Crop damage | 1,500 | 800 | 8,200 | 10,500 |
| | T o t a l | 4,300 | 3,500 | 11,800 | 19,600 |

(4) On page 101, Table II-22, Amount of Total Flood Damage shall be replaced by the following revised table.

Table-II-22 Amount of Total Flood Damage

(Unit: $10^3$ US$)

| | Wonogiri area | Surakarta area | Sragen area | Ponorogo area | Madiun area | Bojonegoro area | Lower Course Left area | Lower Course Right area | Total |
|---|---|---|---|---|---|---|---|---|---|
| Maximum damage | | | | | | | | | |
| Inundation area (ha) | 3,700 | 19,500 | 9,700 | 4,000 | 9,700 | 28,700 | 24,800 | 57,700 | 157,800 |
| Nos. of damageable house | 6,600 | 59,400 | 21,600 | 2,800 | 13,700 | 20,700 | 10,600 | 101,400 | 236,800 |
| Amount of damage($10^3$US$) | 1,310 | 29,280 | 2,890 | 420 | 5,800 | 5,970 | 2,940 | 10,220 | 58,830 |
| House damage ( " ) | 880 | 27,040 | 1,780 | 100 | 5,020 | 2,600 | 640 | 5,280 | 43,340 |
| Crop damage ( " ) | 430 | 2,240 | 1,110 | 320 | 780 | 3,370 | 2,300 | 4,940 | 15,490 |
| Average annual damage | | | | | | | | | |
| Inundation area (ha) | 200 | 7,400 | 5,600 | 1,900 | 4,600 | 24,200 | 17,100 | 31,300 | 92,300 |
| Nos. of damageable house | 300 | 8,100 | 3,000 | 600 | 3,700 | 15,900 | 4,800 | 13,500 | 49,900 |
| Amount of damage($10^3$US$) | 40 | 2,250 | 950 | 240 | 2,350 | 4,360 | 1,920 | 3,140 | 15,250 |
| House damage ( " ) | 30 | 1,510 | 440 | 50 | 1,890 | 1,580 | 270 | 730 | 6,500 |
| Crop damage ( " ) | 10 | 740 | 510 | 190 | 460 | 2,780 | 1,650 | 2,410 | 8,750 |

(5) On page 157, Section IV-7, Annual Benefit, Sub-section 7-1, Annual benefit for each sub-basin, shall be entirely replaced by the following.

IV-7 Annual Benefit

7-1 Annual benefit for each sub-basin

From the studies in Chap. II, the average annual flood damage under the present socio-economic condition of the Basin is summarized again as follows.

| Upper Sala Basin | | Madiun Basin | | Lower Sala Basin | | Whole Basin |
|---|---|---|---|---|---|---|
| Area | Amount ($10^3$US$) | Area | Amount ($10^3$US$) | Area | Amount ($10^3$US$) | Amount ($10^3$US$) |
| Wonogiri area | 130 | Ponorogo area | 240 | Bojonegoro area | 4,360 | |
| Surakarta area | 2,250 | Madiun area | 2,350 | Lower Course Left area | 1,920 | |
| Sragen area | 950 | | | Lower Course Right area(A) | 900/1 | |
| | | | | Lower Course Right area(B) | 2,240/2 | |
| Total | 3,330 | Total | 2,590 | Total | 9,420 | 15,340 |

/1: Damage by the flood from Sala River

/2: Damage by landside water

The annual benefit of the master plan project, that is, the average annual decrease of flood damage by the master plan project is estimated to be US$14,538 million for the whole Basin, US$3.20 million for Upper Sala Basin, US$2.47 million for Madiun Basin, US$8.868 million for Lower Sala Basin as shown in Table IV-14.

Table IV-14 Annual Benefit in Each Sub-basin

| Upper Sala Basin | | Madiun Basin | | Lower Sala Basin | | Whole Basin |
|---|---|---|---|---|---|---|
| Area | Amount ($10^3$US$) | Area | Amount ($10^3$US$) | Area | Amount ($10^3$US$) | Amount ($10^3$US$) |
| Wonogiri area | - /1 | Ponorogo area | 120 /2 | Bojonegoro area | 4,360 | |
| Surakarta area | 2,250 | Madiun area | 2,350 | Lower Course Left area | 1,920 | |
| Sragen area | 950 | | | Lower Course Right area(A) | 900 | |
| | | | | Lower Course Right area(B) | 1,688 /3 | |
| Total | 3,200 | Total | 2,470 | Total | 8,868 | 14,538 |

/1: No benefit is expected in Wonogiri area because no flood control project is prepared for this area.

/2: Calculated on the assumption that as no river improvement project is planned in this area, only 50 % of the damage is decrease by Badegan and Bendo reservoir projects.

/3: Not all of the damage can be eliminated by Jero Swamp drainage project but some part of that is remained. (Refer to Appnedix IV-1).

(6) On page 161, Table IV-15, *Annual Benefit and Construction Cost of Each Project* shall be replaced by the following revised one.

Table IV-15 Annual Benefit and Construction Cost of Each Project

| Project | Construction cost ($10^3$US$) | Annual benefit ($10^3$US$) |
|---|---|---|
| Wonogiri reservoir | 6,400 | 4,000 |
| Badegan reservoir | 7,100 | 273 |
| Bendo reservoir | 2,400 | 168 |
| Jipang reservoir | 31,200 | 2,723 |
| Upper Sala River improvement | 33,100 | 933 |
| Wonogiri - Surakarta | 5,100 | 656 |
| Surakarta - Sragen | 28,000 | 277 |
| Madiun River improvement | 21,400 | 2,029 |
| Lower Sala River improvement | 53,300 | 2,286 |
| Upstream from Babat | 25,000 | 1,654 |
| Downstream from Babat | 28,300 | 632 |
| Jabung retarding basin | 6,800 | 438 |
| Jero swamp drainage | 5,900 | 1,688 |
| Total | 167,600 | 14,538 |

(7) On page 162, the table on the top of that page shall be replaced by the following.

| Sub-basin | Construction cost ($10^3$ US$) | Annual benefit ($10^3$ US$) |
|---|---|---|
| Upper Sala Basin | 36,700 | 3,200 |
| Madiun Basin | 30,900 | 2,470 |
| Lower Sala Basin | 100,000 | 8,868 |
| Whole Basin | 167,600 | 14,538 |

Note: The construction cost of Wonogiri reservoir is allocated for Upper Sala and Lower Sala Basins by the proportional allotment of the annual benefit gained in the respective sub-basins.

for Upper Sala Basin: 6.4 x 57 % = US$3.6 million

for Lower Sala Basin: 6.4 x 43 % = US$2.8 million