

CHAPTER IV

BENEFIT TO ROAD USER COST

In this chapter, the comparison of the benefit of Bang Pa In-Nakhonsawan Highway over the route No.1 and No.309 is in form of distance reduction, average travel speed, travel time savings and road user cost savings.

Distance

The milage elements of the cost of running a vehicle are fuel, tyres, engine oil, maintenance and depreciation. The total economic cost to the vehicle owner for these items is a function of milage driven. Reduction of distance is the major highway item in the running cost of vehicle.

Table 49 shows the comparison of distances by different routes from Bangkok to the various provincial capitals in the middle and northern part of Thailand. Bangkok was chosen as the originated point while important changwats and amphoes traversed by the highway understudied were chosen as destinations. The specific points of destination or centroid of each destination zone refer to the center business district (CBD) of those zones. The informations of distance were obtained from a literature entitled "The Control Section" published by the Thai Highway Department.

Table 49 Comparison of Distances Between Route No.32 and Other Routes

| O-D Pairs | | Name | Dist. on Route No. 32 | Dist. on Old Routes | Diff.* |
|-----------|----------|-----------------------|--------------------------|------------------------|--------|
| Zone No. | Zone No. | | | | |
| 0 | 1 | Ayuthaya | 72 | 86 | -14 |
| | 2 | Ang Thong | 105 | 122 | -17 |
| | 3 | Pa Mok | 119 | 112 | +7 |
| | 4 | Supanburi | 140 | 164 | -24 |
| | 5 | Lopburi | 159 | 154 | +5 |
| | 6 | Khoksamrong | 195 | 190 | +5 |
| | 7 | Singburi | 141 | 187 | -46 |
| | 8 | Chai Nat | 194 | 281 | -87 |
| | 9 | Uthai Thani | 218 | 322 | -104 |
| | 10 | Takhli | 199 | 256 | -57 |
| | 11 | Nakhonsawan | 240 | 344 | -104 |
| | 12 | Beyond Nakhonsawan | - | - | -104 |
| | 13 | To or From East | - | - | - |

* - means Bang Pa In-Nakhonsawan Highway reduces distances from old roads.

+ means Bang Pa In-Nakhonsawan Highway increases distances from old roads.

Average Travel Speed

Before undergoing the analysis of the average travel speeds distinction between two terms of average running speed and average travel speed will be brought to light.

The term "average running speed" means the speeds which most of the vehicle would run in a specific section of road with regardless of the delay encountered along entire route. The term "average travel speed" is the average speed that most of the vehicle used between the given length of road or it is equal to the distance divided by the total time used including delay time. In general, especially for the intercity rural highway, the two terms are not so much different. The running speed is suitable for determining the operating cost since it represents the actual speed. The travel speed term is suitable for calculating the travel time.

For the average travel speed on the Bang Pa In-Nakhonsawan Highway, it is assumed that the average travel speeds are equal for the entire road section. For the old existing roads, the the average travel speeds are determined by weighted average speed of each section. The comparison of the average travel speeds are shown in Table 50.

Travel Time

One of the main purposes in the development of the Bang Pa In-Nakhonsawan Highway is to reduce the travel time and hence saving

Table 50 Comparison of Average Travel Speed Between Route No.32 and Old Routes

| O-D Pairs | | Car | | LB & LT | | 2HT & 3HT | | Heavy Bus | |
|-----------|----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|
| Zone No. | Zone No. | Route No.32 | Old Route |
| 0 | 1 | 85 | 83 | 78 | 76 | 66 | 62 | 80 | 75 |
| | 2 | 85 | 82 | 78 | 72 | 66 | 60 | 80 | 75 |
| | 3 | 80 | 80 | 75 | 72 | 64 | 60 | 80 | 75 |
| | 4 | 80 | 78 | 75 | 72 | 64 | 60 | 80 | 75 |
| | 5 | 82 | 82 | 76 | 76 | 66 | 64 | 80 | 75 |
| | 6 | 82 | 82 | 75 | 75 | 66 | 64 | 80 | 75 |
| | 7 | 85 | 80 | 78 | 75 | 66 | 64 | 80 | 75 |
| | 8 | 85 | 80 | 78 | 74 | 66 | 64 | 80 | 75 |
| | 9 | 85 | 78 | 78 | 74 | 66 | 64 | 80 | 75 |
| | 10 | 85 | 80 | 78 | 75 | 66 | 65 | 80 | 75 |
| | 11 | 85 | 80 | 78 | 75 | 66 | 65 | 80 | 75 |
| | 12 | 85 | 80 | 78 | 75 | 66 | 65 | 80 | 75 |
| | 13 | - | - | - | - | - | - | - | - |

in travel costs. Travel time is a function of distance and travel speed. Table 51 shows the comparisons of travel time along the Bang Pa In-Nakhonsawan Highway and the old existing roads by each type of vehicle.

It can be seen that travelling along the Bang Pa In-Nakhonsawan Highway from Bangkok to the provinces in the northern region of Thailand can reduce travel time of 1 hour 20 minutes* for passenger cars and 1 hour 40 minutes** for heavy trucks.

Road User Cost

The most important purpose to develop the Bang Pa In-Nakhonsawan Highway is to reduce the travel costs. Road user cost is a function of travel time, and operating speed. The evaluation of road user cost may appropriately be derived from the unit of travel cost which was reviewed in Chapter III. Since travel costs also depend on the running speed of vehicle, it is assumed that the travel speeds are the same as running speed. This is true for the intercity trips like the situation of this study. The comparison of road user cost both included and excluded toll charge between route No.32 and old roads for each type of vehicle are shown in Tables 52 and 53.

*The average toll paying delay was about 30 seconds at each toll gate and consider insignificant.

Table 51 Comparison of Travel Time Between Route No. 32 and Old Routes

| O-D Pairs | | Travel Time, min | | | | | | | | | | | |
|-----------|----------|------------------|-----------|--------|-------------|-----------|--------|-------------|-----------|--------|-------------|-----------|--------|
| | | Car | | | LB & LT | | | 2HT & 3HT | | | Heavy Bus | | |
| Zone No. | Zone No. | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* |
| 0 | 1 | 51 | 62 | -11 | 55 | 68 | -12 | 66 | 83 | -17 | 54 | 68 | -14 |
| | 2 | 74 | 89 | -15 | 81 | 101 | -21 | 95 | 122 | -26 | 79 | 97 | -19 |
| | 3 | 89 | 97 | -8 | 95 | 107 | -13 | 111 | 129 | -18 | 89 | 103 | -14 |
| | 4 | 105 | 126 | -21 | 112 | 137 | -25 | 131 | 164 | -33 | 105 | 131 | -26 |
| | 5 | 116 | 112 | -4 | 125 | 121 | +4 | 144 | 144 | - | 119 | 123 | -4 |
| | 6 | 143 | 139 | +4 | 156 | 152 | +4 | 177 | 178 | -1 | 146 | 152 | -6 |
| | 7 | 99 | 140 | -41 | 108 | 149 | -41 | 128 | 175 | -47 | 106 | 149 | -4 |
| | 8 | 137 | 211 | -73 | 150 | 228 | -78 | 177 | 263 | -87 | 146 | 225 | -79 |
| | 9 | 154 | 248 | -94 | 168 | 261 | -93 | 198 | 302 | -104 | 164 | 258 | -94 |
| | 10 | 140 | 192 | -52 | 153 | 205 | -52 | 181 | 236 | -56 | 149 | 205 | -56 |
| | 11 | 170 | 258 | -89 | 185 | 275 | -91 | 219 | 318 | -99 | 180 | 275 | -95 |
| | 12 | - | - | -86 | - | - | -91 | - | - | -99 | - | - | -95 |
| | 13 | - | - | - | - | - | - | - | - | - | - | - | - |

* - means Route No. 32 reduced travel time from the old roads.

+ means Route No. 32 increased travel time from the old roads.

Table 52 Comparison of Road User Costs (include toll charge) Between Route No.32 and Old Routes

| O-D Pairs | | Road User Costs (baht) | | | | | | | | | | | | | | |
|-----------|----------|------------------------|-----------|--------|-------------|-----------|--------|--------------|-----------|--------|-------------|-----------|--------|--------------|-----------|--------|
| | | Cars | | | Light Buses | | | Light Trucks | | | Heavy Buses | | | Heavy Trucks | | |
| Zone No. | Zone No. | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* |
| 0 | 1 | 109.5 | 128.5 | -16.0 | 80.8 | 94.2 | -13.4 | 76.5 | 85.2 | -8.7 | 197.6 | 230.4 | -32.8 | 137.1 | 150.9 | -13.8 |
| | 2 | 161.2 | 182.6 | -21.4 | 119.9 | 133.9 | -14.0 | 108.8 | 121.0 | -12.2 | 291.1 | 327.4 | -36.3 | 205.1 | 214.4 | -9.3 |
| | 3 | 181.4 | 167.5 | +13.9 | 134.0 | 113.7 | +20.3 | 122.1 | 111.1 | +11.0 | 327.3 | 300.5 | +26.8 | 229.2 | 196.8 | +32.4 |
| | 4 | 212.7 | 246.2 | -33.5 | 156.9 | 180.5 | -23.6 | 142.9 | 163.1 | -20.2 | 383.7 | 441.4 | -107.7 | 266.6 | 289.1 | -22.5 |
| | 5 | 241.0 | 230.8 | +10.2 | 177.5 | 169.3 | +8.2 | 161.6 | 153.0 | +8.6 | 434.6 | 413.9 | +20.7 | 300.3 | 271.1 | +29.2 |
| | 6 | 294.3 | 284.8 | +9.5 | 216.4 | 208.9 | +7.5 | 196.9 | 188.8 | +8.1 | 530.4 | 510.9 | +19.5 | 363.8 | 334.6 | +29.2 |
| | 7 | 214.4 | 280.4 | -66.0 | 158.1 | 205.6 | -47.5 | 143.9 | 185.8 | -41.9 | 386.6 | 502.9 | -116.3 | 268.5 | 329.3 | -30.8 |
| | 8 | 293.5 | 422.0 | -128.5 | 215.8 | 309.4 | -90.9 | 196.4 | 279.7 | -83.3 | 529.0 | 756.7 | -227.7 | 362.9 | 495.6 | -132.7 |
| | 9 | 328.8 | 483.8 | -155.0 | 241.5 | 354.7 | -113.2 | 219.7 | 320.6 | -100.9 | 592.3 | 867.5 | -275.2 | 404.9 | 568.2 | -163.3 |
| | 10 | 299.9 | 384.6 | -84.7 | 220.5 | 282.0 | -59.5 | 200.6 | 254.9 | -54.3 | 540.5 | 699.6 | -159.1 | 370.5 | 451.6 | -81.1 |
| | 11 | 361.6 | 517.2 | -155.0 | 265.5 | 379.2 | -113.7 | 241.5 | 342.7 | -101.2 | 651.4 | 927.3 | -275.9 | 444.1 | 607.3 | -166.2 |
| | 12 | - | - | -155.0 | - | - | -113.7 | - | - | -101.2 | - | - | -275.9 | - | - | -166.2 |
| | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* - means Route No. 32 reduced travel costs from old roads.

+ means Route No. 32 increased travel costs from old roads.

Table 53 Comparison of Road User Costs (exclude toll charge) Between Route No. 32 and Old Routes

| O-D Pairs | | Road User Costs (baht) | | | | | | | | | | | | | | |
|-----------|----------|------------------------|-----------|--------|--------------|-----------|--------|--------------|-----------|--------|-------------|-----------|--------|--------------|-----------|--------|
| | | Cars | | | Light Buses | | | Light Trucks | | | Heavy Buses | | | Heavy Trucks | | |
| Zone No. | Zone No. | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* | Route No.32 | Old Route | Diff.* |
| 0 | 1 | 106.5 | 128.5 | -22.0 | 77.8 | 94.2 | -16.4 | 70.5 | 85.2 | -14.7 | 191.6 | 230.4 | -38.8 | 127.1 | 150.9 | -23.8 |
| | 2 | 155.2 | 182.6 | -27.4 | 113.9 | 133.9 | -20.0 | 102.8 | 121.0 | -18.2 | 279.1 | 327.4 | -93.3 | 185.1 | 214.4 | -29.3 |
| | 3 | 175.4 | 167.5 | +7.9 | 128.0 | 113.7 | +14.3 | 116.1 | 111.1 | +5.0 | 315.3 | 300.5 | +14.8 | 209.2 | 196.8 | +12.4 |
| | 4 | 206.7 | 246.2 | -39.5 | 150.9 | 180.5 | -29.6 | 136.9 | 163.1 | -26.2 | 371.7 | 441.4 | -69.7 | 246.6 | 289.1 | -42.5 |
| | 5 | 235.0 | 230.8 | +4.2 | 171.5 | 169.3 | +2.2 | 155.6 | 153.0 | +2.6 | 422.6 | 413.9 | +8.7 | 280.3 | 271.1 | +9.2 |
| | 6 | 288.3 | 284.8 | +3.5 | 210.4 | 208.9 | +1.5 | 190.9 | 188.8 | +2.1 | 518.4 | 510.9 | +7.5 | 343.8 | 334.6 | +9.2 |
| | 7 | 208.4 | 280.4 | -72.0 | 152.1 | 205.6 | -53.5 | 137.9 | 185.0 | -47.9 | 374.6 | 502.9 | -128.3 | 248.5 | 329.3 | -80.8 |
| | 8 | 287.5 | 422.0 | -134.5 | 209.8 | 309.4 | -99.6 | 190.4 | 279.7 | -85.8 | 517.0 | 756.7 | -239.7 | 342.9 | 495.6 | -152.7 |
| | 9 | 322.8 | 483.8 | -161.0 | 235.5 | 354.7 | -119.2 | 213.7 | 320.6 | -106.9 | 580.3 | 867.5 | -287.2 | 384.9 | 568.2 | -183.3 |
| | 10 | 293.9 | 384.6 | -90.7 | 214.5 | 282.0 | -67.5 | 194.6 | 254.9 | -60.3 | 528.5 | 699.6 | -171.1 | 350.5 | 451.6 | -101.1 |
| | 11 | 355.6 | 516.6 | -161.0 | 259.5 | 379.2 | -119.2 | 235.5 | 342.7 | -107.2 | 639.4 | 927.3 | -287.9 | 424.1 | 607.3 | -183.2 |
| | 12 | - | - | -161.0 | - | - | -119.2 | - | - | -107.2 | - | - | -287.9 | - | - | -183.2 |
| | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* - means Route No. 32 reduced travel costs from the old roads.

+ means Route No. 32 increased travel costs from the old roads.