5.3.3 Project Summaries

(1) Road Projects

Intraregional

RP1:[1] *Roads to Support Specific Industrial Developments*—A vitally important project at the intraregional level is to construct the necessary road facilities to support planned industrial developments, e.g., at Bang Saphan, Samut Songkhram, and Chumphon. In the case of the Bang Saphan industrial complex (see Figure 9.5.12), the JICA-assisted *Feasibility Study on Bang Saphan Industrial Estate* has concluded that a new four-lane access road plus interchange connecting Route 4 with the iron/steel industry complex and Prachuap Port should urgently be developed to serve the increasing volumes of heavy traffic; also, the improvement and upgrading of Route 3169 between Route 4 and Bang Saphan town is already in the advanced planning stage by DOH. Similarly detailed assessments of other planned industrial developments in the WSB (e.g., at Samut Songkhram[2] and Chumphon) should be prepared based on the specification of development details (e.g., estate area, location, land use plan).[3]

RP2: Links between Ratchaburi and other Provincial Capitals (i.e., Kanchanaburi, Samut Songkhram)—The proposed project would address the indirect connection between Kanchanaburi and Ratchaburi and the indirect connection between Samut Songkhram and Ratchaburi. Also, the indirect connection between Kanchanaburi and Samut Songkhram would be addressed by dealing with the indirect connection between Ratchaburi and Samut

---

[1]The numbers indicate a reverse hierarchy from intraregional (i.e., within the WSB only), to interregional (i.e., between the WSB and other regions of Thailand), to subregional (i.e., international). The numbers do not necessarily indicate project priority.

[2]It is expected that a circular road linked to Route 35 would be required in the abandoned shrimp field in Samut Songkhram as part of the industrial park plan.

[3]Access roads to planned industrial estates beyond the immediate vicinity of the estates will be considered under separate projects, e.g., improvement of the link between Bang Saphan and Pathiu (see Project RP3).

Songkhram.[1] Specifically, the link between Ratchaburi and Kanchanaburi would be upgraded by (i) utilizing the planned Ban Pong-Cha Am motorway and widening the Ban Pong-Kanchanaburi section of Route 323 to a dual three-lane facility, as recommended for 2001-2006 by the *Long-Term Strategic Study of Highway Planning and Investment*, (ii) constructing a new direct alignment, or (iii) improving Routes 3089 and 3357. The link between Samut Songkhram and Ratchaburi may be improved through extending an already proposed new road project linking a point on Route 3091 about 12 km north of Samut Sakhon (Thumbaen) with Route 325 and by improving Route 325 north of Samut Songkhram (see Figure 9.5.13); the Samut Songkhram-Ratchaburi link is vitally important for the Urban Cluster Development (UCD) proposed for the Upper WSB, which features linkages between the proposed Samut Songkhram Free Trade Area and other centers, including Ratchaburi.

RP3: Pathiu-Route 4 and Pathiu-Bang Saphan Links—Operations at the new Chumphon Airport at Pathiu are expected to commence in 1997, but at present access from the airport to Route 4 takes about an hour by car. Access links are required to link Pathiu with (i) Route 4 and (ii) Bang Saphan (directly)(see Figure 9.5.14). Regarding the Pathiu-Route 4 link, the immediate need is to provide a connection with Route 3201, a four-digit road that runs into Route 4; Route 3201 may also require upgrading later,[2] considering the likelihood of new traffic in the form of passengers on round-trip service to Bangkok, airport employees and employees and customers of new businesses induced by the airport, and truck traffic carrying air freight shipments. The Pathiu-Bang Saphan link is also vitally important for promoting

---

[1]Because it is interregional rather than intraregional, the link between Ratchaburi and Bangkok will be addressed under Project RP10, North-South Links, although it is more of an east-west connection. In addition, improvement of the link between Samut Songkhram and Petchaburi is not proposed here because PWD has recently built a low-volume road between Samut Songkhram and Ban Laem (although a major bridge will not be completed for another two years) and the costs (construction and environmental) of building a high-volume road traversing the mangrove swamp that intervenes between Samut Songkhram and Petchaburi is deemed prohibitive. Also, the links between Kanchanaburi and provincial capitals in the Central and Lower WSB (i.e., Petchaburi, Prachuap Khirikhan, and Chumphon) are not addressed because of the limited traffic between these areas at present and in the foreseeable future, because the traffic that materializes will be well-served by improvements of Route 4 and/or motorway construction as well as the proposed upgrading of the Ratchaburi-Kanchanaburi link, and because of the procedural difficulties and environmental costs of traversing national parks in the western part of the WSB; it is recognized, however, that an alternative route may be needed when Route 4 is closed due to flooding. Therefore new alignments connecting (i) Routes 3301 and 3206 in central Petchaburi Province and (ii) Pranburi and Route 3218 may be worth considering. Also worth noting, the The World Bank-assisted *Long-Term Strategic Study of Highway Planning and Investment* proposed widening Route 325 into a dual two-lane road in the 2001-2006 period.

[2]According to DOH road inventory data, Route 3201 (32 km long) is a two-lane facility that includes both Class 4 and Class 5 sections, with a carriageway width of generally 5.5 m and shoulder width from 0.0 to 1.5 m on each side; roughness levels are in the range of 4-5 as measured by the International Roughness Index (IRI).

the use of the new airport, considering the size of the industrial development likely to occur at Bang Saphan and the proposal for a linked airport-seaport zone. While DOH already has a secondary road under construction completing the connection between Bang Saphan and Pathiu by filling in the "missing link" south of Route 3411, further upgrading is likely to be required as Route 3411 is a Class 5 road[1] (9 m wide with no shoulder) and Route 3374 (leading north to Bang Saphan via Route 3169) is a Class 4 road[2] (5.5 m wide with a 1.75 m wide shoulder on one side).

RP4: Hua Hin-Prachuap Khirikhan-Chumphon Scenic Coastal Road—The RP4 project would upgrade the generally low-quality roads in the coastal corridor from Hua Hin to Chumphon, with such improvements (i) to promote tourism, (ii) to serve local transport demand, and (iii) to link coastal areas in the Lower WSB with the new Chumphon Airport. Regarding the northern portion of this corridor, the December 1992 JICA-assisted *Tourism Development Study on the Hua Hin Cha-Am Beach Area in Thailand* recommended improvement of the "Petchaburi Coastal Road," at a cost of about 63 million Baht (79 million Baht in 1996 values) to increase travel speeds from 20 to 50 km per hour, yielding an economic rate of return of 27.0 per cent. DOH and PWD have various plans to improve the coastal road south of Petchaburi; DOH already has a road under construction from Bang Krud to Bang Saphan in Prachuap Khirikhan province, with plans to continue construction from Bang Saphan to Bang Saphan Noi, then onto Pathiu (the site of the new Chumphon Airport) and Bang Ton Ma Kham, while the section from Bang Ton Ma Kham to Chumphon is under the authority of PWD and to be completed to a Class 4 standard (i.e., pavement width of 6 m) by 1997. More detailed study is required to assess the likely rate of return from improving the corridor to a higher standard. Considering that in at least some sections traffic is relatively low and consists mainly of motorcycles, one approach may be to widen the road in certain town areas in the initial stages, with development to a higher standard (e.g., Class 3) in later years as traffic develops.[3]

RP5: Secondary/Feeder Road Improvements—A project to upgrade secondary and feeder roads in the DOH network has been formulated because the assessment of traffic in the WSB from 1990 to 1994 showed that the greatest rates of traffic growth were found on three- and

---

[1]Average daily traffic of below 300 MVPD.

[2]Average daily traffic of 300-1,000 MVPD.

[3]Another consideration, a consequence of the scenic nature of the road, is that the alignment perhaps should be somewhat circuitous with curves to follow the coastline.

four-digit roads.[1] These roads, important for the region's socioeconomic development, are overcapacity in certain cases and require upgrading based on both engineering and economic considerations, particularly in light of the rapid future traffic growth expected. In formulating this project, the Study Team forecast traffic volumes on all three- and four-digit DOH roads in WSB for which 1994 traffic data was available and compared these forecasts with estimated capacities; the Team identified the road sections and the years for which traffic projections would exceed 14,000 PCU, the warrant for widening to four lanes. In addition to upgrading existing secondary roads, a separate subproject under the RP5 Project would consider the development of new feeder roads where necessary to connect amphoe centers with the recently upgraded Route 4 and/or planned motorways (see Project RP10, North-South Links). Also, secondary and feeder roads required to support the tourism development plan for WSB should be upgraded.

RP6A: Urban Ring/Bypass Roads—As a basic long-term planning proposition, all regional cities within the WSB (e.g., Ratchaburi, Petchaburi, Prachuap Khirikhan) should have ring or bypass roads built by DOH outside of the present and emerging urban core areas.[2] Bypasses eliminate impediments to traffic flow, making for more efficient use of roads. One bypass road that may logically present itself would connect points of Route 4 west of and south of Petchaburi, with one point about 10 km west of the city and another about 10 km south, which would provide good access to the sites under consideration for the proposed Science City.[3] Ring roads increase land development potential and relieve overcrowding by decentralizing city functions, which in turn contributes to upgrading of a city's residential function and the development of business functions in peripheral areas. A successful example of a ring road, within Thailand, is Route 11 around Chiang Mai, which has reduced commuting times and promoted a more desirable urban form.

RP6B: Urban (Municipal) Road Project—While Project RP6A would provide urban ring/bypass roads, Project RP6B would provide more localized road improvements within municipalities in the WSB region; these improvements are accorded high priority in accordance with the strong emphasis on equity and decentralization in the 8th Plan. Particular needs include: (i) the expansion of street networks, to combat the tendency in Thai

[1] 15.5 per cent both in terms of MVPD and of PCU on three-digit roads and 12.3 per cent in terms of PCU and 14.3 per cent in terms of MVPD on four-digit roads.

[2] Many of the regional cities in the WSB have bypass roads in areas that will be required for future urban development.

[3] If the Ban Pong-Cha Am motorway runs through this corridor, as is currently planned, and if it is implemented in a timely manner, then this bypass road may be unnecessary.

regional cities for expansion to take place in the form of ribbon development along the main roads leading out of the cities, which is undesirable since it leads to dangerous, congested traffic conditions; (ii) redevelopment of city center roads in conjunction with land redevelopment; (iii) the planning and restructuring of public transport; and (iv) the development and application of a suitable car parking policy plus selected provision of off-street parking space.[1] Particularly suitable candidates for projects to address these needs in the WSB include Ratchaburi and Petchaburi or Samut Songkhram; Ratchaburi is the most obvious candidate in that the province has the highest motorization rate in the WSB and the fastest motorization growth rate (city data is not readily available); Petchaburi is a candidate as it has the second-highest motorization rate in the region, while Samut Songkhram should be considered because it has the second-highest motorization growth rate and a very inadequate street network. Initiatives in other WSB regional cities (e.g., Chumphon, Kanchanaburi) should follow in due course.

RP7: Rural Road Project—While other proposed road projects would upgrade primary and secondary roads, the RP7 project would upgrade rural roads, i.e., roads at the changwat, amphoe, and tambon level. As shown in Figure 9.5.15, which depicts the results of the latest available comprehensive nationwide rural road inventory analysis, one of the provinces in the WSB (Kanchanaburi) was grouped in the category with the lowest road density, three of the other WSB provinces (Petchaburi, Prachuap Khirikhan, Chumphon) also had significantly lower rural road network densities than the Kingdom average, one province had a rural road density about equal to the Kingdom average (Ratchaburi), and one province (Samut Songkhram) had a rural road density somewhat greater than the Kingdom average.[2] It is beyond the scope of this multisectoral regional study to specify the detail of specific subprojects, but as outlined in the spatial plan, it is expected that at a minimum this would include road links to upland/interior areas in Kanchanaburi and Chumphon provinces, with additional improvements concentrated in Petchaburi and Prachuap Khirikhan provinces, i.e.,

[1] See, e.g., Halcrow Fox and Associates in association with Pak Poy & Kneebone Pty Ltd. and Asian Engineering Consultants Corp. Ltd. and Asian Engineering Consultants Corp., Ltd., *SPURT: Seventh Plan Urban and Regional Transport, Final Report*, March 1991, Chapter 26 [Policy Recommendations for Regional Cities].

[2] While this data is from 16 years ago, it is generally believed to be indicative of relative rural road densities among provinces in 1997; indeed, it has been cited by at least two other JICA-assisted regional planning studies in the 1990s.

the other two WSB provinces with rural road densities less than the national average.[1] Over time, the Rural Road Project will need to focus more on upgrading and maintenance of existing facilities than on the construction of new roads. The Public Works Department reckons that such a transition will occur by around 2002. Finally, the importance of local contributions to rural road projects, both for new construction and maintenance, should be stressed.

RP8: Reinvestment in Existing Roads (e.g., Upgraded Road Maintenance)—While there clearly are gaps in the existing WSB road network where new links may be required due to future travel demand as well as present deficiencies in the network function in certain areas, the existing road network is maturing and therefore requires significant reinvestment, i.e., maintenance, overlays, rehabilitation, and reconstruction. While it is accepted and well-advised practice that maintenance activities and expenditures have "first call" on available financial and logistical resources, a 1992 Asian Development Bank-sponsored technical assistance for the Department of Highways found that DOH has generally underfunded maintenance activities, although the network's condition is actually good to fair, a likely consequence of high investment in rehabilitation and reconstruction compensating for the low level of maintenance.[2] It is well beyond the scope of the current multisectoral regional planning study to specify a detailed road maintenance program for the WSB; however, for DOH roads, a detailed program may be specified based on existing DOH models or the latest version of the World Bank's Highway Design and Maintenance Standards (HDM) model calibrated to Thai conditions, while for rural roads, standard rural road planning methodologies may be applied.[3]

---

[1]Some improvements should also be implemented in the other two WSB provinces, Ratchaburi and Samut Songkhram, with the degree of need the critical criterion for assessing specific projects. A possible methodology for proposing specific subprojects would be to give priority to roads that (i) support other proposed regional development projects (e.g., in the agricultural sector); (ii) serve areas where there is no road within a 5 km radius of the proposed alignment; (iii) function as shortcuts to nearby markets or trunk roads and will perform well within the network for the area; (iv) serve areas with relatively high population densities; and (v) promote exportable crop production and agro-industry production. Further, it must be recognized that the benefit derived from rural road projects may mainly arise from development benefits (i.e., net value added) or producer surplus rather than road-user savings; otherwise many rural road projects will not show sufficiently high economic returns, even though they may effectively promote the social equity objectives of the Eighth Plan.

[2]See PADECO Co., Ltd., *Preparation of an Investment Programme for the Department of Highways, Main Text, Volume I*, Asian Development Bank T.A. No. 1362-THA, p. 8-3, 8-8, July 1992. It should also be noted that underfunded maintenance is an issue with the rural road network under the authority of various agencies; with only limited funds available for recurrent expenditures, rural roads deteriorate rapidly due to traffic and natural causes (e.g., rainfall), with further investment sometimes required every two or three years to upgrade the roadway, which is both impractical and uneconomic.

[3]See, e.g., H.L. Beenhakker and A.M. Lago, *Economic Appraisal of Rural Roads, Simplified Procedures for Screening and Appraisal*, World Bank Staff Working Paper No. 610, 1983.

Interregional

RP9: Outer-Outer Orbital Route for the Extended Bangkok Metropolitan Region—One of the most important projects proposed by the present study is the development of a new highway north of Route 4 to better link the WSB with the Northern, Northeastern, and Eastern Seaboard regions via an "outer-outer" Bangkok orbital route (i.e., ring road).

Two conceptual alignments are shown in Figure 9.5.16:

(i) Option 1, which was first put forward as the 366-km Toll Motorway (TM) 36[1] in the JICA-assisted *Toll Highway Development Study in the Kingdom of Thailand* (1991) and was repeated in a 1993 paper prepared for NESDB's *Metropolitan Regional Structure Planning Study*, would be an outer belt motorway about 50-100 km from Bangkok.

(ii) Option 2 presents an alternative alignment, running more directly in a northeasterly direction from Route 4 to Ayutthaya, and more directly toward Chonburi and the Eastern Seaboard in a southeasterly direction.[2]

Regardless of which option is preferred, the rationale for the such an outer-outer orbital route is as follows:

[1]From Wat Phleng to Bang Pakong.

[2]Relative to Option 1, Option 2 would offer the benefit of somewhat shorter travel distances to the Northeastern and ESB regions, although it would require slightly longer travel distances to the Northern region and perhaps more importantly it would not well serve a number of the medium-sized cities traversed by Option 1 (e.g., Ang Thong, Lop Buri, Saraburi), even though a supplemental Suphan Buri link is part of the proposal; also, part of the Option 2 alignment may be too close to the proposed Outer Bangkok Ring Road.

(i) From an interregional transport perspective, the route would facilitate the more efficient movement of interregional freight traffic with origins and destinations outside of the BMR.[1]

(ii) From a metropolitan development perspective, the route would "activate" a number of medium-size cities with high development potential in the area located about 50-100 km from Bangkok.[2]

Finally, as was noted in Section 5.2.2, DOH has some planned road improvements in the area of the proposed project (in addition to the motorway set out in Option 1); these are mainly smaller in scale than envisaged by the RP9 Project, however.

RP10: North-South Links with the BMA--The main north-south artery in the WSB, Route 4, will have been widened into a four-lane divided highway throughout virtually the entire region by the end of 1997 as part of DOH's Regional Road Improvement Project. In addition, there are a number of proposals to add further capacity in the North-South Corridor in the WSB during the study planning horizon (i.e., until 2011); first and foremost among these are DOH's motorway plans, including Motorway No. 8 (Bangkok-Pak Tho in 2002-06, Pak Tho-Cha Am in 1997-2001, and Cha Am-

[1]Admittedly, a review of the most recent available origin-destination matrix of road freight traffic by region shows that "Bangkok and vicinity" is currently the origin of 45 per cent and the destination of 19 per cent of all road freight transport in Thailand. However, there are still possibilities for better serving interregional freight flows such as those between the WSB and the Northern, Northeastern, and Eastern regions, as shown in the matrix. More importantly, once the road network is developed to better accommodate such interregional movements, significant changes can be expected in this origin-destination matrix; almost certainly, the BMA is reaching its practical limit in terms of its capacity to accommodate all of this traffic. In addition, since most goods movement in the Kingdom pass through the BMR even if neither the origin nor the destination is in the region, the proposed project would seem to offer the prospect of substantially reducing congestion in metropolitan Bangkok. Indeed, one finding of the joint NESDB/UNDP/TDRI *National Urban Development Policy Framework* study, was that "the improvement and construction of road and rail linkages between regional or provincial cities deserves additional attention."

[2]An urban planning study following upon the aforementioned JICA toll motorway study developed a proposal for satellite towns in Ratchaburi (including Ban Pong and Photharam), Nakhon Pathom (including Kamphaeng Saen), Suphan Buri (including Bang Pla Ma), Saraburi (including Kaeng Khoi and Nong Khae), Nakhon Nayok (including Ban Na and Ongkharak), and Chachoengsao (including Suvintawong). Building the proposed road could therefore contribute to the development of these medium-scale centers, while at the same time decentralize activities within an extended Bangkok Metropolitan Region (or EBMR, as termed by the *National Urban Development Policy Framework* study). Option 1 would be particularly well suited for serving this urban development objective.

Chumphon in 2002-06).[1] An important issue, then, is to what extent extra capacity is required in this corridor for the development of the Kingdom and the WSB. An analysis of capacity requirements in the North-South Corridor is presented in Table 9.5.21; among other things, it indicates that the construction of the Ban Pong-Cha Am motorway, now scheduled for completion in 2000 is approximately correct in its timing,[2] but that the development of a motorway from Cha Am to Chumphon in 2002-06 may provide too much capacity in certain sections (e.g., south of Km 364) too soon,[3] although perhaps it could be justified on strategic grounds, assuming adequate funding can be found from the private or public sector.

RP11: Chumphon (Bang Saphan)-Ranong Links[4]—The connection between Chumphon and the bordering province of Ranong is now along Route 4, a winding, two-lane facility running 120 km (compared to a direct distance of about 80 km, implying a route or circuitry factor of 1.5) from the junction of Routes 4 and 401 to Ranong. The RP11 project (see Figure 9.5.17) would improve the connection between Chumphon and Ranong provinces by: (i) widening and improving Route 4 to a four-lane facility, from Chumphon to Ranong and southward toward Phangnga and Krabi;[5] and/or (ii) constructing a new direct link

---

[1]Others include DOH's plan for a "spare highway to the South," with Kanchanaburi-Ratchaburi-Ta Yang and Pranburi-Chumphon sections proposed for 1997-2001. In addition, there are a number of improvements of Route 4 that were recommended by the World Bank-assisted *Long-Term Strategic Study of Highway Planning and Investment*, including widening to dual five-lane in the Nakhon Chaisi-Nakhon Pathom-Ban Pong section (1996-2001), widening to dual three-lane between Ban Pong and Petchaburi (2001-06), widening to dual three-lane between Petchaburi and Cha Am (2006-11), widening to dual three-lane in the Cha Am-Pranburi-Prachuap Khirikhan section (2001-06), and widening to dual three-lane between Prachuap Khirikhan and Chumphon (2006-11); and (iv) construction of a new road linking Nakhon Chaisi, Nakhon Pathom, and Ratchaburi between 2006 and 2011. Further, ETA has proposed a toll expressway in the corridor. This (WSB) Study recommends adoption of the proposal of the Bangkok Regional Structure Plan for the development of only one (initial) motorway route in the southern corridor, with construction by DOH most sensible because of their more advanced planning efforts in this particular corridor, assisted by JICA.

[2]It could perhaps be delayed one or two years, as it would provide capacity not required until 2001 or 2002, at which time it would provide two more lanes than required (and four more in some sections).

[3]One important caveat to this whole analysis, a point often put forward by DOH is that arguably friction effects may be greater for highways with six lanes (i.e., dual three lanes) than for smaller highways because the effects of U-turns, right turns, and intersections cannot be treated as efficiently by auxiliary lanes in these multilane highways due to high arrival rates, which in turn result in less gap acceptances. The Study Team has noted well this thoughtful point, but has finally decided to follow the standard capacity references (i.e., the Highway Capacity Manual of the United States and equivalent United Kingdom documentation), which generally do not allow for a per-lane reduction in capacity for multi-lane roads, but merely adopt a proportional increase for dual three-lane (and wider) roads. A detailed study of this important technical issue under Thai conditions is urged, however, as it has important implications for highway planning throughout the country.

[4]Also subregional when linked with Ranong/Phangnga Port Development (WT9).

[5]Many of these improvements are now programmed.

between a point at around Km 530 of Route 4 (northeast of Kra Buri) and a point near Km 470 of Route 4 (north of Tha Sae), to provide more direct access to points north of Chumphon city, including the industrial estates being developed at Bang Saphan in Prachuap Khirikhan province and Pathiu in Chumphon province. The rationale and ultimate feasibility for all of these improvements hinges upon the development of a significant port in Ranong or Phangnga provinces, which could generate traffic to and from Chumphon (see the description of Project WT9, Ranong/Phangnga Port Development) and from points feeding into Chumphon or Prachuap Port at Bang Saphan via a Gulf of Thailand coastal shipping network (see the description of Project WT5, Gulf of Thailand "Inland Navigation Scheme"). Ongoing developments in Ranong that lend support to this project include a new multipurpose port, an industrial estate, and a new university campus. [1]

Subregional

RP12: Subregional Links with Myanmar—Consistent with the recent trend toward subregional economic cooperation among the countries of the Greater Mekong Subregion, Projects RP12A to RP12C would open up new corridors between Thailand and Myanmar. At present, major crossings between the country include Mae Sod/Tachilek in the north, Mae Sot/Myawaddy in Tak province (north of Kanchanaburi province), and Ranong/Kawthaung (southwest of Chumphon province); the proposed projects would add the following corridors (see Figure 9.5.18): (i) RP12A: Kanchanaburi-Tavoy/Dawei; (ii) RP12B: Kraburi (Route 4)-Marang (Myanmar)-Victoria Point/Kawthaung, which links with a proposed connection to Pathiu (RP11); and (iii) RP12C: Kanchanaburi-Three Pagodas Pass-Moulmein/Mawlamyine. All corridors would be developed in conjunction with corresponding ports; see, e.g., WT8-Tavoy/Dawei Deep-Sea Port Development, WT9-Ranong/Phangnga Port Development. Additional Thai-Myanmar corridors within the general vicinity of the WSB are also possible, e.g., a link to provide access to new hydropower developments in the Tenasserim/Tanintharyi River system on the Myanmar side, a link to connect the WSB with new industrial developments that logically present themselves on the Myanmar side within the context of the country's spatial structure (e.g., agro-industry), a Bang Saphan-Rai Suan Khwan-Tenasserim/Tanintharyi-Myeik/Mergui link, a Bang Saphan-Bokpyin link.

---

[1] It should be noted, however, that while these road improvements are supported by a strong rationale when linked with other proposed projects, traffic on Route 4 in the Route 4/401-Ranong section was only about 2,300 to 5,300 MVPD or 3,330-7,500 PCU per day in 1994, well below the warrants for widening to four lanes (i.e., 8,000 or so MVPD per day or 14,000 PCU per day). This finding is further confirmed by data from the Land Transport Department's annual road freight survey, which suggests that freight moving between the two provinces was virtually nil in 1994.

The rationale for the cross-border links, in general terms, would be to: (i) facilitate exchange and development between and among Thailand and Myanmar in the "twin regions" of the WSB and (Myanmar's) Tenasserim/Tanintharyi Division; (ii) promote the foreign trade of the countries with the rest of the world, particularly with western-situated countries (e.g., in the Indian Subcontinent, the Middle East, Europe); (iii) advance industrial development in both countries; (iv) support rural development and increase earnings of low-income groups, thereby reducing cross-border migration; and (v) promote tourism. The projects are viewed as "win-win" undertakings, i.e., offering net benefits for both countries. The northern corridors (RP12A and RP12C) appear most attractive because they are the closest to Bangkok, the largest metropolitan area in the two countries; in particular, RP12A would provide the shortest distance between Bangkok and the new port, a direct distance of only about 250 km. In addition, there is considerable economic development potential in the northern corridors, with plentiful supplies of electricity and water, well-developed agro-industry, and a beautiful landscape. All corridors, but particularly the RP12A alignment, would provide east-west transport links to supplement Thailand's strong north-south links, and which could be connected with the Bangkok-Phnom Penh-Ho Chi Minh City-Vung Tau Road, the most advanced on the list of priority projects promoted under the Greater Mekong Subregional cooperation scheme. In addition, all corridors offer Myanmar a gateway to Association of Southeast Asian (ASEAN) countries. The corridors are also consistent with Thailand's proposal to establish a Subcontinental Economic Cooperation (SEC) group.[1]

---

[1]The RP12A corridor would follow an existing alignment that runs for 58 km between Tavoy/Dawei and Myitto. For the section between Myitto and Thailand's National Highway 323, two alternative (newly built) routes have been proposed. "Alternative Route 1," which would follow a footpath or cart-road established during World War II, would run east along the Tennasarim/Tanintharyi River, ascend the slope of Mt. Khao Yao and cross the peak of Mt. Bilanktaung in the vicinity of Ban Bong Ti; from Ban Bong Ti, there is an existing low-volume alignment connecting with National Highway 323 that could be upgraded. "Alternative Route 2" would make use of a now-abandoned logging road established by the Thai private sector. It would run north to Kataungni, ascend along the western ridge of Mt. Bilanktaung and cross the mountain peak northwest of Mt. Khao Ro Rae. On the Thai side, the road would lead to Ban Mae Nam Noi, where a bridge crossing would be necessary; from Ban Mae Nam Noi there is an existing low-volume alignment connecting with National Highway 323 that could be upgraded. The RP12B corridor is connected by an existing road between Kraburi and Kawthaung, but substantial upgrading and/or realignment is likely to be required. The RP12C corridor includes an existing three-digit DOH highway (Route 323) in Thailand and a one-lane road from the border to Moulmein/Mawlamyine via the main north-south route in Southern Myanmar (recently upgraded, but still low-grade).

(2) Road Transport Projects

Interregional Projects

RT1: Intercity and Rural Bus Transport Improvement Project—While most problem and issue areas in intercity and rural bus transport must be addressed at the national level (e.g., route administration and licensing) and are therefore beyond the scope of this study, certain issues can be effectively addressed at the regional level and are therefore the focus of the RT1 project. The most important issue to be addressed in this project is the generally inadequate quantity and quality of bus terminals in the region. Table 9.5.22 sets out a summary of the existing situation and terminal improvement plans in the six provinces in the WSB during the period from 1997 to 2001. Figure 9.5.19 presents the perspective of a suitable bus terminal along with possible locations for bus terminal development in Petchaburi, as identified in a 1990 feasibility study but not yet constructed.[1] At least one other intercity bus transport issue that may be addressed on a regional basis includes the construction of bus stopping places along the major routes (i.e., rest areas).

RT2: Truck Terminal Project—Truck terminals in the WSB would be designed to: (i) improve freight transport capacity and operations; (ii) serve as regional centers for receiving, sorting, and delivering general cargo brought from Bangkok (and other regions); (iii) manage the picking up, sorting, and loading of locally manufactured products for shipment to Bangkok (and other regions); and (iv) reduce urban traffic congestion. A truck terminal complex may include: (i) facilities for vehicles (e.g., stopping places, parking area, marshaling yard, gasoline station, repair shop, wash, weighing station); (ii) facilities for freight handling (e.g., temporary storage areas); (iii) facilities for people (e.g., lodging, restaurant, medical clinic); and (iv) data processing facilities (e.g., telephone, fax machine). While the Land Transport Department puts a higher priority on developing truck terminals at sites other than the WSB (e.g., Bangkok, Chiang Mai, Nakhon Ratchasima, Khon Kaen, Nakhon Sawan, Hat Yai), the WSB would seem to offer a number of possible sites for truck

[1]Terminal planning should involve a consideration of the following issues: (i) requirements for local traffic management, pedestrian, and urban service improvements; (ii) site availability and ownership; (iii) methods of land parcel assembly; (iv) impact of choice of site location on bus operating and passenger access costs; (v) the effect of terminals on local land values and development activity including possible integration with the adjacent land use; (vi) the tradeoff between higher land values and greater development benefits and bus operating and passenger access costs; (vii) operational considerations to determine the optimum terminal configuration, e.g., the extent to which rural bus services can be accommodated in or near an intercity bus terminal; (viii) financial considerations; and (ix) implementation strategy. See Pak-Poy & Knecbone Pty Ltd and Asian Engineering Consultants Corp., Ltd., *Study of Inter-City and Rural Bus Transport, Phase II, Final Report*, January 1991, section 9.

terminals, the most suitable at Ban Pong in Ratchaburi Province, which is at the crossroads of east-west highways and railways. LTD officials have suggested that sites in the WSB may become appropriate for development in 5-10 years, at which time they would be developed for implementation in a coordinated manner with the truck terminals to be developed in the Bangkok Metropolitan Area commencing in 1996. The cost of a medium-size regional truck terminal is estimated at about 200 million Baht in 1996 values.[1]

RT3: Road Safety Project—Most road safety problem and issue areas must be addressed at the national level (e.g., road safety administration and coordination, driver training/testing, vehicle regulations/inspection) and are therefore beyond the scope of this study,[2] but certain issues can be effectively addressed at the regional level and are therefore the focus of the RT3 project. These issues include accident "blackspot" (i.e., high accident-location) improvement, road user publicity and campaigns, pedestrian and bicyclist safety, and emergency medical services. For example, a detailed study of accident blackspots should be undertaken and engineering countermeasures recommended and implemented to address the problems found. A list of 26 accident blackspots in the WSB identified by DOH is presented in the attached project profile with information on the number and types of accidents at each location. Of the 26 hazardous locations identified, 19 (73 per cent) were in Chumphon province, five (19 per cent) in Kanchanaburi province, and two (8 per cent) in Prachuap Khirikhan province.

(3) Water Transport Projects

Interregional

WT1: Prachuap Deep-Sea Port Extension Project—A large industrial city is planned for Bang Saphan, including facilities for the iron/steel industry and general industry; indeed, a major deep-sea port has already been developed at Bang Saphan, including a 490 m long main berth 15 m below mean sea level (MSL) and a 245 m long secondary berth 10 m below MSL. Since Bang Saphan appears to be the most suitable site in the WSB for deep-sea port development (see Figure 9.5.20, which presents water depths in the region), Prachuap Port

---

[1]The substantial benefits from regional truck terminals in terms of reducing transport costs and urban traffic congestion are well established in Japan. For example, three years after the development of two major truck terminals in Tokyo, travel by line-haul (i.e., 10-ton) trucks within the Tokyo area decreased by 37 per cent and travel by distribution (i.e., 4-ton) trucks was reduced by 12 per cent.

[2]A World Bank-sponsored study is now underway to prepare a Road Safety Master Plan that will guide road safety activities in Thailand in future years.

is expected to play a major role not only for the development of the Bang Saphan area, but for a larger hinterland including other parts of the WSB region.

The JICA Bang Saphan Study has forecast traffic at Prachuap Port to increase from 2.3 million tons in 1995, to 6.3 million tons in 2001, to 12.7 million tons in 2006, and to 22.8 million tons in 2011 (see Project Profile WT). As noted in Section 5.2.4, the overall annual average traffic growth rates implied by these forecasts are 18.0 per cent between 1995 and 2001, 15.3 per cent between 2001 and 2006, and 12.4 per cent between 2006 and 2011, or 15.4 per cent between 1995 and 2011.

The WT1 project follows the recommendations of the JICA Bang Saphan team, which has put forward a possible port expansion plan to serve the forecast demand by expanding the berths within the existing tightly spaced port configuration. In particular, it has provisionally planned for a required additional berth length of 1,400 m by 2006 and 2,000 m by 2011, to serve steel and general cargo. Development plans for general cargo and bulk berths at Prachuap Port are presented in the attached Project Profile.

WT2: Chumphon Feeder Port[1] Project—The WT2 project would develop a feeder port in the vicinity of Chumphon (Figure 9.5.21), which is emerging as the gateway to southern Thailand. In addition to serving "normal" traffic between Chumphon and the rest of the Southern region (i.e., existing traffic plus growth of this traffic), the new port would also serve new traffic generated by the (Pathiu) industrial estate/free trade zone proposed as part of the WSB study and by opening a new corridor to Ranong (see Road Project RP11, Chumphon-Ranong Links and Water Transport Project WT9, Ranong/Phangnga Port Development).

A 1993 *Feasibility Study for Construction of Chumphon Port*[2] found that, under conditions prevailing at the time, the cost of conventional marine transport between Chumphon and Bangkok would be 4.2 per cent higher than the cost of road transport between those two points, largely a consequence of the longer turnaround time for conventional vessels and the double handling costs. However, the same study found that if a ro-ro (roll-on/roll-off) truck ferry were used to minimize port time, the cost of marine transport would be 23 per cent cheaper than the cost of land transport. Based on this 1993 analysis, there have been two proposals put forward for ro-ro ferry ports in Chumphon, one by the 1993 study and the

[1]Another term for "feeder port," as used in this study, is "coastal port."

[2]Southeast Asia Technology Co., Ltd., *Feasibility Study for Construction of Chumphon Port*, prepared for the Harbour Department, September 1993.

other by the private-sector Khi Dha Group.[1] The 1993 study forecast total freight traffic potential at new Chumphon port to be about 1.6 million tons per year, i.e., 510 trucks per day multiplied by 365 days per year (assuming 8.5 tons per truck, consistent with trucking industry studies); the Khi Dha Group's plan seems consistent with this forecast, as estimated in the discussion of the WT5 project below.[2] A larger port would be possible, however, if a new corridor to Ranong is opened, as discussed earlier; in such case, further study would be required to determine the scale, appropriate location, and functional role of Chumphon port.

WT3 and WT4: Samut Songkhram and Ban Laem Feeder Port Projects---Samut Songkhram provincial authorities have proposed construction of a general cargo port at the mouth of the Mae Klong River capable of receiving vessels up to 5,000 dwt (Project WT3). The (interrelated) objectives of the Samut Songkhram proposal are to reduce the road traffic problem in Bangkok, to promote the Government's general decentralization policy, to lessen congestion at Bangkok's Klong Toey Port and emerging congestion at Laem Chabang Port, and to decentralize gasoline distribution outside of Bangkok. The WT3 project, as conceived in the WSB study, would be accompanied by development of an industrial estate/free trade zone, with roads developed to support the new industrial complex.[3]

Petchaburi provincial authorities have put forward a competing, although less well-defined, proposal for a feeder port at Ban Laem, another existing estaurine port, on the Petchaburi River; this proposal is the WT4 project. Without an industrial estate planned in the area, however, the project has a weaker rationale than the Samut Songkhram proposal. Also, Samut Songkhram is closer to the regional growth center of Ratchaburi than is Ban Laem, an advantage that will be accentuated with the development of an improved Samut Songkhram-Ratchaburi road link (Project RP2).

---

[1]One, made in the original 1993 study, was for a 273 million baht (1996 values) facility at Laem Kho Thian, a site about 1.5 km from Ko Samet, southeast of Chumphon; this site was later rejected as it was found to be in a sensitive, reserved area with significant potential for tourism. The other is at Khao Pho Bae, about 15 km north of Chumphon, which has been put forward by the Khi Dha Group, a Thai private enterprise that has received a license from the Ministry of Transport and Communication to construct facilities and operate ro-ro cargo ferry routes connecting Chumphon with Laem Chabang and Laem Chabang with Samut Sakhon (see Project WT5, Gulf of Thailand "Inland Navigation" Promotion Project). A review of the water depth chart for the Chumphon area (see Figure 9.5.34) suggests that additional sites are likely possible in the various bays located along the shoreline, with particularly suitable sites south of Chumphon.

[2]Economic analysis conducted by the 1993 study indicated an economic rate of return of 18.2 per cent for the proposed ro-ro port (at Laem Kho Thian).

[3]Relative to developing a feeder port at Samut Sakhon, the neighboring province northeast of Samut Songkram and also currently having a small estaurine port, the Samut Songkhram authorities argue that land availability is limited in Samut Sakhon, which is closer to Bangkok.

Based on an examination of the water depth chart for the area (see Figure 9.5.22), the Study Team has concluded that dredging of the channel in any of the three proposed feeder ports discussed above to a depth of 6 m, i.e., that which is required to handle vessels of up to 5,000 dwt, may be cost prohibitive. Dredging the channel for use by smaller vessels may be justified, however (e.g., ro-ro vessels).[1]

WT5: Gulf of Thailand "Inland Navigation" Promotion Project—The WT5 project would establish a coastal shipping network within the Gulf of Thailand, connecting various WSB ports with the emerging deep-sea port at Laem Chabang. The project is consistent with the water transport development strategy of the Eighth Plan "to link inland water transport with the southern and eastern coasts, to promote water transport as one measure to ease traffic congestion in Bangkok and its perimeters and also to promote water transport as part of multimodal transport." In addition, over the longer term the project is expected to prove a boon to the Thai shipping industry, which the Office of the Maritime Promotion Commission has been actively fostering. And while the project is classified as interregional, it could have subregional and global impacts, as Laem Chabang begins to serve as a gateway to Indochina and the rest of the world.

The project has been under consideration by both public and private sector organizations for a number of years; in 1995 the Khi Dha Group obtained a license from the Ministry of Transport and Communications to construct facilities and operate ro-ro cargo ferry services connecting Chumphon with Laem Chabang and Laem Chabang with Samut Sakhon. The stated rationale for Khi Dha's "Siam Sea Link" project is to provide a "Bangkok Bypass" solution, in order to (i) establish in Thailand a proven and efficient transport mode, (ii) provide an alternative to congested and polluted roads and delayed deliveries, (iii) extend the unit load concept and reduce unnecessary handling costs, (iv) reduce the risk of damage to goods in transport, (v) improve the utilization of road vehicles, and (vi) reduce the environmental impacts of road transport. Khi Dha was planning to commence their Siam Sea Link operation in April 1997, first using Bang Saphan rather than Chumphon, to take advantage of existing facilities at the former location. The

[1]Indeed, the Harbour Department already plans to dredge the Samut Sakhon channel to a depth of 5 m by 1997 to facilitate the proposed Samut Sakhon-Laem Chabang ro-ro ferry service to be operated by the Khi Dha Group (see Project WT5, Gulf of Thailand "Inland Navigation" Promotion Project); a similar strategy could be adopted at Samut Songkhram.

Project proposed here would build upon the initial Siam Sea Link operation to establish a full-scale coastal shipping network in the Gulf of Thailand.[1]

WT6: Mae Klong River Navigation Project--The WT6 Project, drawing upon a proposal first made in 1988 by the *Study for the Improvement of Inland Waterways*,[2] would allow year-round navigability up to potential future transshipment points upstream of Ratchaburi for sugar and molasses from mills near Ban Pong and gravel and sand near the Wachira Longkon Dam. Sugar and molasses would be transported in 700 dwt barges from the Mae Klong River directly to the sugar terminal at Laem Chabang instead of moving by truck to Bangkok. Construction materials such as sand and gravel would sail to Bangkok.

The project area would take in the Mae Klong River from the estuary at Samut Songkhram to Kanchanaburi, a distance of 136 km, which may be divided into two stretches: (i) the 42 km long lower Mae Klong River stretch from the estuary to Ratchaburi and (ii) the 94 km long upper Mae Klong River stretch from Ratchaburi to the Wachira Longkon dam (81 km) and then on to Kanchanaburi (13 km). The proposal as put forward by the *Study for the Improvement of Inland Waterways* involves two methods of improving the river for three depth scenarios: (i) 1.70 m for a 700 dwt barge loaded to 320 tons; (ii) 2.80 m for a 700 dwt barge loaded to 615 tons; and (iii) 3.20 m for a 700 dwt barge loaded to capacity. In addition, the proposal includes a port 10 km south of Ban Pong (i.e., the limit of the river free flow improvement zone), with two loading platforms to allow sugar mills load barges en route to the sugar terminal at Laem Chabang. Although not considered by the 1988 consultants, port development at Ratchaburi would seem to warrant consideration, given the high volumes of bulk traffic generated by this province.[3]

---

[1] As was noted in the discussion of the WT3 project, this advantage could be significant provided that dredging of the Samut Songkhram channel to at least -4.0 m and preferably to -5.0 m were economically feasible.

[2] See BCEOM, DECONS, KEC, and CNR, *Study for Improvement of Inland Waterways, Final Report*, prepared for the Harbour Department, May 1988.

[3] The consultants undertaking the *Study for the Improvement of Inland Waterways* estimated an economic rate of return of 15.0 per cent for their proposal for the Mae Klong River improvements, with benefits generated by cost savings in the transport of bulk cargo. However, they recommended waiting until establishment of a sugar terminal at Laem Chabang, as about two-thirds of the river traffic was expected to involve sugar; they also recommended a staged approach, beginning with the free flow improvements up to Ban Pong. A new detailed assessment of this proposal is expected in the ongoing15-month *Study of the Mae Klong and Tha Chin Rivers* executed by the Harbour Department. With the establishment of a sugar terminal at Laem Chabang, improving navigation along the Mae Klong River may now be economically viable; one concern is the likely future sugar traffic generated in the river hinterland, forecast by the 1988 consultants to increase by 1.7 per cent per year from 1990 to 2015, but forecast by the current Study Team's Agricultural Specialist to decrease by about three per cent per year.

WT7: Hua Hin Cha Am Tourist Pier Project—The WT7 project would improve tourist piers in Petchaburi (Chao Sam Ran, Thawisuk), Cha Am, Hua Hin, Pranburi, and Prachuap Khirikhan at an estimated cost of 65 million baht in 1996 values. The December 1992 JICA-assisted *Tourism Development Study on the Hua Hin/Cha-Am Beach Area in Thailand* noted that eight different sea transport routes for tourism purposes had been planned. Improved tourist piers will help promote the implementation of such routes as well as serving as a starting point for boat trips. The *Hua Hin Cha-Am Study* forecast the modal share of sea transport to the region increasing from nil to 2.2-4.4 per cent after implementation of such a service, with the former share for Cha Am and the latter for Hua Hin. One caveat here is the reputed dislike by Thai people of travel by sea.

Subregional/Global

WT8: Tavoy/Dawei Deep-Sea Port—Linked with Project RP12A, the Kanchanaburi-Tavoy/Dawei Link, the development of a deep-sea port at Tavoy/Dawei would provide an integrated east-west transport corridor in the Upper WSB and its "twin region" in Myanmar. The rationale and objectives of the project are similar to those set out in the discussion of the RP12A project, e.g., facilitate exchange and development between and among Thailand and Myanmar in the "twin regions" of the WSB and (Myanmar's) Tenasserim/Tanintharyi Division, promote the foreign trade of the countries with the rest of the world, particularly with western-situated countries (e.g., Indian Subcontinent, the Middle East, Europe), and advance industrial development in both countries.[1]

Considering the role of Tavoy/Dawei port as a facility for transshipment for Thailand, as an industrial port associated with industrial activities in the region, and as a regional port supporting developing in Lower Myanmar (i.e., the country's "WSB"), and considering the time likely required for port traffic to develop, a staged approach to port development is recommended, with port extensions to be implemented as warranted by

[1]From the point of view of Myanmar, the Tavoy/Dawei Deep-Sea Port Project would also have the benefit of providing the country with its first deep-sea port. The country's largest port, at Rangoon/Yangon, is a river port that recently reached its practical capacity of five million tons, with annual traffic growth rates in the order of 25-30 per cent. There is now a project underway to develop additional capacity at Thilawa, about 10 km downstream of Yangon, but this too is unlikely to be sufficient to serve the country's growing foreign trade requirements. The Government is considering developing a deep-sea port at Kyaukpyu, on Rambyie Island off the Arakan/Rakhine Coast, which offers an excellent site for a deep-sea port but which is isolated from central Myanmar by poor transport links although the Government has been actively working to remedy the situation. The hinterland of the proposed Tavoy/Dawei Deep-Sea Port Project would generally be quite different than that of a Kyaukpyu Deep-Sea Port, however, as the latter port would be located about 350 km northwest from Yangon (air distance).

traffic growth. The initial stage facilities would include: (i) one 260 m multipurpose berth for 40,000 dwt vessels, (ii) two secondary berths totaling 260 m for 5,000 dwt vessels, (iii) a small-craft basin, (iv) a 30,000 m^2 open-stage yard, (v) 5,000 m^2 of multipurpose shed, and (vi) other basic facilities/utilities (e.g., an operation building). As port demand builds up with the expected development of the Myanmar economy, additional berth space of about 3,300 m will be required, assuming port capacity of 10 million tons per year and a berth production rate of 3,000 tons/year/meter.

While any forecast of future cross-border traffic would be highly speculative, the potential of such traffic in the future is considerable. The preliminary study forecast port demand of the order of 7.0-13.0 million tons per year,[1] with most of this demand involving cross-border traffic of industrial goods or products from the Upper WSB and Bangkok.

WT9: Ranong/Phangnga Port Development—The rationale underlying the WT9 project is the need for a high-volume port north of Phuket[2] in order to serve seaborne cargo demand to western-situated countries and, possibly, to serve as the western terminus of a land bridge across the Isthmus of Thailand if Krabi is deemed inappropriate for environmental or other reasons. The Harbour Department already has formulated a plan to develop a 973 million Baht, two-berth coastal port at Ranong capable of serving vessels up to 5,000 dwt; the port, to include both cargo and passenger terminals, is located about 8 km north of Ranong opposite Ko Song Tai, an island of interest to tourists. While the planned coastal port development in Ranong appears suitably sized to serve likely demand in the near future, with a strengthened land link between Chumphon and Ranong (Project RP11) and the development of a coastal shipping network in the Gulf of Thailand (Project WT5), there may be merit to building a deep-sea port in the Ranong/Phangnga area, particularly if the western port were connected with a new deep-sea port at Khanom on the east coast in Nakhon Si Thammarat province.

---

[1] In addition to the 5.0-10.0 tons of throughput estimated for the Tavoy/Dawei Industrial Complex and the 1.0 million tons estimated for traffic diversion from the existing Bangkok Port, 1.0-2.0 million tons of throughput would be locally generated in Myanmar's Tanintharyi Division.

[2] See Norconsult International A.S., *Formulation of a Spatial Development Framework for Thailand, Presentation Booklet for Seminar*, April 3, 1996.

(4) Railway Projects

Interregional

RW1: Improvement of the Southern Main Line—The RW1 project would upgrade SRT's Southern Line, the principal existing railway line in the WSB, in order to reduce transport costs and improve the railway link to the BMA in the north, and the Southern region, Malaysia, and Singapore to the south. Both short- and long-term components are envisaged. The short-term component incorporates the planned railway improvements for the region in the Eighth Plan period (i.e., 1997-2001), which are noted in Section 5.2.4 (e.g., 25 km of double tracking in Chumphon province, some bridge work, turnout replacement). The long-term component would be determined based upon an assessment of a number of recent proposals (e.g., the *High Speed Train Study*, which considered three high-speed rail alternatives for the Southern Corridor; the ESCAP *Report on the Development of the Trans-Asian Railway in the Indochina and Asean Subregion*; the proposal that emerged at the March 1996 Asia-Europe Meeting to study a high-speed railway linking Singapore, Malaysia, and Thailand). The Study Team also suggests consideration of the possibility of establishing Inland Clearance Depots (ICDs) at Ban Pong and Chumphon (also see Project RW5, Freight Transport Improvement), which should be considered along with the other medium- and long-term components.

The RW1 project is listed as interregional but it has subregional elements to the extent that traffic to and from Malaysia is promoted. Therefore, any infrastructure investments in the line should be accompanied by measures to address non-physical barriers to cross-border rail transport (again, see also the RW5 project).

RW2—Completion of Missing Link to Connect the Southern Line with the Northern and Northeastern Lines and RW3—Bangkok-Samut Songkhram-Pak Tho Link—The rationale behind both the RW2 and RW3 projects is to improve the profitability of branch lines by connecting them at both ends to main lines.[1] The RW2 project would provide a missing link between Suphan Buri, the terminus of the Nong Pla Duk-Suphan Buri Line (which is linked to the Southern Line), and the Northern Line, which traverses Lop Buri, as well as the Northeastern Line, which may be reached via Saraburi. The RW3 project would extend the Wong Wien Yai-Mae Klong Line at both ends to provide a direct link among Bangkok, Samut Songkhram, and Pak Tho; major elements of the project would include links between

[1] Another project that has been suggested by SRT officers but is not put forward here is a link between the Southern Line at Prachuap Khirikhan and the Nong Pla Duk Line at Kanchanaburi.

Thonburi and Bangkok (including a bridge over the Chao Phraya River), bridges over the Tha Chin and Mae Klong Rivers, and new track between Samut Songkhram and Pak Tho. As part of the Wong Wien Yai-Mae Klong Line is to be incorporated in the Hopewell urban transport project in the Bangkok area, certain legal issues might have to be resolved before implementation of the RW3 project. The two projects have been put forward previously by SRT as an alternative to abandonment of branch lines; the RW3 project, probably the less feasible of the two (because of the high construction costs), was first studied in 1971 in a Japanese-sponsored study that found the alternative of double tracking from Bang Sue to Nakhon Pathom (now under construction) more viable. However, a variant of the RW3 project focusing on upgrading of the existing link between Samut Songkhram and Samut Sakhon may be worth considering, as a private-sector concern is considering an investment to improve the line between Thonburi (Bangkok) and Samut Sakhon.

RW4: Development of Spur or Long Loop Lines to Major Industrial Estates—The RW4 project would develop spur lines[1] or long loop lines serving major industrial sites in the region for the loading of bulk freight. Candidates sites to be served would include Bang Saphan and Chumphon. Consider, for example, that the JICA Bang Saphan team has forecast railway cargo traffic generated by the Bang Saphan complex to reach 0.25-0.40 million tons by 2004 and 1.16-1.22 million tons by 2010, i.e., 6.5-8.0 per cent and 13.4-13.6 per cent of the land traffic generated in 2005 and 2010, respectively. While this forecast is likely below the traffic density required to justify construction of a spur or long loop line (in the range of 2-3 million tons per year), it is likely that more traffic would move by rail if such a line were constructed.

RW5: Freight Transport Improvement—The RW5 Project calls for a number of related measures to upgrade freight transport in the WSB in order to increase rail's market share. These measures, targeted with an understanding of the kind of traffic suited for rail (e.g., bulk commodity haulage; trunk distribution of containerized cargoes, especially to and from ports), include: (i) a more modernized approach to intermodal transport; (ii) aggressive responses to specific opportunities (e.g., the transport of paper chips to a mill in Kanchanaburi); (iii) procurement of new locomotives and wagons (i.e., freight cars), to alleviate the chronic motive power and rolling stock shortages; (iv) upgraded container handling capacity (e.g., through ICD development) and improved rail access to container areas and stacking areas at ports; (v) the undertaking of a detailed study of the relative costs and benefits of investing in low-profile container wagons as an alternative to expanding the

[1] Also referred to as stub tracks, short branch tracks, or industrial sidings.

dimensions of critical structures in order to accommodate super high-cube container wagons; and (vi) facilitation measures for cross-border rail transport.

RW6: Tourist Train to Hua Hin/Cha Am—The RW6 project would involve establishing a Bangkok-Hua Hin/Cha Am tourist train similar to the existing weekly (Sunday) tourist train service between Bangkok and Kanchanaburi. The JICA-assisted *Tourism Development Study on the Hua Hin/Cha Am Beach Area in Thailand* (1992) also recommended such a project noting the benefits of providing increased public transportation capacity and offering a new type of service making traveling by train more attractive for tourists visiting the area. The time schedule for the Bangkok-Hua Hin/Cha-Am run would have to be revised to allow introduction of the new service. Estimated project cost is 150 million baht (in 1996 values), with private-sector participation possible, as in the case of a Bangkok-Kanchanaburi service, which was to be added to the luxury Eastern and Oriental Express route in January 1997. However, the project has become increasingly difficult to justify with the upgrading of the competing highway route to Hua Hin/Cha Am in recent years.

Subregional

RW7: Thailand-Myanmar Railway Project—The Thai and Myanmar railway systems were briefly connected by the Japanese during World War II, and a number of proposals have been put forward since then to reconnect the two systems, most recently in the Asian Development Bank-sponsored *Subregional Transport Sector Study*. In the WSB project area and neighboring provinces these proposals include: (i) restoring the original construction between the countries, following the Kwai Noi River before crossing into Myanmar at Three Pagodas Pass; (ii) a 196 km link between Phitsanalouk and Mae Sod; and (iii) a 377 km link between Suphan Buri and Mae Sod.[1] One virtue of the RW7 project would be its provision of a missing link of the Trans-Asian Railway; also it is part of one of the Singapore-Kunming rail links agreed to be studied at a recent ASEAN meeting. However, construction of such a new line should not proceed until after rationalization of the operations of SRT and Myanma Railways and an improvement in railway finances. Also, it would be necessary for the two regional railway administrations to agree on interchange

[1]The first-named option suffers from obstacles posed by the Kao Lam Dam on the Thai side and the lack of a connection to Myanmar on the Thai side. The second- and third-named options were studied in 1972 by the Overseas Technical Cooperation Agency of Japan (JICA's predecessor), which found that the Suphan Buri-Mae Sod link was economically more advantageous since it would pass through areas that were then and to some degree are still undeveloped and rich in resources. Both the second and third options would require extension to connect with the Myanmar railway system, probably at Myaingalay, 24 km from Thaton; the section between Myaingalay and Mae Sod would be difficult as it would entail two tunnels (11.8 km and 14.6 km) on the Thai side of the border and a 2.5 km crossing of the Thanlwin River at Pa'an in Myanmar.

standards (e.g., axle loading, method of payment for the use of railway cars of another railway administration).

(5) Air Transport Projects

Interregional

AT1: Aggressive Marketing of Chumphon (Pathiu) Airport—As noted previously, the Department of Aviation has been developing a new Chumphon (Pathiu) Airport, which will be opened in 1997. One indication of the level of demand that could be expected on the Bangkok-Chumphon air route, at least initially, is from the positive experience of the service between Bangkok and Ranong, initiated in October 1995. After achieving an occupancy rate of 100 per cent on flights three times a week, Bangkok Airways instituted daily service on the route, with occupancies in mid-1996 100 per cent during the weekends and 65-70 per cent on weekdays; in addition, air freight demand on the Bangkok-Ranong route exceeds capacity, with fish and shrimp from the Andaman Sea the most important commodities carried, to destinations in Bangkok and Japan.

The proposed project would involve aggressive marketing of the new airport in order to maximize its use and thereby promote the economic development of the Lower WSB, from Bang Saphan to Lang Suan. Figure 9.5.23 presents a conceptual plan of the market for the new Chumphon (Pathiu) Airport, which would involve serving (i) air passenger and freight demand[1] from new free trade zones in Bang Saphan and Pathiu, (ii) air freight demand for high-value perishable agricultural products (e.g., fruit, flowers), and (iii) tourism demand, which is expected to increase rapidly in this emerging tourist destination.[2] Improvement of road links to Route 4 and Bang Saphan (RP3) will be important for success of the AT1 project, however.

---

[1]Certain relatively inexpensive improvements to the airport may be required to better serve freight.

[2]The potential of a new airport to open up markets for certain exports with high value/weight ratios and which can be produced advantageously as a consequence of various factors, such as climate and resource availability, has been well-demonstrated elsewhere in Asia, e.g., in the southern Philippine island of Mindanao, which developed a 20 per cent share of the Japanese asparagus market after the opening of a new airport. Also worth noting is this study's forecast of national annual growth rates in air freight, 30 per cent until 2001 and the 20 per cent until 2011 (see Section 5.2.5). Regarding tourism demand, if Bangkok Airways operates the route, they could market a "triangle" diving package, involving a circuit of diving sites off of Chumphon, a boat connection to Ko Tao, and then an onward boat connection to Ko Samui, which Bangkok Airways serves with 12 flights daily.

AT2: Expansion of Hua Hin Airport—The constraints of the Hua Hin Airport are well known and were enumerated in section 5.2.5 (e.g., a relatively short asphaltic concrete runway, 1200 m x 30 m, suitable only for ATR 72 class aircraft (62-seat capacity) with reduced payloads). In view of these constraints, the JICA-assisted *Tourism Development Study on the Hua Hin/Cha-Am Beach Area in Thailand* (1992) proposed an "Airport and Air Transportation Service Improvement" Project, which would involve extending the existing runway at Hua Hin in order to allow the use of larger aircraft, or presumably at least heavier payloads with existing aircraft.[1] This project is strongly supported by Bangkok Airways, which notes several marketing opportunities that they must forego until the runway is extended (e.g., promoting their Bangkok-Hua Hin route among Scandinavian, English, and German tour operators, which provide most of the current traffic; promoting golf packages in the Singaporean market).

The project may be a difficult one to realize, however. As noted in Section 5.2.5, the total number of passengers at Hua Hin Airport peaked in 1992 at 19,233, then decreased by 15.3 per cent to 16,283 in 1993, and by 31.2 per cent to 11,209 in 1994; the modal share of air transport for visitors to Cha Am and Hua Hin is less than one per cent. In addition, the cost of the project, estimated by the 1992 JICA study as only 12 million Baht, has now been estimated at one billion Baht in a preliminary internal study conducted by the Department of Aviation; such a high cost was estimated because extension of the runway may require relocation of Route 4 and perhaps also of SRT's Southern Line.[2]

AT3: Expansion of Ratchaburi Airport—The Thai Aerospace Corporation has proposed expanding their Ratchaburi Airport ("The Eagle Airpark") by, among other things, extending the runway from 1,400 m to 2,800 m to accommodate larger aircraft. Their vision of the future of Ratchaburi Airport includes: (i) air freight distribution, (ii) a light aircraft maintenance center, (iii) an enhanced aviation education and training center, and (iv) ultimately, if possible, an additional airport for Bangkok linked by high-speed rail to Bangkok Noi station. While the last-named element appears unlikely given the airport's distance from Bangkok (i.e., about 90 km by road, or longer than any existing airport in the world from the city center), the other "niche" markets could be productively pursued, perhaps within the existing runway configuration.

---

[1]The 1992 study also indicated that the military airport in Prachuap Khirikhan was expected to be used for civil aviation in the longer run. Investigations by the Study Team for the current project found that such use is unlikely.

[2]In addition, the proposed Ban Pong-Cha Am motorway, now in the detailed design stage, will when completed make the road transport option even more competitive.

Subregional

AT4: Subregional Air Linkage Agreement—In 1994 the Asian Development Bank-sponsored *Subregional Transport Sector Study* put forward a Project to Establish New Subregional Routes, which was followed by a suggestion by the Thai delegation at the Inception Meeting of the Subregional Transport Forum in 1995 to establish a Working Group on Air Linkages, with the first meeting of the Working Group held in August 1996.[1] Although the priority routes to be considered are not within the WSB (e.g., Bangkok-Luang Prabang, Bangkok-Siem Reap, Chiang Mai-Jinghong), over time there may be a possibility of expanding demand for WSB airports (e.g., Chumphon/Pathiu) though subregional linkages. A related activity is Bangkok Airways' proposal for a meeting of the region's secondary carriers to discuss growth opportunities in the growing tourism industry in the region.

5.4 Preliminary Prioritization of the Proposed Projects and Implementation Phasing

Table 9.5.23 assigns priorities to the various transport projects on a preliminary basis along with broad indications of implementation phasing by five-year planning period; more detailed implementation schedules are provided for the projects for which an elaborated Project Profile has been prepared and annexed in Appendix II. The table presents the projects by subsector (e.g., road, water transport) and geographic impact (e.g., intraregional, interregional). The "remarks" section included in the table provides a justification of the priority assigned to each project.

Key points regarding the assigning of priorities are set out below:

(i) The extent to which the projects contribute to the transport development strategies presented in Section 5.3.1 (e.g., reducing total distribution costs, assisting development projects in other sectors) was considered in broad terms along with the results of the project assessments undertaken in Section 5.3.3, which considered traffic potential, engineering considerations, social factors, and economic rates of return, among other factors. Projects deemed especially important for strategic reasons (e.g., the projects related to the Tavoy/Dawei Corridor, the outer-outer orbital route for the extended BMR)

[1]Also, the Asian Development Bank sponsored *Indonesia-Malaysia-Thailand Growth Triangle Development Project* in 1995 called for an air linkage agreement in that subregion.

were accorded high priority, a practice consistent with the nature of a long-term regional planning study.

(ii) The interrelationships between and among projects within the transport sector was taken into account both for assigning priorities and phasing. Thus, for example, the prioritization and timing of the Kanchanaburi-Tavoy/Dawei Link (RP12A and RP2) and Dawei/Tavoy Deep-Sea Port Development (WT8) were made consistent with each other, as was the prioritization of Chumphon-Ranong Links (RP11) and Ranong/Phangnga Port Development (WT9).

(iii) Prefeasibility and feasibility studies are necessary before implementation, even for the projects assigned a high priority.

(iv) Generally, high-priority projects are to be implemented during the first five-year planning period (1997-2001), medium-priority projects are to be implemented during the second five-year planning period (2002-06), and low-priority projects are to be implemented during the third five-year planning period (2007-11) or beyond (as shown in the table). Certain projects are to be implemented in more than one planning period, because they may start in the middle of a planning period and require a few years or more to implement, because they are of a continuing nature (e.g., the rural road project, reinvestment in existing roads), or because it may be appropriate to implement certain subprojects before others (e.g., as in the case of the Hua Hin-Prachuap Khirikhan-Chumphon Scenic Road, in which the Petchaburi Coastal Road element shows a economic high rate of return).

(v) All priorities are subject to confirmation by national and provincial officials.

A high priority was assigned to 12 (32 per cent) of the projects, a medium priority to 15 projects (39 per cent), and a low priority to 11 projects (29 per cent). Of the 12 high-priority projects, eight are in the road subsector, one in the road transport subsector, and three in the water transport subsector; as road and water transport are the subsectors with the greatest potential to shape future development, the result is not surprising. Rail transport faces a declining modal share in the WSB, and the region's unique geography limits the potential for air transport development; these modes should not be neglected, however. Also, of the 12 high-priority projects, six are intraregional, four are interregional, and two are subregional, indicating a strong emphasis on serving the demands for improved accessibility within the

region, but also considering the need to serve regional exports and imports, both international and domestic (i.e., from the WSB to other regions of Thailand).

The 12 high-priority projects, all of which should be considered for implementation (e.g., feasibility study, construction) during the Eighth Plan period (i.e., 1997-2001),[1] are listed below:

RP1 Roads to Support Specific Industrial Developments;
RP3 Pathiu-Route 4 and Pathiu-Bang Saphan Links;
RP5 Secondary/Feeder Road Improvements;
RP6B Urban (Municipal) Road Project;
RP7 Rural Road Project;
RP8 Reinvestment in Existing Roads (e.g., Upgraded Road Maintenance);
RP9 Outer-Outer Orbital Route for the Extended Bangkok Metropolitan Region;
RP11 Kanchanaburi-Tavoy/Dawei Link;
RT3 Road Safety Project
WT1 Prachuap Deep-Sea Port Extension Project;
WT5 Gulf of Thailand "Inland Navigation" Promotion Project; and
WT8 Tavoy/Dawei Deep-Sea Port Development.

In addition, at least components of the following three projects should be considered for implementation during the Eighth Plan period, although they were ranked only medium in priority:

RP9 North-South Links with the BMA (certain components only);
RT1 Intercity and Rural Bus Transport Improvement Project; and
WT2 Chumphon Feeder Port Project.

After considering these priorities along with comments made by national and provincial officials, the Study Team selected the following projects for more detailed study, including preparation of a more detailed project plan and estimation of costs, as presented in Appendix H:

RP5 Secondary/Feeder Road Improvements;
RP6B Urban/Municipal Road Project;

[1] A more detailed scheduling of these high-priority projects, based on budgetary and intersectoral assessments, is expected later in this Study.

RP9/RT2/RW5	Integrated Transport and Land Use Development in the Corridor between Ban Pong and Ayutthaya/Lop Buri in the Extended Bangkok Metropolitan Region;
RT3	Road Safety Project;
WT1	Prachuap Deep-Sea Port Extension Project;
WT5	Gulf of Thailand Inland Navigation Project; and
RP12A/WT8	Kanchanaburi-Tavoy/Dawei Link and Tavoy/Dawei Deep-Sea Port Project [Thailand-Myanmar Transport Corridor Project].

The longest of the more detailed Project Profiles was prepared for the RP9/RT2/RW5 projects, as this is deemed a particularly high-priority initiative by the Study Team.

Table 9.5.1 Inventory of Roads in the Western Seaboard
(Selected Roads from DOH Road Database)

Route	From	To	No. of Lanes	Functional Class	Left Shoulder		Surface				Base		Sub-base		Right Shoulder	
					Width (m)	Type	Width (m)	Type	Thick (mm)	Year	Type	Thick (mm)	Type	Thick (mm)	Width (m)	Type
4	83+700	84+112	3	D	-	-	6.5	AC	50	1991	CR	200	SA	150	-	-
4	83+700	84+112	3	D	-	-	6.5	AC	50	1991	CR	200	SA	150	-	-
4	776+160	776+660	2	4	1.5		6	ST	10		CR	150	SA	200	1.5	
4	148+778	169+900	2	2	2.25		6.5	AC	80		CR	200	SA	200	2.25	
4	106+652	148+778	2	2	2.25		6.5	AC	80		CR	200	SA	200	2.25	
4	163+334	164+320	2	D	2.5	0	7	AC	50		CR	200	SA	150	1.5	
4	163+334	164+320	2	D	1.5	0	7	AC	50		CR	200	SA	150	2.5	
4	169+120	170+717	2	1	2.5	0	7	AC	50		CR	150	SA	150	2.5	
4	170+717	182+900	2	D	2.5	0	7	AC	50	1993	CR	200	SA	150	1.5	
4	170+717	182+900	2	D	1.5	0	7	AC	50	1993	CR	200	SA	150	2.5	
4	182+900	189+0	4	D	2.5	0	14.7	AC	50	1984	CR	150	SA	150	1.5	
4	182+900	189+0	4	D	1.5	0	14.7	AC	50	1984	CR	150	SA	150	2.5	
4	189+0	201+0	2	D	2.5	0	7	AC	50	1984	CR	150	SA	150	1.5	
4	189+0	201+0	2	D	1.5	0	7	AC	50	1984	CR	150	SA	150	2.5	
4	201+0	205+700	2	D	2.5	0	7	AC	50	1984	CR	150	SA	150	1.5	
4	201+0	205+700	2	D	1.5	0	7	AC	80	1993	CR	150	SA	150	2.5	
4	206+500	234+961	2	2	2.25	0	6.5	AC	50	1992	CR	150	SA	150	2.25	
4	234+961	255+0	2	2	2.25	0	6.5	AC	50	1992	CR	150	SA	150	2.25	
4	255+0	256+157	4	D	3.4	0	13	AC	50	1977	CR	150	SA	150	3.4	
4	256+157	257+10	4	D	3.4	0	13	AC	50	1977	CR	150	SA	150	3.4	
4	257+10	292+700	2	2	2.25	0	6.5	AC	50	1981	CR	150	SA	150	2.25	
4	292+700	293+102	4	D	2.25	0	13	AC	50	1981	CR	150	SA	150	2.25	
4	293+102	293+700	4	D	2.25	0	13	AC	50	1981	CR	150	SA	150	2.25	
4	293+700	297+0	2	2	2.25	0	6.5	AC	50	1981	CR	150	SA	150	2.25	
4	297+0	322+950	2	1	2.25	0	6.5	AC	0	0	CR	0	SA	150	2.25	
4	322+950	363+745	2	1	2.25	0	6.5	AC	0	0	CR	0	SA	0	2.25	
4	363+845	364+486	2	1	2.25	0	6.5	PM	0	0	CR	0	SA	0	2.25	
4	364+486	398+500	2	1	2.25	0	6.5	AC	0	0	CR	0	SA	0	2.25	
4	398+500	423+600	2	1	2.25	0	6.5	AC	0	0	CR	0	SA	0	2.25	
4	423+600	450+89	2	1	2.25	0	6.5	AC	0	0	CR	0	SA	0	2.25	
4	450+89	476+605	2	1	2.25	0	6.5	AC	0	0	CR	0	SA	0	2.25	
4	476+605	499+330	2	1	2.25	0	6.5	AC	0	0	CR	0	SA	0	2.25	
4	499+330	525+462	2	1	2.25	UP	6.5	AC	0	0	CR	0	SA	0	2.25	UP
4	525+462	526+0	2	1	2.25	UP	6.5	AC	0	0	CR	0	SA	0	2.25	UP
4	80+245	86+709	2	D	2.5	AC	7	AC	70	0	CR	150	SA	150	1.5	AC
4	80+413	86+877	2	D	1.5	AC	7	AC	100	1989	CR	200	SA	200	2.5	AC
4	86+709	89+901	2	D	2.5	AC	7	AC	7	1989	CR	150	SA	150	1.5	AC
4	86+877	90+69	2	D	2.5	AC	7	AC	70	1989	CR	200	SA	200	2.5	AC
4	89+901	99+975	2	D	2.5	AC	7	AC	70	1989	CR	150	SA	150	1.5	AC
4	90+69	99+848	2	D	1.5	AC	7	AC	100	1989	CR	200	SA	200	2.5	AC
4	93+930	106+189	2	3	2	UP	6	PM	60	0	AT	150	SA	150	2	UP
4	99+975	101+205	2	D	2.5	AC	7	AC	70	1989	CR	150	SA	150	1.5	AC
4	99+848	101+197	2	D	1.5	AC	7	AC	100	1989	CR	200	SA	200	2.5	AC
4	101+205	106+400	2	D	2.5	AC	7	AC	70	1989	CR	150	SA	150	1.5	AC
4	101+197	104+706	2	D	1.5	AC	7	AC	100	1989	CR	200	SA	200	2.58	AC
4	107+427	107+861	2	3	2	UP	6	PM	60	0	AT	150	SA	150	2	UP
	112+0	113+26														
4	113+26	114+0	2	1	2.5	AC	7	AC	70	1989	CR	150	SA	150	2.5	AC
4	76+269	79+845	2	0	2.5	0	7	AC	0	1955	CR	200	SA	200	2.5	
4	76+269	79+845	2	0	2.5	0	7	AC	0	1955	CR	200	SA	200	2.5	
41	0+0	34+560	2	1	2.5	0	7	AC	0	0	ST	0	SA	0	2.5	
41	34+500	66+200	2	1	2.5	0	7	AC	0	0	ST	0	SA	0	2.5	
323	72+180	76+726	2	0	2.5	0	7	AC	0	1981	CR	300	SA	300	2.5	
323	72+180	76+726	2	0	2.5	0	7	AC	0	1981	CR	300	SA	300	2.5	
323	76+726	79+922	2	0	2	0	7	AC	0	1979	CR	300	SA	300	2	
323	76+726	79+922	2	0	2	0	7	AC	0	1979	CR	300	SA	300	2	
323	79+922	100+927	4	0	200	0	15	AC	0	1979	RC	300	SA	300	2	
323	81+710	82+25	2	0	150	0	6	PM	0	0	AB	0	AC	0	1.5	
323	96+400	100+655	2	0	200	0	7	AC	500	0	AC	500	RC	200	2	
323	100+927	116+0	2	0	250	0	7	AC	0	1981	CR	300	SA	150	2.5	
323	100+927	116+0	2	0	250	0	7	AC	0	1981	CR	300	SA	150	2.5	
323	100+655	117+800	2	0	200	0	7	AC	500	0	CR	200	CR	150	2	
325	0+0	15+0	2	3	2	UP	6	PM	70	0	AT	150	SA	250	2	UP
325	15+0	20+124	2	3	2	UP	6	AC	70	0	AT	150	SA	250	2	UP
325	20+124	30+0	2	3	2	UP	6	AC	25	0	CR	150	SA	250	2	UP

Table 9.5.1 Inventory of Roads in the Western Seaboard
(Selected Roads from DOH Road Database)

Route	From	To	No. of Lanes	Functional Class	Left Shoulder		Surface				Base		Sub-base		Right Shoulder	
					Width (m)	Type	Width (m)	Type	Thick (mm)	Year	Type	Thick (mm)	Type	Thick (mm)	Width (m)	Type
325	30+0	38+215	2	3	2	UP	6	DT	25	0	CR	150	SA	250	2	UP
325	0+0	1+83	2	3	2	UP	6	AC	50	0	CR	200	SA	150	2	UP
326	0+0	2+0	2	2	1.5	0	7	AC	0	0	CR	0	SA	0	2	
330	0+0	1+241	2	3	2	UP	6	AC	40	0	CR	300	SA	200	2	UP
346	52+112	74+550	2	0	250	0	7	AC	80	0	CR	200	SA	300	2.5	
3036	0+0	26+389	2	0	200	0	6	AC	100	0	CR	0	SA	0	2	
3081	0+0	10+678	2	0	2.5	0	7	AC	100	0	CR	200	CR	150	2.5	
3084	0+0	9+0	2	0	1.75	0	5.5	AC	0	1988	CR	150	SA	150	1.75	
3087	0+0	27+344	2	2	2.25	UP	6.5	AC	50	0	CR	200	SA	150	2.25	UP
3087	0+0	0+150	2	2	2.25	AC	6.5	AC	50	0	CR	200	SA	150	2.25	AC
3087	0+0	4+376	2	3	2	UP	6	AC	40	0	CR	150	SA	150	2	UP
3087	2+769	3+804	2	3	2	UP	6	AC	40	0	CR	150	SA	150	2	UP
3087	1+25	18+839	2	3	2	UP	6	AC	40	0	CR	150	SA	150	2	UP
3087	18+839	30+800	2	3	2	UP	6	AC	40	0	CR	150	SA	150	2	UP
3087	30+800	44+200	2	5	0	0	6	SA	0	0	0	0	0	0	0	
3087	44+200	45+829	2	4	1.75	UP	5.5	ST	25	0	CR	0	SA	0	1.75	UP
3088	0+0	2+414	2	4	1.5	UP	5.5	PM	50	0	CR	150	SA	150	1.5	UP
3088	0+0	19+454	2	4	1.5	UP	5.5	DT	25	0	CR	150	SA	150	1.5	UP
3088	0+0	0+299	2	4	1.5	UP	5.5	DT	25	0	CR	150	SA	150	1.5	UP
3088	19+768	22+969	2	4	1.5	UP	5.5	DT	25	0	CR	150	SA	150	1.5	UP
3089	0+0	7+0	2	3	2	UP	6	AC	50	0	CR	150	SA	150	2	UP
3089	7+0	28+600	2	4	1.5	UP	5	DT	25	0	CR	150	SA	150	1.5	UP
3089	0+0	0+330	2	2	2.25	AC	6.5	AC	50	0	CR	200	SA	150	2.25	AC
3089	28+600	29+0	2	0	1.5	0	6	PM	0	1975	CR	0	SA	0	1.5	
3089	29+0	83+782	2	0	1.5	0	6	PM	0	1973	CR	150	SA	150	1.5	
3090	0+0	8+440	2	3	2	UP	6	DT	25	0	CR	150	SA	150	2	UP
3092	0+0	9+0	2	4	1.5	UP	5.5	DT	25	0	CR	150	SA	150	1.5	UP
3093	0+0	20+420	2	4	1.5	UP	6	PM	70	0	CR	150	SA	150	1.5	UP
3167	0+0	11+205	2	5	1.5	0	5	PM	0	0	CR	0	SA	0	1.5	
3168	0+0	0+800	4	D	2.5	0	14	PM	0	0	CR	200	SA	200	2.5	
3168	0+800	2+250	2	5	1.5	0	5	PM	0	0	SA	0	0	0	1.5	
3168	2+250	4+650	2	5	1.5	0	5	PM	0	0	SA	0	0	0	1.5	
3168	2+250	3+800	2	5	1.5	0	5	PM	0	0	SA	0	0	0	1.5	
3168	5+340	5+650	2	5	1.5	0	5	PM	0	0	SA	0	0	0	1.5	
3168	5+650	12+710	2	5	1.5	0	5	PM	0	0	SA	0	0	0	1.5	
3169	0+0	14+224	2	5	1.5	0	5	PM	0	0	CR	0	SA	0	1.5	
3171	0+875	5+950	2	5	1.5	0	5	DT	25	0	CR	150	SA	200	1.5	
3172	0+0	1+0	2	5	1.5	0	5	PM	50	0	CR	150	SA	150	1	
3172	1+0	4+340	2	5	1.5	0	5	DT	25	0	CR	150	SA	150	1	
3173	0+0	1+0	2	5	1.5	0	5	AC	50	0	CR	150	SA	150	1.5	
3173	1+0	2+900	2	5	1.5	0	5	PM	25	0	CR	150	SA	150	1.5	
3174	0+0	14+190	2	5	1.5	0	5	DT	25	0	CR	200	SA	150	1.5	
3175	0+645	1+600	2	5	1.5	0	5	ST	25	0	CR	200	SA	150	1.5	
3175	1+600	5+0	2	5	1.5	0	5	DT	25	0	CR	200	SA	150	1.5	
3176	0+0	3+0	2	5	1.5	0	5	DT	25	0	CR	200	SA	150	1.5	
3176	3+0	12+67	2	5	1.5	0	5	ST	25	0	CR	200	SA	150	1.5	
3176	12+67	14+200	2	5	1.5	0	5	DT	15	0	CR	200	SA	150	1.5	
3177	0+0	15+0	2	4	2	0	6	AC	50	0	CR	200	SA	150	2	
3177	15+0	15+200	2	5	0	0	8	PM	0	0	SA	0	0	0	0	
3177	0+0	1+992	2	2	1.5	0	8	AC	50	0	CR	200	SA	150	1.5	
3178	0+0	2+0	2	5	1.5	0	5	DT	25	0	CR	150	SA	150	1.5	
3178	2+0	3+0	2	5	1.5	0	5	AT	50	0	CR	150	SA	150	1.5	
3178	3+0	10+0	2	5	1.5	0	5	DT	25	0	CR	150	SA	150	1.5	
3178	10+0	12+675	2	5	1.5	0	5	ST	25	0	CR	150	SA	200	1.5	
3179	0+0	8-91	2	5	1.5	0	5	DT	25	0	CR	150	SA	200	1.5	
3180	0+0	1+500	2	4	1.75	0	5.5	AC	0	0	CR	0	SA	0	1.75	
3180	1+500	10+0	2	5	0	0	9	SA	0	0	CR	0	SA	0	0	
3180	10+0	11+500	2	4	1.75	0	5.5	AC	0	0	CR	0	SA	0	1.75	
3180	11+500	14+937	2	5	0	0	9	SA	0	0	CR	0	SA	0	0	
3181	0+0	2+989	2	5	1.5	0	5.5	PM	0	0	CR	0	SA	0	1.5	
3187	0+0	28+201	2	4	1.55	0	5.5	DT	25	0	CR	200	SA	200	1.55	
3201	0+0	16+500	2	4	1.75	0	5.5	ST	0	0	CR	0	SA	0	1.75	
3201	10+500	20+0	2	5	0	0	9	SA	0	0	CR	0	SA	0	0	
3201	20+0	21+500	2	4	1.75	0	5.5	ST	0	0	CR	0	SA	0	1.75	
3201	21+5	30+0	2	5	0	0	9	SA	0	0	0	0	0	0	0	

Table 9.5.1 Inventory of Roads in the Western Seaboard
(Selected Roads from DOH Road Database)

			No. of	Functional	Left Shoulder		Surface				Base		Sub-base		Right Shoulder	
Route	From	To	Lanes	Class	Width (m)	Type	Width (m)	Type	Thick (mm)	Year	Type	Thick (mm)	Type	Thick (mm)	Width (m)	Type
3201	30+0	31+358	2	4	1.75	0	5.5	AC	0	0	CR	0	SA	0	1.75	
3203	0+0	8+0	2	4	1.5	0	5.5	ST	0	0	CR	150	SA	150	1.5	
3204	0+0	11+760	5	5	1.5	0	5	DT	25	0	CR	150	SA	150	1.5	
3205	0+0	2+0	2	5	0	0	8	SA	0	0	0	0	SA	200	0	
3205	2+0	3+0	2	5	1.25	0	5.5	DT	25	0	CR	150	SA	150	1.25	
3205	3+0	3+800	2	5	0	0	8	SA	0	0	0	0	SA	200	0	
3206	0+0	35+350	2	4	1.75	UP	5.5	DT	20	0	CR	200	SA	150	1.75	UP
3206	35+350	54+104	2	4	1.5	ST	6	DT	20	0	CR	200	SA	250	1.5	ST
3209	4+0	28+800	2	3	2	UP	6	PM	70	0	CR	150	SA	150	2	UP
3209	28+800	42+775	2	4	1.75	UP	5.5	DT	20	1982	CR	160	SA	300	1.75	UP
3209	0+0	0+90	2	0	2	0	6	PM	0	1978	CR	150	SA	300	2	
3209	0+90	2+10	2	0	2	0	6	AC	0	1985	CR	150	SA	300	2	
3209	2+10	4+0	2	0	2	0	6	PM	0	1978	CR	150	SA	300	2	
3209	3+800	7+900	2	0	0	0	6	SA	0	0	SA	0	SA	0	0	
3209	7+900	8+600	2	0	1.75	0	5.5	DT	0	0	CR	0	SA	0	0	
3209	8+600	10+400	2	0	0	0	6	SA	0	0	SA	0	SA	0	0	
3217	0+0	17+375	2	4	1.75	0	5.5	DT	0	0	CR	200	SA	150	1.75	
3218	0+0	18+800	2	4	1.5	0	5.5	DT	0	0	CR	150	SA	150	1.5	
3219	0+0	17+400	2	5	1.5	0	5.5	ST	25	0	CR	150	SA	150	1.5	
3219	17+400	39+200	2	5	1.5	0	5.5	DT	25	0	CR	150	SA	150	1.5	
3236	0+0	9+75	0	0	0	0	0	0	0	0	0	0	0	0	0	
3236	9+800	18+640	2	4	1.75	UP	5.5	ST	0	1991	CR	220	SA	150	1.75	UP
3253	0+0	23+690	2	4	1.75	0	5.5	ST	0	0	CR	0	SA	0	1.75	
3273	0+0	16+457	2	2	2.25	UP	6.5	AC	40	0	CR	150	SA	150	2.25	UP
3291	0+0	0+850	2	2	2.25	UP	6.5	AC	0	0	CR	150	SA	150	2.25	UP
3291	0+850	3+920	2	2	2.25	UP	6.5	DT	25	0	CR	150	SA	150	2.25	UP
3291	13+934	13+705	2	2	2.25	AC	6.5	AC	50	0	CR	200	SA	150	2.25	AC
3301	0+0	23+980	2	4	1.75	0	5.5	ST	0	0	CR	200	SA	150	1.75	
3313	0+0	30+29	2	3	2	UP	6	AC	50	0	CR	150	SA	180	2	UP
3324	0+0	1+0	2	4	1.5	UP	5.5	DT	25	0	CR	150	SA	150	1.5	UP
3325	0+0	4+200	2	4	1.5	0	5.5	DT	25	0	CR	150	SA	150	1.5	
3335	0+0	7+550	2	4	1.5	UP	5.5	DT	25	0	CR	150	SA	150	1.5	UP
3337	0+0	1+83	2	4	175	UP	5.5	AC	0	0	CR	200	SA	150	1.75	UP
3337	1+83	11+0	2	4	1.75	UP	5.5	DT	25	0	CR	200	SA	150	1.75	UP
3337	11+0	18+500	2	4	1.75	UP	5.5	ST	25	0	CR	200	SA	150	1.75	UP
3338	0+0	6+195	2	4	1.75	UP	5.5	DT	25	0	CR	150	SA	150	1.75	UP
3338	6+195	10+0	2	5	0	0	6	SA	0	0	0	0	0	0	0	
3339	0+0	5+112	2	4	1.75	UP	5.5	DT	25	0	CR	150	SA	150	1.75	UP
3349	0+0	23+426	2	4	1.75	0	5.5	DT	20	0	CR	200	SA	150	1.75	
3374	0+0	26+711	2	4	1.75	0	5.5	ST	0	0	CR	0	SA	0	1.75	
3400	0+0	7+700	2	5	0	0	6	SA	0	0	SA	0	SA	0	0	
3410	0+0	2+482	2	4	1.75	0	5.5	DT	0	0	SA	200	SA	150	1.75	
3410	2+482	4+0	2	4	1.75	0	5.5	ST	25	0	SA	150	SA	150	1.75	
3410	4+0	12+75	2	5	0	0	8	SA	0	0	0	0	0	0	0	
3410	12+75	13+75	2	4	1.78	0	5.5	ST	0	0	SA	200	SA	150	1.78	
3410	13+75	25+0	2	5	0	0	8	SA	0	0	0	0	0	0	0	
3411	0+0	17+0	2	5	0	0	9	SA	0	0	0	0	0	0	0	
3416	0+0	3+0	2	5	0	0	6	DT	25	0	CR	200	SA	150	0	
3416	3+0	7+108	2	5	0	0	6	SA	0	0	SA	0	SA	0	0	
3416	7+108	15+850	2	5	0	0	6	SA	0	0	SA	0	SA	0	0	
3416	7+108	11+550	2	5	0	0	6	SA	0	0	SA	0	SA	0	0	
3432	0+0	5+0	2	5	0	0	8	SA	0	0	0	0	SA	150	0	
3432	5+0	6+900	2	5	0	0	8	DT	0	0	0	0	SA	150	0	
3432	6+900	8+100	2	5	0	0	8	SA	0	0	0	0	SA	150	0	
3432	8+100	8+700	2	5	0	0	8	DT	0	0	0	0	SA	150	0	
3432	8+700	21+700	2	5	0	0	8	SA	0	0	0	0	SA	150	0	
3432	21+700	31+750	2	4	1.75	0	5.5	DT	30	0	CR	150	SA	200	1.75	
3432	0+0	11+250	2	5	0	0	8	SA	0	0	0	0	SA	150	0	
3459	0+0	11+461	2	4	1.75	0	5.5	ST	0	0	CR	0	SA	0	1.75	
3463	0+0	7+0	2	5	0.5	0	5	DT	0	0	CR	0	SA	0	0.5	
4001	1+0	11+0	2	4	1.5	0	6	ST	0	0	CR	0	SA	0	1.5	
4002	0+0	7+583	2	3	1.5	AC	6	AC	50	0	SA	200	SA	200	1.5	
4003	0+0	15+0	2	5	1.5	0	5	ST	0	0	CR	0	SA	0	1.5	
4003	15+0	15+282	2	4	1.75	0	5.5	AC	0	0	CR	0	SA	0	1.75	
4006	19+0	34+0	2	4	1	UP	7	AC	40	0	CR	200	0	0	1	UP

Table 9.5.1 Inventory of Roads in the Western Seaboard
(Selected Roads from DOH Road Database)

					Left Shoulder		Surface				Base		Sub-base		Right Shoulder	
Route	From	To	No. of Lanes	Functional Class	Width (m)	Type	Width (m)	Type	Thick (mm)	Year	Type	Thick (mm)	Type	Thick (mm)	Width (m)	Type
4006	34+0	39+0	2	4	1.5	UP	6	AC	40	0	CR	200	0	0	1.5	UP
4006	39+0	68+618	2	4	1.75	UP	5.5	AC	40	0	CR	200	0	0	1.75	UP
4096	0+0	10+358	2	4	1.75	0	5.5	ST	0	0	CR	0	SA	0	1.75	
4098	0+0	7+150	2	5	1.5	0	5	ST	0	0	CR	0	SA	0	1.5	
4099	0+0	6+500	2	4	1.5	UP	5	ST	0	0	CR	0	SA	0	1.5	UP
4119	7+0	14+737	2	3	2	0	6	PM	0	0	CR	0	SA	0	2	
4134	0+0	10+900	2	4	1.75	UP	5.5	ST	0	0	CR	0	SA	0	1.75	
4134	10+900	15+300	2	5	0	0	9	SA	0	0	0	0	0	0	0	
4139	0+0	23+310	2	4	1.75	0	5.5	ST	0	0	CR	0	SA	0	1.75	
4198	0+0	3+900	2	4	1.75	0	5.5	AC	0	0	CR	0	SA	0	1.75	

Legend: AC=Asphaltic Concrete
ST=Single Surface Treatment
DT=Double Surface Treatment
PM=Penetration Macadam
UP=Unpaved
CR=Crushed Rock
SA=Soil Aggregate
IRI=International Road Roughness Index
0=No Data Available
D=Dual Carriageway

Source: Department of Highways

Table 9.5.2 Vehicle Registration Data for the Western Seaboard (1994)

Item	Kanchanaburi	Samut Songkram	Ratchaburi	Phetchaburi	Prachuap Khirikhan	Chumphon	Western Seaboard Total	Kingdom Total
Total	164,549	34,496	255,329	109,784	129,130	98,809	627,548	12,579,903
Motor Vehicle Act (1979)	152,021	31,678	242,552	103,362	122,246	95,735	595,573	11,974,342
Sedan (not more than 7 pass)	5,286	1,598	9,566	3,552	2,201	1,816	18,733	1,265,030
Microbus & passenger pick up	3,259	1,005	6,394	1,899	1,638	948	11,884	533,797
Van & pick up	22,784	6,955	41,711	16,301	16,116	12,522	93,605	1,625,041
Motortricycle	4	0	198	7	2	23	230	3,619
Interprovincial taxi (Sedan)	0	0	19	0	0	0	19	357
Urban taxi (Sedan)	0	0	0	32	0	26	58	48,846
Fixed route taxi	0	4	0	0	0	0	4	9,158
Motortricycle taxi (Tuk Tuk)	22	289	297	69	7	1	663	51,040
Hotel taxi (Sedan)	0	0	0	0	0	0	0	927
Tour taxi (Sedan)	0	0	0	0	0	0	0	694
Car for hire (Sedan)	0	0	0	0	0	0	0	465
Motorcycle	119,244	21,723	182,941	80,474	101,381	80,066	466,585	8,248,303
Tractor	1,321	21	1,074	223	865	225	2,408	86,504
Road roller	3	0	112	5	33	16	166	4,575
Farm vehicle	6	5	199	800	1	3	1,008	93,283
Automobile trailer	92	78	41	0	2	89	210	3,153
Land Transport Act (1979)	12,528	2,818	12,777	6,422	6,884	3,073	31,974	561,545
Bus	1,251	354	1,091	706	199	381	2,731	86,195
Fixed route bus	1,104	340	946	516	171	376	2,349	64,028
Non-fixed route bus	55	11	98	178	15	3	305	15,033
Private bus	92	3	47	12	13	2	77	7,134
Truck	11,079	2,275	11,387	5,716	6,566	2,586	28,530	450,680
Non-fixed route truck	2,334	85	229	1,213	57	246	1,830	49,433
10 wheeled	1,382	64	124	974	57	59	1,278	15,666
6 wheeled	630	7	85	73	0	4	169	8,932
4 wheeled	254	0	0	10	0	0	10	2,368
Truck tractor	0	0	0	2	0	34	36	4,714
Trailer	13	7	20	130	0	18	175	3,833
Semi trailer	0	0	0	12	0	29	41	7,073
Others	55	7	0	12	0	102	121	6,847
Private truck	8,745	2,190	11,158	4,503	6,509	2,340	26,700	401,247
10 wheeled	3,237	1,125	4,654	1,706	1,572	623	9,680	112,724
6 wheeled	2,907	808	4,267	1,617	2,131	1,299	10,122	169,945
4 wheeled	2,017	185	1,569	1,124	2,648	210	5,736	77,262
Truck tractor	229	3	41	0	11	7	62	6,405
Trailer	152	28	419	48	77	43	615	9,886
Semi trailer	82	1	118	7	16	21	163	6,336
Others	121	40	90	1	54	137	322	18,671
Small rural bus	198	189	299	0	119	106	713	24,670
Non-Motorized Vehicle Act (1935)	0	0	0	0	0	1	1	44,016

Note: 1994 data presented due to some anomalies in the available 1995 data.

Source: Land Transport Department

Table 9.5.3 Motorization Rates by Province in the Western Seaboard

Province	Motorization Rate[1](1994)	Growth in Number of Vehicles[2] (% p.a., 1990-1994)
Kanchanaburi	47	11.6
Ratchaburi	75	25.5
Samut Songkhram	48	24.5
Phetchaburi	52	12.6
Prachuap Khirikhan	42	14.1
Chumphon	43	17.6
Western Seaboard	59	17.8
Kingdom	58	12.4

[1]Number of cars and light vehicles (excluding motorcycles) per 1,000 population.

[2] Growth in cars and light vehicles (excluding motorcycles).

Source : The Study Team

Table 9.5.4 Traffic on DOH Highways in the WSB

Route	Location	Station Km	1990 AADT	1994 AADT	1990-1994 Growth Rate (%)	% Heavy Vehicles (1994)
4	Bypass Don Krabuang (E) - Ratchaburi District	76+400	16,893	29,543	15.0	47.0
4	Km.79+845 (Ban Pong Dist) - Bypass E-Chang B	80+000	24,964	31,436	5.9	36.5
4	Bypass E-Chang (B) - Bypass E-Chang (E)	86+900	2,927	5,688	18.1	11.8
4	Bypass E-Chang	84+500	17,413	27,849	12.5	38.4
4	Bypass From Km. 93+930 - Km. 106-189	93+580	10,699	28,366	27.6	32.4
4	Bypass Km. 93+930 (B) - Bypass Km. 106+189 (E)	105+500	1,853	2,516	7.9	13.2
4	Bypass Ratchaburi	104+800	19,079	19,423	0.4	19.8
4	Bypass Ratchaburi (E) - Wang Manao Bridge	112+500	11,519	16,325	9.1	34.9
4	Wang Manao Bridge - Km. 49+447	136+500	15,177	23,879	12.0	26.7
4	Bypass Phetchaburi	12+000	13,638	22,096	12.8	26.5
4	Bypass Phetchaburi (E) - Junction Cha Am	179+500	16,162	23,781	10.1	28.0
4	Junction Cha Am - Junction to Nong Kae	216+920	11,725	15,139	6.6	26.2
4	Junction to Nong Kae - Junction to Pranburi	251+100	12,515	18,310	10.0	36.6
4	Junction to Pranburi - Junction to Kuiburi	292+400	8,231	19,621	24.3	19.9
4	Junction to Kuiburi - Junction to Prachuap Khirikhan	314+075	23,126	23,126	0.0	47.1
4	Junction Thap Sakae - Km. 364+486 (Chumphon Dist.)	364+200	6,254	11,777	17.1	28.0
4	Junction to Bang Saphan - Km. 423+600 Bridge	400+400**	7,074	9,563	7.8	31.5
4	Huaiphraek Bangthalai Bridge - Junction Tha Sae	465+700	6,702	8,104	4.9	35.2
35	Samut Songkhram - R. No. 4 (Pak Tho)	62+150	16,885	21,546	6.3	39.7
35	Samut Songkhram - R. No. 4 (Pak Tho)	84+000	14,295	18,813	7.1	43.4
41	Junction Pathom Phon (Chumphon) - Junction to Sami	23+200*	-	11,247	NA	28.9
41	Km. 55+000 (Chomphom Dist) - Junction to Lungsuan	65+450	6,356	15,938	25.8	30.1
321	Junction R. No. 4 (Nakhon Pathom) - Km. 88+000	68+000	12,055	16,851	8.7	35.2
321	Km. 88+500 - Junction Uthong	107+401*	-	6,726	NA	24.4
321	Junction Uthong - Km. 143+000	133+884*	-	8,653	NA	21.3
321	Km. 143+000- Junction Suphanburi	164+000*	-	21,772	NA	16.0
323	Junction Krachap - Bypass Ban Pong (B)	73+000	20,231	38,045	17.1	43.0
323	Bypass Ban Pong	77+000	17,586	40,340	23.1	37.2
323	Bypass Ban Pong (E) - Junction to Phrathaendongrang	80+264	19,768	37,346	17.2	36.1
323	Tha Maka - Junction Phrathaendong Rang (Old)	97+000	3,470	7,857	22.7	24.8
323	Junction to Phrathaen Dongrang - Km. 116+000	112+300**	8,532	15,260	15.6	18.8
323	Km. 116+000 - Muni. of Kanchanaburi	117+000*	-	18,463	NA	15.9
323	Junction to Phrathaen Dongrang-R. No. 323 (Thamuang)	108+300**	7,191	3,818	-14.6	32.4
323	Bypass Kanchanaburi	2+200**	1,915	2,821	10.2	24.4
323	Muni of Kanchanaburi-Kangsen	4+830*	-	19,198	NA	8.9
324	Muni of Kanchanaburi - Km. 23+072	12+000	3,159	7,117	22.5	14.9
324	Km. 30+000 - Junction Uthong	42+000	2,070	3,838	16.7	20.0
325	Junction E-Chang - Khlong Dam Noensaduak	3+500	4,845	7,695	12.3	26.2
325	Khlong Damnoensaduak - Muni of Samut Songkhram	32+790	4,016	7,209	15.7	26.6
326	Junction Prachuap Khirikhan	0+500	2,759	8,507	32.5	18.6
327	Junction Pathom Phon (Chumphon) - Muni. of Chumphon	502+000	6,795	14,642	21.2	18.3
327	Junction to Chumphon	0+500	8,171	18,142	22.1	17.5
330	Junction Route No. 00040501 - Ratchaburi	0+500	9,610	17,236	15.7	11.5
346	R. No. 340 - Km. 52+112 (Banpong Dist.)	33+000	8,976	11,638	6.7	45.0
346	Km. 52+112 - R. No. 321 (Kamphaengsaen)	55+000	7,691	7,858	0.5	43.8
346	Kamphang San - Km. 36+000	21+000	4,199	5,767	8.3	38.9
3081	Tha Rua-Phrathaen Dong Rang	0+500	9,120	6,492	-8.1	15.3
3084	Tha Muang - Km. 9+000	1+000	3,202	4,887	11.1	13.3
3085	Junction R. No. 3209 (Yang Ko) - Lamsai	0+500	920	1,294	8.9	14.3
3087	Ratchaburi - Bypass Chom Bung	16+000	3,707	5,992	12.8	13.9
3087	Bypass Chom Bung	0+500	1,629	3,247	18.8	20.2
3087	Bypass Chom Bung (B) - Bypass Chom Bung (E)	28+000	3,381	5,942	15.1	8.1
3087	Junction Chom Bung	0+500*	-	3,247	NA	20.2

Table 9.5.4 Traffic on DOH Highways in the WSB

Route	Location	Station Km	1990 AADT	1994 AADT	1990-1994 Growth Rate (%)	% Heavy Vehicles (1994)
3087	Bypass Chom Bung (E) - Chat Pa Wai	18+500	2,071	2,853	8.3	16.2
3087	Chat Pa Wai - Pha Pok Khang Khao	30+000	1,557	2,249	9.6	13.8
3088	Ratchaburi - R. No. 3093	0+800	5,120	8,304	12.9	18.2
3088	R. No. 3093 - R. No. 35	0+200	1,146	1,125	-0.5	19.3
3089	Khao Ngu - Km. 28+000 (Ban Pong Dist.)	1+000	2,305	5,412	23.8	22.4
3089	Km. 28+600 (Ratchaburi Dist.) - Khok Sung	28+000*	-	7,737	NA	29.9
3089	Khok Sung - R. No. 323 (Bock Phrai)	32+000	4,444	6,225	8.8	30.5
3090	Khao Chong Phran - Mae Klong Bridge	5+000	3,109	4,540	9.9	40.1
3092	Samut Songkham - Km. 9+000 (Thonburi Dist.)	1+800	2,380	3,995	13.8	15.8
3092	Km. 32+850 - Samut Sakhom	34+900	8,081	12,843	12.3	24.1
3093	Tha Nam Samut Songkhram - R. No. 4 (Pak Tho)	18+800	1,443	7,645	51.7	24.2
3167	Prachuap Khirikhan - Nong Hin	1+500	444	2,137	48.1	19.5
3168	Junction R. No. 4 - Bypass Pranburi	1+000	5,493	4,843	-3.1	14.7
3168	Bypass Pranburi	4+000	2,688	3,645	7.9	17.4
3168	Bypass Pranburi (E) - Km. 12+710	6+000	2,264	2,756	5.0	15.7
3169	Junction R. No. 4 - Chai Thale	0+500	1,479	3,931	27.7	17.4
3171	Muni. of Phetchaburi - Ban Dai It - R. No. 3204	1+375	886	7,105	68.3	25.2
3172	Junction Khao Yoi Railway Station	1+100	625	671	1.8	11.0
3173	Phetchaburi - Khao Luang	0+500	1,757	4,867	29.0	5.3
3174	Junction R. No. 4 - Ban Tha	1+150	1,634	2,521	11.5	18.5
3175	Tha Yang - Khuan Phet	0+750	2,333	1,548	-9.7	11.1
3176	Phetchaburi - Ban Laem	2+300	1,271	3,140	25.4	18.6
3177	Phetchaburi - Had Chao Samran	0+500	2,285	6,070	27.7	12.0
3179	Muni. of Phetchaburi - R. No. 4	0+500	1,456	3,916	28.1	7.4
3180	Junction R. No. 4 - Tha Samet	1+800	391	1,244	33.6	28.5
3181	Junction R. No. 4 - Tha Sae	0+500	2,394	4,469	16.9	14.4
3187	Khan Phet - Ban Kula*	10+350*	-	2,386	NA	21.8
3201	Junction R. No. 4 - Pathiu - R. No. 3180 (Ton Makham)	8+000	1,126	2,116	17.1	14.9
3203	Junction R. No. 4 - Hup Taphong	1+500	1,640	1,283	-6.0	16.3
3204	Route No. 4 - Petchaburi	3+950	834	1,485	15.5	26.3
3205	Wat Chan - Rai Sat	0+500	230	401	14.9	40.9
3206	Junction R. No. 4 (Pak Tho) - Tha Yang	0+600	3,577	3,534	-0.3	43.2
3206	Tha Yang - Hin Si - Pong Kra Thing	1+000	1,923	376	-33.5	14.4
3209	Tha Maka - Km. 4+000 (Kanchanaburi Dist.)	0+500	4,463	10,605	24.2	27.0
3209	Km. 4+000 (Banpong Dist.) - Nongtakya	18+000	2,052	4,501	21.7	40.1
3209	Junction R. No. 3209 0101 - Khao Chong	6+700**	326	1,285	40.9	32.3
3209	Nongtakya - Kanchanaburi Dist.	29+300**	1,844	3,160	14.4	20.6
3209	Ratchaburi Dist. - Dan Makham Tia	44+750*	-	1,816	NA	22.3
3209	Dan Makham Tia - Kong Phasom Sat	59+450**	1,852	2,026	2.3	11.6
3209	Wang Pla Mu - Wang Lan	1+750**	718	1,292	15.8	18.6
3217	Junction R. No. 4 - Yang Chum	0+500	1,071	2,234	20.2	15.2
3218	Junction R. No. 4 - Huai Mong Khon	3+000	3,646	4,401	4.8	13.5
3219	Nong Ta Phao - Watai School	0+500**	2,327	4,545	18.2	24.8
3236	Junction R. No. 325 (Hua Pho) - Pho Hak	0+500	1,673	3,006	15.8	33.7
3236	Junction R. No. 325 (Hua Pho) - Pho Hak	8+000*	-	2,456	NA	36.4
3236	Pho Hak - R. No. 3097	12+750*	-	3,012	NA	40.1
3253	Junction R. No. 4 - Thung Maha	15+000	430	1,017	24.0	10.8
3273	Khok Sung - Nong Pet	8+000	2,227	3,211	9.6	32.2
3291	Junction R. No. 4 (Chedi Hak) - R. No. 3087 (Khao Ngu)	3+000	6,646	10,683	12.6	19.5
3301	Junction R. 3219 (Nong Phlap) - Yang Chum	0+500	703	1,534	21.5	26.6
3305	Junction R. No. 323 (Tha Nam Tun) - R. No. 3228 (Khao Pun)	1+000	1,156	2,030	15.1	30.6
3313	Junction R. No. 3087 (Chat Pa Hwai) - Pong Krathing	0+800	1,293	2,736	20.6	12.7
3324	Junction R. No. 3313 - Huai Sua	0+500	200	448	22.3	13.2

Table 9.5.4 Traffic on DOH Highways in the WSB

Route	Location	Station Km	1990 AADT	1994 AADT	1990-1994 Growth Rate (%)	%Heavy Vehicles (1994)
3325	Junction R. No. 4 - Hat Sai Yai	0+500	617	918	10.4	10.3
3335	Junction R. No. 4 (Ban Sing) - R. No. 3237 (Bang Kra Do)	4+000	1,366	2,086	11.2	15.3
3337	Junction R. No. 4 (Chin Na Si) - Thung Luang	0+900	3,793	6,085	12.5	63.5
3337	Thung Luang - R. No. 3206 (Hin Si)	11+500	781	803	0.7	23.4
3338	Junction R. No. 4 (Chin Na Si) - Khu Bua	1+100	467	973	20.1	28.0
3339	Ratchaburi - Khu Bua	4+500	506	1,169	23.3	4.9
3349	Junction R. No. 4 (Nong Khuang) - Nong Ya Plong	0+500	1,103	3,308	31.6	36.5
3357	Nong Tak Ya - Khao Khwang	24+400	844	2,462	30.7	40.1
3361	Dan Makham Tia - Pak Dong	0+500	450	820	16.2	18.9
3394	Junction R. No. 323 (Luk Kae) - Huai Krabok-Nong Khaem	0+500	2,966	4,707	12.2	21.3
3400	Junction R. No. 3301 - Thung Kham	0+500	44	252	54.7	0.0
3410	Kho Lok Sang - Huai Sok	13+500**	271	694	26.5	27.1
3411	Don Yang - Huai Sak	2+700	124	460	38.8	9.1
3416	Junction R. No. 3301 - Km. 7+108	0+500	59	179	32.0	0.0
3432	Junction R. No. 3410 (Hin Lat) - Kaeng Kachan Dam	0+500	207	592	30.0	28.5
3459	Junction R. No. 4 - Pak Khlong Ban Khrud	8+232	346	752	21.4	22.3
3463	Junction R. No. 4 - Nikom Prachuap Khirikhan	0+500*	-	6,545	NA	32.2
4001	Muni. of Chumphon - Pak Nam Chumphon	5+500	3,959	7,214	16.2	16.1
4002	Langsuan - Pak Nam Langsuan	0+533	1,114	3,495	33.1	12.3
4003	Khuan Ta Lom - Sawi - Bo Kha	3+850	716	2,135	31.4	12.6
4006	Junction R. No. 4 (Ratchakrut) - Lang Suan	2+500**	945	1,147	5.0	21.6
4096	Junction R. No. 41 - Pak Nam Ta Ko	2+700	477	1,096	23.1	8.0
4097	Junction R. No. 41 - Bang Nam Chut	6+200	211	978	46.7	37.3
4098	Pak Nam Chumphon - Hat Sai Ri	2+600	955	1,964	19.8	24.0
4099	Junction R. No. 41 - Mae Nam Lang Suan	5+500	214	483	22.6	23.2
4119	Junction R. No. 4001 (Pak Khlong) - HongYen Chumphon	7+600	3,266	5,651	14.7	18.1
4134	Lang Suan - R. No. 4112 (La Mae)	7+500	321	869	28.3	22.3
4139	Junction R. No. 41 (Na Nua) - Khao Thalu	4+700	1,207	1,604	7.4	14.7
4198	Junction R. No. 41 - Pak Ta Ko	0+500	169	485	30.2	11.8
	Total (including stations with *, but not with **)		566,996	922,024	12.9	
	1-digit roads		225,951	336,542	10.5	
	2-digit roads		37,536	56,297	10.7	
	3-digit roads		153,039	271,987	15.5	
	4-digit roads		150,470	257,198	14.3	

Note: * denotes that comparable data for 1990 not available
** denotes that data is basically comparable, although the station in 1994 was moved up to few km away from the station in 1990
Certain growth rates negative according to data reported by DOH

Source: Department of Highways

Table 9.5.5 Traffic on DOH Highways in the WSB (PCU Per Day)

Route	Location	Station Km	1990 AADT (PCU)									1994 AADT (PCU)									1990-94 Growth Rate in Total PCU
			Car & Taxi (1.0 PCU)	Light Bus (1.0 PCU)	Heavy Bus (2.0 PCU)	Light Truck (1.0 PCU)	Medium Truck (2.0 PCU)	Heavy Truck (3.0 PCU)	Bicycles/ Tricycles (0.2 PCU)	Motorcycles (0.3 PCU)	Total PCU	Car & Taxi (1.0 PCU)	Light Bus (1.0 PCU)	Heavy Bus (2.0 PCU)	Light Truck (1.0 PCU)	Medium Truck (2.0 PCU)	Heavy Truck (3.0 PCU)	Bicycles/ Tricycles (0.2 PCU)	Motorcycles (0.3 PCU)	Total PCU	
4	Bypass Don Kratuang (E) - Ratchaburi District	76+400	3,023	315	1,506	7,114	2,604	13,158	14	540	28,275	5,888	966	2,138	8,908	9,586	24,057	21	687	52,151	16.5
4	Km.79+845 (Ban Pong Dist) - Bypass E-Chang B	80+000	4,635	399	2,244	9,054	3,518	24,285	30	503	44,467	9,006	1,088	1,534	9,859	6,218	22,821	7	922	51,455	3.7
4	Bypass E-Chang (B) - Bypass E-Chang (E)	86+900	850	149	0	1,399	502	834	25	450	4,209	1,195	138	8	3,681	648	1,038	18	1,109	7,835	16.8
4	Bypass E-Chang	84+500	5,301	207	1,086	4,707	2,554	16,110	8	450	30,423	5,840	341	1,090	10,962	4,524	23,697	8	799	47,261	11.6
4	Bypass From Km. 93+930 - Km. 106+189	93+580	3,258	291	738	2,861	2,390	8,205	9	497	18,239	7,224	273	1,104	11,678	2,894	21,576	1	463	45,214	25.5
4	Bypass Km. 93+930 (B) - Bypass Km. 106+189 (E)	105+500	586	151	16	645	532	591	20	214	2,755	1,848	103	22	233	318	486	13	558	3,581	6.8
4	Bypass Ratchaburi	104+800	5,326	363	1,190	9,325	2,154	7,179	12	1,024	26,573	3,836	857	1,552	10,884	3,096	4,566	16	1,175	25,982	-0.6
4	Bypass Ratchaburi (E) - Wang Manao Bridge	112+500	2,433	124	886	4,741	1,558	8,997	25	275	19,039	2,528	207	788	7,895	2,070	12,798	5	347	26,639	8.8
4	Wang Manao Bridge - Km. 49+447	136+500	5,460	282	1,618	3,944	2,618	10,119	16	225	24,282	8,094	1,205	1,514	8,214	3,402	11,724	12	452	34,618	9.3
4	Bypass Photchaburi	12+000	5,243	119	532	4,657	2,284	6,633	10	425	19,903	333	6,622	492	395	18,734	5,379	7	723	32,685	13.2
4	Bypass Photchaburi (E) - Junction Cha Am	179+500	9,355	498	1,280	2,442	2,262	6,300	0	277	22,410	6,808	1,122	2,202	9,199	5,046	9,084	12	668	34,141	11.1
4	Junction Cha Am - Junction to Nong Kae	216+920	5,308	451	2,464	1,621	3,230	4,488	9	261	17,834	4,914	177	1,094	6,086	2,848	3,973	4	613	21,709	5.0
4	Junction to Nong Kae - Junction to Pranburi	251+100	1,653	185	706	7,596	1,830	5,436	6	302	17,715	7,302	194	918	4,107	5,392	10,656	6	590	29,166	13.3
4	Junction to Pranburi - Junction to Kuiburi	292+400	1,461	83	690	4,231	1,494	4,092	4	428	12,483	4,479	342	566	10,902	5,212	3,027	9	1,712	26,248	20.4
4	Junction to Kuiburi - Junction to Prachuap Khirikhan	314+975	1,700	79	434	5,379	9,138	408	1	631	17,770	5,319	331	1,344	6,574	8,562	17,847	7	568	40,552	22.9
4	Junction Thap Sakae - Km. 364+486 (Chumphon Dist.)	364+200	1,007	94	516	2,726	2,048	3,435	3	436	10,265	4,019	124	664	4,325	5,170	1,146	15	682	16,155	12.0
4	Junction to Bang Saphan - Km. 423+600 Bridge	400+400**	1,451	27	980	2,119	1,390	6,876	2	264	13,110	2,704	40	320	3,808	1,866	5,754	1	530	15,023	3.5
4	Huaphraek Bangthalu Bridge - Junction Tha Sae	465+700	2,369	85	522	2,156	1,426	3,331	2	167	10,077	3,688	19	482	1,543	1,760	5,199	2	314	13,007	6.6
35	Samut Songkhram - R. No. 4 (Pak Tho)	62+150	3,012	539	2,772	2,421	3,082	23,958	12	216	36,011	6,330	504	2,432	6,164	3,286	17,067	4	313	36,100	0.1
35	Samut Songkhram - R. No. 4 (Pak Tho)	84+000	2,626	185	1,262	2,146	1,466	23,922	3	62	31,672	5,246	567	1,306	4,834	2,378	18,972	12	160	33,475	1.4
41	Junction Pathom Phon (Chumphon) - Junction to Samu	23+200**	-	-	-	-	-	-	-	-	-	2,428	333	258	5,233	939	2,076	21	1,367	12,635	-
41	Km. 55+000 (Chumphon Dist) - Junction to Lungsuan	65+450	973	229	138	3,113	766	1,087	30	2,045	8,381	2,595	454	336	8,091	1,896	2,566	21	4,718	20,677	25.3
321	Junction R. No. 4 (Nakhon Pathom) - Km. 88+000	68+000	2,349	142	1,476	4,241	1,406	11,646	7	279	21,546	1,776	11	1,392	9,126	2,288	12,309	2	484	27,378	6.2
321	Km. 88+500 - Junction Uthong	107+401**	458	118	378	2,410	714	4,272	25	285	8,660	810	168	344	4,105	880	3,093	12	463	9,875	3.3
321	Junction Uthong - Km. 143+000	133+884**	3,979	94	432	563	942	4,326	13	358	10,707	1,667	107	448	5,034	1,322	2,880	22	1,039	12,519	4.0
321	Km. 143+000- Junction Suphanburi	164+000*	-	-	-	-	-	-	-	-	-	5,798	1,829	1,184	10,662	2,164	5,427	27	2,787	29,878	-
323	Junction Krachap - Bypass Ban Pong (B)	73+000	3,712	442	1,296	8,465	2,372	17,514	13	802	34,556	4,908	522	1,464	16,272	3,848	41,061	6	1,091	69,172	18.9
323	Bypass Ban Pong	77+600	3,358	44	246	6,472	3,720	17,187	16	649	31,692	11,573	231	204	13,524	4,102	38,577	2	2,512	70,726	22.2
323	Bypass Ban Pong (E) - Junction to Phrahamdongrang	80+264	3,312	710	1,948	6,643	3,058	19,800	37	1,171	36,679	7,458	748	1,746	15,641	4,412	31,260	6	2,750	64,022	14.9
323	Tha Maka - Junction Phrathamdong Kang (Old)	97+000	333	169	390	2,209	248	1,320	6	313	4,988	1,058	208	920	4,640	1,028	2,931	9	863	11,657	23.6
323	Junction to Phrathem Dongrang - Km. 116+000	112+300**	107	175	6	545	166	807	5	190	2,000	2,961	50	444	9,375	1,958	4,992	3	430	20,225	78.3
323	Km. 116+000 - Muni. of Kanchanaburi	117+000*	-	-	-	-	-	-	-	-	-	7,411	326	1,044	7,788	1,500	4,998	6	1,173	24,247	-
323	Junction to Phrathaem Dongrang-R. No. 323 (Thamuang)	108+300**	857	120	134	3,986	822	5,250	8	409	11,586	470	189	776	1,923	508	1,782	11	461	6,121	-14.7
323	Bypass Kanchanaburi	2+200**	262	151	732	778	274	663	1	225	3,086	729	82	16	1,322	430	1,395	5	252	4,231	8.2
323	Muni of Kanchanaburi-Kangsen	4+830**	-	-	-	-	-	-	-	-	-	7,503	911	876	9,078	1,234	1,953	2	1,162	22,719	-
324	Muni of Kanchanaburi - Km. 23+072	12+000	990	183	254	1,336	386	990	13	255	4,407	1,951	347	394	3,759	612	1,671	5	814	9,553	21.3
324	Km. 30+000 - Junction Uthong	42+000	218	21	196	1,323	676	231	2	269	2,926	1,680	109	222	1,281	612	1,053	2	387	5,346	16.3
325	Junction E-Chang - Khlong Dam Noensaduak	3+500	1,417	402	382	2,080	870	960	14	381	6,505	2,834	623	700	2,220	1,426	2,865	23	664	11,295	14.8
325	Khlong Damroennaduak - Muni of Samut Songkhram	32+790	1,883	535	794	594	728	729	19	266	5,547	2,984	845	1,398	1,459	1,194	1,875	18	416	10,189	16.4
326	Junction Prachuap Khirikhan	0+500	904	131	364	1,222	494	219	10	720	4,064	4,913	249	1,124	1,759	1,306	1,113	12	1,658	12,134	31.4
327	Junction Pathom Phon (Chumphon) - Muni. of Chum Phon	502+000	1,669	285	504	3,615	1,262	1,029	1	826	9,191	4,600	731	1,014	6,628	2,752	2,400	1	1,492	19,618	20.9
327	Junction to Chumphon	0+500	1,985	361	520	6,259	1,780	1,248	5	1,024	11,182	6,141	885	1,124	7,950	3,082	3,189	4	1,960	24,335	21.5
330	Junction Route No. 00040501 - Ratchaburi	0+500	3,332	523	1,094	3,552	1,312	2,400	28	813	13,254	6,123	745	1,476	8,378	1,394	1,665	13	1,657	21,451	12.8
346	R. No. 346 - Km. 52+112 (Bampong Dist.)	33+000	4,247	120	532	949	6,160	942	5	118	13,073	2,676	336	466	3,392	2,204	11,697	12	281	21,065	12.9
346	Km. 52+112 - R. No. 321 (Kamphaengsaen)	55+000	710	187	690	2,832	5,746	2,232	11	282	12,691	2,616	260	266	1,544	4,828	2,673	6	241	12,433	-0.5
346	Kamphaeng Sen - Km. 36+000	21+000	174	98	62	2,564	336	3,504	5	305	7,043	240	87	44	3,195	408	6,057	4	493	10,528	10.6
3081	Tha Kua-Phrathaen Dong Rang	0+500	271	129	36	4,739	462	11,196	13	680	17,528	3,165	121	532	2,213	502	1,428	21	903	8,885	-15.6
3084	Tha Muang - Km. 94+000	14+000	267	47	4	1,924	500	2,136	13	532	5,422	2,437	54	14	1,747	558	1,089	12	923	6,834	6.0
3085	Junction R. No. 3209 (Yang Ko) - Lamsa	0+500	55	9	6	516	194	720	2	156	1,658	140	11	14	958	116	360	5	281	1,885	3.2
3087	Ratchaburi - Bypass Chom Bung	16+000	1,068	60	224	1,876	234	822	3	142	4,429	1,671	155	294	3,333	646	1,089	3	289	7,480	14.0
3087	Bypass Chom Bung	0+500	479	0	0	815	314	534	1	64	2,207	660	10	72	1,922	554	1,026	5	237	4,486	19.4
3087	Bypass Chom Bung (B) - Bypass Chom Bung (E)	28+000	1,008	91	234	1,803	470	291	49	647	4,622	1,798	72	298	3,588	478	288	34	1,254	7,810	14.0
3087	Junction Chom Bung	0+500*	-	-	-	-	-	-	-	-	-	203	72	24	175	38	48	21	136	717	-
3087	Bypass Chom Bung (E) - Chat Pa Wa	19+500	396	9	156	1,237	388	471	8	161	2,826	1,009	29	224	1,354	432	399	3	203	3,653	6.6
3087	Chat Pa Wa - Pha Pok Khang Khao	30+000	380	55	136	837	306	192	36	210	2,153	282	52	122	1,604	382	177	20	502	3,140	9.9
3088	Ratchaburi - R. No. 3093	0+800	1,922	1,170	464	990	1,060	828	18	297	6,750	4,832	830	642	1,131	1,378	1,503	49	758	11,124	13.3
3088	R. No. 3093 - R. No. 35	0+200	213	46	26	577	206	582	10	56	1,715	405	47	32	456	252	225	7	125	1,548	-2.5
3089	Khao Nga - Km. 28+000 (Ban Pong Dist.)	1+000	622	108	78	659	364	1,155	22	199	3,208	1,784	170	250	2,248	1,066	1,656	12	672	7,858	25.1
3089	Km. 28+600 (Ratchaburi Dist.) - Khok Sung	28+000*	-	-	-	-	-	-	-	-	-	3,316	128	372	1,982	1,808	3,663	6	657	11,931	-
3089	Khok Sung - R. No. 323 (Baek Phra)	32+000	535	60	238	1,656	936	4,818	16	343	8,602	860	160	280	3,308	708	4,209	10	541	10,076	4.0

Table 9.5.5 Traffic on DOH Highways in the WSB (PCU Per Day)

Route	Location	Station Km	1990 AADT (PCU)									1994 AADT (PCU)									1990-94 Growth Rate on Total PCU
			Car & Taxi (1.0 PCU)	Light Bus (1.0 PCU)	Heavy Bus (2.0 PCU)	Light Truck (1.0 PCU)	Medium Truck (2.0 PCU)	Heavy Truck (3.0 PCU)	Bicycles/ Tricycles (0.2 PCU)	Motorcycles (0.3 PCU)	Total PCU	Car & Taxi (1.0 PCU)	Light Bus (1.0 PCU)	Heavy Bus (2.0 PCU)	Light Truck (1.0 PCU)	Medium Truck (2.0 PCU)	Heavy Truck (3.0 PCU)	Bicycles/ Tricycles (0.2 PCU)	Motorcycles (0.3 PCU)	Total PCU	
3090	Khao Chong Phran - Mae Klong Bridge	5+000	692	100	92	868	1,088	2,577	27	229	5,674	335	43	18	2,342	626	4,494	1	503	8,362	10.2
3092	Samut Songkhram - Km. 9+000 (Thonburi Dist.)	1+800	738	474	402	719	292	306	20	491	3,441	2,313	417	444	633	472	522	7	716	5,524	12.6
3092	Km. 32+850 - Samut Sakhorn	34+900	5,281	865	826	819	1,344	93	156	1,020	10,404	5,738	599	3,588	3,406	1,204	2,112	246	1,168	18,081	14.8
3093	Tha Nam Samut Songkhram - R. No. 4 (Pak Tho)	18+800	977	375	278	1,897	1,226	1,317	93	402	6,568	1,359	351	440	4,088	1,660	2,391	122	1,044	11,454	14.9
3167	Phachuap Khirikhan - Nong Hin	1+500	133	31	10	223	76	42	17	305	837	912	126	178	682	434	333	29	535	3,229	40.1
3168	Junction R. No. 4 - Bypass Pranburi	1+000	812	406	54	3,612	870	603	67	837	7,262	1,767	475	158	1,891	628	951	22	938	6,830	-1.5
3168	Bypass Pranburi	4+000	326	213	46	1,746	526	351	7	404	3,620	1,343	475	192	1,193	464	918	7	538	5,129	9.1
3168	Bypass Pranburi (E) - Km. 12+710	6+000	285	201	10	1,138	892	567	2	263	3,358	1,203	252	34	868	244	882	7	385	3,875	3.6
3169	Junction R. No. 4 - Chai Thale	0+500	243	56	32	875	376	303	8	389	2,282	1,118	66	126	2,063	698	816	5	690	5,583	25.1
3171	Muni. of Phetchaburi - Ban Dai It - R. No. 3204	1+375	343	142	16	256	86	282	52	350	1,527	2,366	964	1,384	1,983	1,480	1,080	103	968	10,330	61.3
3172	Junction Khao Yoi Railway Station	1+100	118	7	4	432	94	57	38	140	890	121	2	26	474	82	66	27	254	1,046	4.1
3173	Phetchaburi - Khao Luang	0+500	613	494	22	551	108	102	30	395	2,314	1,844	759	76	2,007	258	270	22	1,227	6,463	
3174	Junction R. No. 4 - Ban Tha	1+150	395	193	32	521	538	720	26	102	2,527	1,298	48	42	718	616	3,414	2	340	6,468	
3175	Tha Yang - Khuan Phet	0+750	855	173	38	742	692	594	99	426	3,620	765	29	8	1,182	104	348	25	500	2,962	
3176	Phetchaburi - Ban Laem	2+300	653	226	252	401	374	384	24	167	2,480	653	182	268	1,722	504	591	26	632	4,577	
3177	Phetchaburi - Had Chao Samran	0+500	879	215	14	961	228	327	29	597	3,250	1,921	393	270	3,029	696	732	23	1,107	8,171	
3179	Muni. of Phetchaburi - R. No. 4	0+500	666	83	0	520	298	114	21	532	2,234	2,296	292	58	1,038	329	303	19	1,235	5,561	25.6
3180	Junction R. No. 4 - Tha Samet	1+800	12	2	2	190	260	168	6	77	717	474	25	8	391	352	522	20	223	2,015	29.5
3181	Junction R. No. 4 - Tha Sae	0+500	811	81	158	924	848	225	7	439	3,493	1,690	201	326	1,934	740	333	10	996	6,220	15.5
3187	Khan Phet - Ban Kula*	10+350*	-	-	-	-	-	-	-	-	-	235	43	20	1,588	470	825	16	775	3,972	-
3201	Junction R. No. 4 - Pathiu - R. No. 3180 (Ton Makham)	8+000	279	15	16	465	566	229	3	152	1,724	1,113	29	18	658	452	243	7	225	2,745	12.3
3203	Junction R. No. 4 - Hup Taphong	1+500	632	34	32	291	622	1,068	25	158	2,863	180	18	6	876	172	360	9	218	1,839	-10.5
3204	Route No. 4 - Petchaburi	3+950	57	116	20	380	182	540	32	50	1,377	213	96	12	785	270	750	17	395	2,539	16.5
3205	Wat Chan - Ras Sat	0+500	34	34	2	114	46	72	16	27	345	82	52	28	103	64	354	12	62	758	21.7
3206	Junction R. No. 4 (Pak Tho) - Tha Yang	0+600	205	34	82	802	346	6,966	14	212	8,661	339	103	130	1,566	390	3,798	8	417	6,751	-6.0
3206	Tha Yang - Hin Sa - Pong Krit Thung	1+000	111	24	38	467	164	3,660	8	116	4,588	34	10	24	278	78	9	1	42	476	-43.3
3209	Tha Maka - Km. 4+000 (Kanchanaburi Dist.)	0+500	312	30	44	2,676	246	3,900	24	860	8,091	1,791	1,060	24	4,892	2,130	3,564	58	1,709	12,424	11.3
3209	Km. 4+000 (Ratpong Dist.) - Nongtakya	18+000	103	25	52	997	288	2,271	2	123	3,861	391	7	72	2,297	716	4,236	0	358	8,077	20.3
3209	Junction R. No. 3209 0101 - Khao Chong	6+700**	19	9	8	495	44	231	10	79	894	208	270	286	392	304	360	65	241	2,126	24.2
3209	Nongtakya - Kanchanaburi Dist.	29+300**	152	24	54	951	202	1,767	0	170	3,321	255	20	72	2,233	342	1,335	3	376	4,636	8.7
3209	Ratchaburi Dist. - Dan Makham Tia	44+750**	-	-	-	-	-	-	-	-	-	185	28	90	1,198	308	618	17	302	2,747	-
3209	Dan Makham Tia - Kong Phanom Sat	59+450**	199	47	58	980	372	1,233	2	168	3,060	856	26	80	909	172	327	1	258	2,629	-3.7
3209	Wang Pla Mu - Wang Lan	1+750**	37	8	4	125	228	396	4	104	906	224	15	14	813	184	423	6	236	1,915	20.6
3217	Junction R. No. 4 - Yang Chum	0+500	63	53	0	699	268	390	6	124	1,595	102	56	0	1,736	376	456	3	382	3,111	18.2
3218	Junction R. No. 4 - Huai Mong Khon	3+000	2,022	88	102	957	628	642	7	198	4,645	1,472	153	156	2,180	710	489	1	559	5,719	5.3
3219	Nong Ta Phao - Walai School	0+500**	1,095	28	906	590	276	69	15	109	3,087	436	110	180	2,870	896	1,773	10	309	6,585	20.8
3236	Junction R. No. 325 (Hua Pho) - Pho Hak	0+500	396	95	24	680	348	948	29	201	1,016	361	91	180	1,541	538	1,962	51	476	5,200	50.4
3236	Junction R. No. 325 (Hua Pho) - Pho Hak	8+000*	-	-	-	-	-	-	-	-	-	1,016	124	290	422	1,478	30	12	170	3,543	-
3236	Pho Hak - R. No. 3097	12+750*	-	-	-	-	-	-	-	-	-	1,408	40	82	355	1,190	1,719	8	171	4,973	-
3253	Junction R. No. 4 - Thung Maha	15+000	29	6	10	321	20	87	1	142	616	289	71	58	547	118	66	2	189	1,340	21.5
3273	Khok Sung - Nong Pet	8+000	422	64	14	887	219	2,214	10	192	4,021	369	92	104	1,715	538	2,142	7	596	5,565	8.5
3291	Junction R. No. 4 (Chedi Hak) - R. No. 3087 (Khao Ngu)	3+000	1,179	161	310	3,468	1,186	3,270	6	549	10,129	5,466	345	604	2,793	1,444	3,165	4	839	14,660	9.7
3301	Junction R. 3219 (Nong Phlap) - Yang Chum	0+500	27	10	2	411	232	414	12	67	1,175	84	9	38	1,033	520	387	17	260	2,348	18.9
3305	Junction R. No. 323 (Tha Nam Tun) - R. No. 3228 (Khao Pun)	1+000	116	16	4	736	302	405	23	143	1,745	248	61	44	1,099	488	1,068	2	352	3,362	17.8
3313	Junction R. No. 3087 (Chat Pa Hwai) - Pong Krathang	0+800	149	1	80	851	248	384	6	176	1,895	246	76	118	2,066	358	330	5	389	3,588	17.3
3324	Junction R. No. 3313 - Huai Sua	0+500	8	3	2	126	104	30	9	68	350	33	5	0	351	108	15	6	259	776	22.0
3325	Junction R. No. 4 - Hat Sai Yai	0+500	529	22	36	44	30	27	4	110	781	799	3	16	21	60	171	10	266	1,345	14.6
3335	Junction R. No. 4 (Ban Sung) - R. No. 323* (Bang Kra Do)	4+000	201	34	10	889	306	252	21	196	1,909	251	17	14	1,498	312	6,258	25	352	8,727	46.2
3337	Junction R. No. 4 (Chan Na Si) - Thung Luang	0+900	308	120	134	690	598	6,027	20	298	8,194	314	104	184	1,800	528	10,533	10	575	14,048	14.4
3337	Thung Luang - R. No. 3206 (Hin Si)	11+500	18	5	106	515	212	252	11	109	1,228	328	10	108	277	154	171	4	164	1,216	-0.2
3338	Junction R. No. 4 (Chan Na Si) - Kha Bua	1+100	62	9	12	286	108	150	12	78	717	112	20	18	369	236	435	19	282	1,691	23.9
3339	Ratchaburi - Khu Bua	4+500	81	59	24	264	158	33	23	56	698	291	91	12	750	78	36	12	390	1,668	24.3
3349	Junction R. No. 4 (Nong Khuang) - Nong Ya Plong	0+500	239	56	0	383	110	1,110	5	66	1,969	585	319	480	1,196	476	2,190	19	247	5,511	29.3
3357	Nong Tak Ya - Khao Khwang	24+400	95	12	14	192	254	1,224	10	125	1,927	282	27	26	1,292	590	2,385	3	145	4,750	25.3
3361	Dan Makham Tia - Pak Dong	0+500	33	1	2	264	72	345	5	107	829	85	3	0	577	98	318	7	258	1,346	12.9
3394	Junction R. No. 323 (Laik Kae) - Huai Krabok-Nong Khaem	0+500	257	49	12	1,707	238	2,484	64	657	5,467	595	68	40	3,043	388	2,361	35	1,355	7,886	9.6
3400	Junction R. No. 3301 - Thung Kham	0+500	10	2	46	7	4	0	0	9	79	0	0	0	252	0	0	1	44	297	39.3
3410	Kho Lok Sang - Huai Sok	13+500**	33	46	16	104	72	132	17	36	456	262	57	18	187	190	252	12	55	1,033	22.7
3411	Don Yang - Huai Sak	2+700	3	0	0	105	22	15	2	80	227	40	17	26	361	50	12	1	128	635	29.3
3416	Junction R. No. 3301 - Km. 7+100	0+500	8	4	2	41	8	3	0	18	86	0	0	0	393	18	3	0	89	503	56.2

Table 9.5.5 Traffic on DOH Highways in the WSB (PCU Per Day)

Route	Location	Station Km	1990 AADT (PCU)									1994 AADT (PCU)									1990-94 Growth Rate in Total PCU
			Car & Taxi (1.0 PCU)	Light Bus (1.0 PCU)	Heavy Bus (2.0 PCU)	Light Truck (1.0 PCU)	Medium Truck (2.0 PCU)	Heavy Truck (3.0 PCU)	Bicycles/ Tricycles (0.2 PCU)	Motorcycles (0.3 PCU)	Total PCU	Car & Taxi (1.0 PCU)	Light Bus (1.0 PCU)	Heavy Bus (2.0 PCU)	Light Truck (1.0 PCU)	Medium Truck (2.0 PCU)	Heavy Truck (3.0 PCU)	Bicycles/ Tricycles (0.2 PCU)	Motorcycles (0.3 PCU)	Total PCU	
3432	Junction R. No. 3410 (Hin Lat) - Kaeng Kachan Dam	0+500	28	23	12	106	54	51	12	28	314	150	48	24	138	96	153	8	42	657	20.2
3459	Junction R. No. 4 - Pak Khlong Ban Khrod	8+232	27	5	2	203	150	102	38	349	876	269	22	10	293	182	216	3	221	1,216	8.6
3463	Junction R. No. 4 - Nikom Prachuap Khirikhan	0+500*	-	-	-	-	-	-	-	-	-	1,676	73	174	2,689	3,800	360	12	446	9,230	-
4001	Muna. of Chumphon - Pak Nam Chumphon	5+500	971	592	102	1,698	860	651	3	466	5,343	2,241	821	252	2,994	1,196	1,302	9	901	9,716	16.1
4002	Langsuan - Pak Nam Langsuan	0+533	126	150	12	659	250	144	6	423	1,769	1,139	353	34	1,574	614	315	15	1,103	5,146	30.6
4003	Khuan To Lom - Sawi - Bo Kha	3+850	113	97	2	390	186	66	1	289	1,144	183	108	14	1,574	324	303	1	622	3,129	28.6
4006	Junction R. No. 4 (Ratchakrut) - Lang Suan	2+500**	302	215	78	266	282	6	0	10	1,139	806	35	92	191	340	108	0	56	1,628	9.4
4096	Junction R. No. 41 - Pak Nam Ta Ko	2+700	46	2	0	283	116	264	5	154	870	164	2	4	842	110	93	2	353	1,570	15.9
4097	Junction R. No. 41 - Bang Nam Chut	6+200	15	23	2	105	80	81	3	76	385	309	68	72	236	198	690	7	164	1,744	45.9
4098	Pak Nam Chumphon - Hat Sai Ri	2+600	96	226	72	488	142	114	2	242	1,382	413	198	212	882	628	153	2	464	2,952	20.9
4099	Junction R. No. 41 - Mae Nam Lang Suan	5+500	15	9	2	135	80	33	7	126	407	107	41	28	223	120	114	8	179	820	19.1
4119	Junction R. No. 4001 (Pak Khlong) - HongYan Chumphon	7+600	728	231	98	1,518	952	792	1	323	4,642	2,121	437	286	2,072	998	1,137	6	706	7,763	13.7
4134	Lang Suan - R. No. 4112 (La Mae)	7+500	25	77	36	167	64	6	9	128	511	31	97	80	547	210	147	19	299	1,430	29.5
4139	Junction R. No. 41 (Na Nua) - Khao Thalu	4+700	56	30	34	976	140	174	6	153	1,569	73	0	80	1,296	242	222	1	242	2,156	8.3
4198	Junction R. No. 41 - Pak Ta Ko	0+500	6	8	0	117	28	72	0	64	309	47	0	4	381	84	39	1	137	693	22.4

	Total PCU 1990	Total PCU 1994	1990-1994 Growth Rate in Total PCUs
Total (including stations with one *, but not with **)	914,077	1,454,046	12.3
1-digit roads	339,828	523,421	11.4
2-digit roads	76,064	90,252	4.4
3-digit roads	255,380	453,873	15.5
4-digit roads	242,805	386,501	12.3

Note: * denotes that comparable data for 1990 not available

** denotes that data is basically comparable, although the station in 1994 was moved up to few km away from the station in 1990

Certain growth rates negative according to data reported by DOH

Source: Department of Highways

Table 9.5.6A Interprovincial Road Cargo Flows in 1994 (Agricultural Commodities)

Units: tons

PROVINCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1. Kanchanaburi		4,635	1,460	547	16,044		1,265,170	1,075,438	2,005,444	22,399	2,338,422	155,948		2,175	6,887,682
2. Samut Songkram	6,843					547	474,137	8,065	13,346	3,421	18,472	7,890		5,699	538,420
3. Ratchaburi		1,095					3,412,679	94,472	101,935	23,197	62,944	279,346		42,187	4,017,855
4. Petchaburi	3,284	730	3,193		9,627		572,441	276,893	51,002	3,285	47,720	55,884		23,480	1,047,539
5. Prachuap Khirikhan			5,475				590,557	21,666	66,376	33,980	47,715	19,753		5,790	791,312
6. Chumphon	456						160,442	34,989	11,172	12,084	26,505	38,547		13,617	297,812
7. Bangkok and vicinity	388,490	212,108	852,186	300,884	187,440	88,797		202,272					48,430	NA	2,280,607
8. Suphan Buri	34,912	7,659	247,172	19,710	23,777	10,399	1,300,472		3,920,907	197,902	146,253	51,894	2,006	63,305	6,026,368
9. Northern Region	33,556	14,503	114,355	74,756	65,676	10,146		107,195							420,187
10. Central Region (excluding BMA)	7,025	2,554	87,359	9,580	4,422	19,544		20,450					1,459	1,185	153,578
11. Northeastern Region	73,931	7,435	106,667	63,281	56,176	14,960		32,739					2,325		357,514
12. Eastern Region	4,889	58,004	126,301	19,068	21,348			13,893	46,114						289,617
13. Ranong		821					217,709	2,326	10,218	6,384	5,930	25,366		30,741	
14. Other South	34,124	7,389	6,615	4,515	7,707	5,793		37,534					319		103,996
Total	587,510	316,933	1,550,783	492,341	392,217	150,186	7,993,607	1,927,932	6,226,514	302,652	2,693,961	634,628		188,179	23,212,487

Notes: (1) Agricultural commodities include live animals, maize, rice, cassava, sugar cone, wood, animal fodder, sugar, other foodstuffs, and other agricultural commodities.
(2) Only flows relevant to the WSB are shown.

Source: Annual Survey (Land Transport Department-MOTC)

Table 9.5.6B Interprovincial Road Cargo Flows in 1994 (Minerals)

Units: tons

PROVINCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1. Kanchanaburi		17,927	64,692	3,285	3,695		27,599								117,198
2. Samut Songkram			1,825				33,531	4,105	17,747	6,570	8,210	17,702		684	90,374
3. Ratchaburi							4,311		1,870		3,375				9,556
4. Petchaburi														2,303	2,303
5. Prachuap Khirikhan												13,687		456	14,143
6. Chumphon							3,421			1,642	25,319				30,382
7. Bangkok and vicinity	352,806	144,183	614,514	421,027	384,788	289,385		31,559							2,238,262
8. Suphan Buri							18,993		6,570	3,119					28,682
9. Northern Region	2,007		49,019												51,026
10. Central Region (excluding BMA)	273		2,190					1,093							3,556
11. Northeastern Region			10,948												10,948
12. Eastern Region	21,896	5,910	13,000	4,447		3,421		2,964							51,638
13. Ranong														273	273
14. Other South						3,420		456							3,876
Total	376,982	168,020	756,188	428,759	388,483	296,226	87,855	40,177	26,187	11,331	36,904	31,389		3,716	2,652,217

Notes: (1) Minerals include solid mineral fuels, petroleum products, ores/metal wastes, and metal products.

(2) Only flows relevant to the WSB are shown.

Source: Annual Survey (Land Transport Department-MOTC)

Table 9.5.6C Interprovincial Road Cargo Flows in 1994 (Construction Materials)

Units: tons

PROVINCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1. Kanchanaburi		7,026	4,927				5,356,328	124,906				3,193			5,496,380
2. Samut Songkram							796,526								796,526
3. Ratchaburi	2,281	35,585					30,330,607	16,329	22,903	116,887	19,706	15,054		1,368	30,560,720
4. Petchaburi		4,562					1,759,354				4,562	3,285		8,798	1,780,561
5. Prachuap Khirikhan							9,124		7,300						16,424
6. Chumphon				1,095			4,562							456	6,113
7. Bangkok and vicinity	36,862	149,456	193,142	105,251	85,222	16,150		61,653					12,774		660,510
8. Suphan Buri	7,755		3,921		456		330,826		8,484	154,294	2,433	182		865	509,216
9. Northern Region	13,505		14,006		912			17,470							45,893
10. Central Region (excluding BMA)	152,656	71,719	379,211	297,640	146,127	39,418		66,320					48,360		1,201,451
11. Northeastern Region			8,623	1,596											10,219
12. Eastern Region	6,022	2,737	20,939	4,653				30,154					2,281		66,786
13. Ranong							7,299			2,737				912	
14. Other South															
Total	219,081	271,085	624,769	410,235	232,717	55,568	38,594,626	316,832	38,687	273,918	26,701	21,714		12,399	41,150,799

Notes: (1) Construction materials include sand/gravel/clay/slag, cement, and other minerals and building materials.
(2) Only flows relevant to the WSB are shown.

Source: Annual Survey (Land Transport Department-MOTC)

Table 9.5.6D Interprovincial Road Cargo Flows in 1994 (Fertilizer and Chemicals)

Units: tons

PROVINCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1. Kanchanaburi							57,574							1,824	59,398
2. Samut Songkram			2,555	3,193			7,436								13,184
3. Ratchaburi							68,474	2,190	10,083	1,825	3,375	5,109			91,056
4. Petchaburi							3,792					2,737			6,529
5. Prachuap Khirikhan							8,896								8,896
6. Chumphon							4,562							2,189	6,751
7. Bangkok and vicinity	92,613	14,689	100,003	104,887	81,253	49,226		84,615					14,598		541,884
8. Suphan Buri	3,193		1,003				7,338		365	592	365	1,368		365	14,589
9. Northern Region								2,190							2,190
10. Central Region (excluding BMA)			1,825		4,380			365							6,570
11. Northeastern Region		912													912
12. Eastern Region			1,460					547							2,007
13. Ranong							1,825							547	
14. Other South															0
Total	95,806	15,601	106,846	108,080	85,633	49,226	159,897	89,907	10,448	2,417	3,740	9,214	14,598	4,925	753,966

Notes: Only flows relevant to the WSB are shown.

Source: Annual Survey (Land Transport Department-MOTC)

Table 9.5.6E Interprovincial Road Cargo Flows in 1994 (Equipment and Other Manufactured Articles)

Units: tons

PROVINCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1. Kanchanaburi							278,715				1,093				279,808
2. Samut Songkram							20,439		1,461	730	1,003				23,633
3. Ratchaburi							588,534		25,258	9,118	96,340	33,668		1,411	754,329
4. Petchaburi							10,354		729		820	4,197		136	16,236
5. Prachuap Khirikhan							23,355		227		912	6,158		1,368	32,020
6. Chumphon								365					456	1,048	1,869
7. Bangkok and vicinity	138,919	8,255	506,498	55,655	104,791			64,385							878,503
8. Suphan Buri			4,470		456		22,243	0	4,835	8,207	2,098	547		228	43,084
9. Northern Region	4,287		18,885					7,023							30,195
10. Central Region (excluding BMA)	5,839	1,825	26,596	547				9,298							44,105
11. Northeastern Region	21,988		78,238		13,504			6,249							119,979
12. Eastern Region			48,496	1,825				912							51,233
13. Ranong	547						319		1,095		547				
14. Other South															0
Total	171,580	10,080	683,183	58,027	118,751	0	943,959	88,232	33,605	18,055	102,813	44,570	456	4,191	2,274,994

Note: Only flows relevant to the WSB are shown.

Source: Annual Survey (Land Transport Department-MOTC)

Table 9.5.6F Interprovincial Road Cargo Plans in 1994 (Miscellaneous and Containers)

Units: tons

PROVINCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
1. Kanchanaburi			91				36,403	227	3,740		3,922				44,383
2. Samut Songkram	4,106		730				19,200	2,372		456	365	2,737			29,966
3. Ratchaburi	912						112,448	1,960	6,703	2,643	6,021	91			130,778
4. Petchaburi					2,555		41,422	363	2,233	136	547	2,554			49,810
5. Prachuap Khirikhan							11,402		273			45			11,720
6. Chumphon							4,106	456			912	2,737			8,211
7. Bangkok and vicinity	244,768	78,511	256,847	250,746	233,680	124,961		129,259					66,882		1,385,654
8. Suphan Buri	501	182	2,869	821	2,919		29,349	0	2,462	1,137	1,733				41,973
9. Northern Region	730	1,925	4,017	2,007	5,201	28		4,562							18,470
10. Central Region (excluding BMA)		1,732	7,160	1,368	319			1,959							12,538
11. Northeastern Region	25,349	821	11,402	3,832	23,723	4,744		7,207							77,078
12. Eastern Region	2,555	1,687	5,426		547	2,281		455					17		12,968
13. Ranong							3,832		912	1,825					
14. Other South		456	6,386	319	45			1,139					821		9,166
Total	278,921	85,314	294,928	259,093	268,989	132,014	258,162	149,959	16,323	6,197	13,500	8,164	67,720	0	1,832,715

Note: Only flows relevant to the WSB are shown.

Source: Annual Survey (Land Transport Department-MOTC)

Table 9.5.7 ***Road Accidents on DOH Highways in the WSB, 1992-1994***

Province	No. of Accidents (Annual Average)	Number of Fatalities	Number of Casualties
Kanchanaburi	165	145	310
Ratchaburi	200	93	215
Samut Songkram	25	16	30
Petchaburi	126	63	198
Prachuap Khirikhan	196	126	278
Chumphon	377	187	442
Total	1,089	630	1,473

Note: The number of accidents and casualties appears low in relation to the number of fatalities.

Source: Department of Highways (data from other sources may differ)

Table 9.5.8A Project Proposals Affecting the Study Area from DOH's Long-Term Strategic Plan (1996-2011)

Type of Improvement	Timing	Location	Length (km.)	Total Cost (Mil. Baht)	Recommended Source of Finance		
					DOH	Private	Aid
Motorway	1996 - 2001	Ban Pong-Cha Am	122	15,705.0	1,400.0	25,640.0	0.0
Widening to Dual 5-Lane	1996 - 2001	Nakhon Chaisi-Nakhon Pathom-Ban Pong (Route 4)	24	1,044.9	1,044.9		
Widening to Dual 2-Lane	2001-2006	Samut Songkram-Ratchaburi (Route 325)	44	858.4	858.4		
Widening to Dual 3-Lane	2001-2006	Ban Pong-Petchaburi (Route 4)	87	1,205.3	1,205.3		
Widening to Dual 3-Lane	2001 - 2006	Cha Am-Pranburi-Prachuap Khiri Khan (Route 4)	114	1,588.2			1,588.2
Widening to Dual 3-Lane	2001 - 2006	Ban Pong-Kanchanaburi (Route 323)	34	469.1	469.1		
Widening to Dual 3-Lane	2006 - 2011	Petchaburi-A. Cha Am (Route 4)	34	473.0	473.0		
Widening to Dual 3-Lane	2006 - 2011	Prachuap Khiri Khan-Chumphon (Route 4)	174	2,345.8			2,345.8
New Construction	2006 - 2011	Nakhon Chaisi-Nakhon Pathom-Ratchaburi	54	3,488.4	3,488.4		

Note: Additional motorway proposals were put forward for the period from 2011 to 2016

Source: Wilbur Smith and Associates, Inc., Asian Engineering Corp., Ltd , and PADECO Co., Ltd , *Long-Term Strategic Study: Highway Planning and Investment* , Final Report, Volume II, Chapter 12, 1996.

Table 9.5.8B Project Proposals Affecting the Study Area from DOH's Motorway Plan (1997-2011)

Motorway Number	Section	Timing	Length (Km)	Total Cost (Mil. Baht)
8	Bangkok - Pak Tho	2002-2006	67	36,800
	Pak Tho - Cha Am	1997-2001	72	10,080
	Cha Am - Chumphon	2002-2006	266	19,550
	Chumphon - Ban Nasan	2007-2011	200	15,940
51	Bangkok - Suphanburi	2007-2011	62	5,590
81	Bang Yai - Ban Pong	1997-2001	53	9,140
	Ban Pong - Kanchanaburi	2002-2006	47	4,010
84	Pak Tho - Ban Pong	1997-2001	62	11,780
91	Ban Pong - Singburi	2007-2011	134	12,390
	Singburi - Saraburi	2002-2006	70	6,050
	Saraburi - Bang Pakong	1997-2001	120	10,100

Source: Department of Highways

Table 9.5.8C Project Proposals Affecting the Study Area from the 8th Plan (1997-2001)

No.	Highway No.	Route	Length (Km)	Total Cost (Mil. Baht)	Timing	Province
		Widening Projects				
1	4	Hua Hin - Pranburi	16	100	1997-2001	P. Khirikhan
2	325	Damnoen Saduak - Samut Songkram	18	550	1997-1999	Samut Songkram
3	3208	Route 4 (Khao Wang) - Nampu	19	500	1997-1999	Ratchaburi
4	-	Kanchanaburi - Nakhon Pathom - Suphanburi - Saraburi - Chachoengsao	287	6,300	1997-2001	Kanchanaburi, Nakhon Pathom, Suphanburi, Saraburi, Chachoengsao
5	-	Pathumtani - Ladlumkhaw - Bang Lane	41	1,500	1997-2001	Pathumtani, Nakhon Pathom
		Improvement Projects				
6	3168	Route 4 - Paknam Pranburi	13	90	1998-2000	P. Khirikhan
7	3169	Route 4 - Beach (A. Bang Saphan)	15	150	1998-2000	P. Khirikhan
8	3175	Petch Dam - Khao Look Chang	17	90	1998-2000	Phetchaburi
9	3499	Petch Dam - Kaeng Krachan	25	130	1998-2000	Phetchaburi
		Intercity Motorway Projects				
10	-	Ban Pong - Pak Tho	62	17,500	1997-2001	Ratchaburi
11	-	Pak Tho - Cha Am	72	11,900	1997-2001	Ratchaburi
		New Link Projects				
12	353	Ta Yang - Nong Yaplong	20	220	1997-1999	Petchaburi
13	-	Krathumban - Ban Phaw - Damnoen Saduak	50	400	1997-1999	Samut Sakhon, Samut Songkram
14	-	*Nakorn Chaisri - Ratchaburi*				
		"Spare Highway" to the South				
15	-	Kanchanaburi - Ratchaburi - Ta Yang - Nong Yaplong - Yangchum - Nong Plub - Yangchum (Kuiburi) - P. Khirikhan Estate			1997-2001	Kanchanaburi Ratchaburi P. Khirikhan
		Pranburi - Chumphon			1997-2001	P. Khirikhan

Source: Department of Highways

Table 9.5.9 Traffic at WSB Coastal Ports (1993)

Units: tons

Port	International			Domestic			Total		
	Inward	Outward	Total	Inward	Outward	Total	Inward	Outward	Total
Mekong									
Samut Songkhram	64,265	89	64,354	685,656	28,545	714,202	749,921	28,635	778,556
Ban Laem									
Petchaburi	87,550	53,152	140,702	14,833	135,613	150,446	102,383	188,765	291,148
Ko Lak									
Prachuap Khirikhan	0	17,246	17,246	21,235	0	21,235	21,235	17,246	38,481
Paknam									
Chumphon	145,520	0	145,520	80,966	23,419	104,385	226,486	23,419	249,905
Total	297,335	70,487	367,822	802,690	187,577	990,268	1,100,025	258,065	1,358,090

Source: Harbour Department

Table 9.5.10 Financial Highlights of the State Railway of Thailand (SRT)

Units: Million Baht (unless otherwise stated)

Item	1986	1987	1988	1989	1990	1991	1992	1993
Assets	18302	18599	20066	20762	21449	22666	24709	27845
Liabilities	11614	11974	13171	13287	14346	15380	18091	19641
Equity	6689	6625	6896	7475	7103	7286	6618	8204
Revenues	3332	3370	3701	4036	4545	5489	5852	4705
Costs	4376	4355	4251	4628	5340	6268	7031	5634
Profits before Tax	-1035	-986	-550	-592	-795	-778	-1178	-929
Capital Expenditures	1447	737	1261	1817	1542	8198	2103	10943
Remittance to Government	0	0	0	0	0	0	0	0
Subsidy	78	904	904	1431	1452	1646	2689	2984
Number of Employees	26329	25769	25063	25019	25769	25864	25284	21004
% Return on Assets (Profit/Total Assets)	-5.7%	-5.3%	-2.7%	-2.9%	-3.7%	-3.4%	-4.80%	-3.3%
% Return on Equity (Profit/Equity)	-15.5%	-14.9%	-8.0%	-7.9%	-11.2%	-10.7%	17.8%	-11.3%
% Return on Sales (Net Income/Sales)	-31.1%	-29.3%	-14.9%	-14.7%	-17.5%	-14.2%	-20.1%	-19.7%
Debt Equity	173.6%	180.7%	191.0%	177.8%	202.0%	211.1%	273.4%	239.4%
EFFICIENCY INDICATORS 1993 Prices								
Revenue per Employee	0.17	0.17	0.19	0.20	0.20	0.23	0.24	0.22
Cost per Employee	0.23	0.22	0.22	0.22	0.24	0.26	0.29	0.27
Profit per Employee	-0.05	-0.05	-0.03	-0.03	-0.04	-0.03	-0.05	-0.04
Operating Ratio (Cost/Revenue)	131.1%	129.3%	114.9%	114.9%	117.5%	114%	120.1%	119.7%

Source : The World Bank

Table 9.5.11A Railway Passenger Transport to/from the Western Seaboard, 1994

Province	Origin		Destination		Total	
	Passengers	Passenger-km ('000)	Passengers	Passenger-km ('000)	Passengers	Passenger-km ('000)
Kanchanaburi	630,936	74,315	474,588	48,814	1,105,524	123,129
Ratchaburi	453,080	38,943	505,866	51,614	958,946	90,557
Samut Songkhram	254,342	7,178	230,541	7,412	484,883	14,590
Petchaburi	192,448	20,169	190,541	19,558	382,974	39,727
Prachuap Khirikhan	504,483	72,875	463,884	57,848	968,367	130,723
Chumphon	928,258	144,918	938,124	145,570	1,866,382	290,488
Western Seaboard	2,963,547	358,398	2,803,529	330,816	5,767,076	689,214
Kingdom	58,253,975	6,142,518	58,253,975	6,142,518	116,507,950	6,424,520

Source: State Railway of Thailand

Table 9.5.11B Rail Freight Transport by Commodity Group and Changwat of Unloading and Loading in Western Seaboard, 1994

Units: Tons

Commodity Group	Changwat of Loading								Changwat of Unloading							
	K	R	SS	P	PKK	C	WSB	KT	K	R	SS	P	PKK	C	WSB	KT
Live Animals	-	1,892	-	-	1,880	-	3,772	445,449	-	-	-	-	-	-	0	445,451
Rice	-	1,804	-	1,498	95	182	3,579	280,000	-	3,172	-	838	3,625	19,751	27,386	280,006
Maize	754	117	-	-	135	1,587	1,839	7,035	-	-	-	-	-	-	0	7,036
Cassava	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0
Sugar Cane	-	-	-	-	-	-	0	349	-	-	-	-	-	-	0	349
Rubber	-	998	-	-	-	107	1,105	45,183	-	-	-	-	-	-	0	45,188
Wood, Timber	131	252	-	12	12	53	329	116,837	-	19,581	-	585	8,615	244	29,025	117,130
Other Agricultural Products	431	7,194	-	27,837	27,131	33,420	95,582	1,795,864	294	16,949	-	843	4,455	26,956	49,497	1,795,865
Animal fodder	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0
Sugar	-	1,031	-	-	-	-	1,031	51,239	-	-	-	-	-	-	0	51,238
Other Foodstuffs	-	5,981	-	-	-	-	5,981	53,294	-	-	-	-	-	-	0	53,284
Solid Mineral Fuels	-	-	-	-	-	1	1	6,975	-	-	-	-	-	-	0	6,971
Petroleum Products	-	50	-	-	-	-	50	2,328,848	-	-	-	-	12	-	12	2,328,844
Ores and Metal Wastes	-	-	-	-	-	-	0	211,647	-	-	-	-	-	-	0	211,647
Metal Products	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0
Sand, Gravel, Clay, and Slag	-	-	-	-	15	-	15	6,547	-	-	-	-	-	-	0	6,549
Cement	-	-	-	82,574	-	-	82,574	1,865,168	-	-	-	-	-	42,658	42,658	1,865,165
Other Minerals	-	-	-	-	-	-	0	239,598	-	-	-	-	-	-	0	239,596
Fertilizers	60	-	-	-	-	-	0	1,804	-	8	-	30	-	227	265	1,803
Chemicals	-	-	-	-	-	3	3	153	-	-	-	-	-	2	2	152
Equipment, Other Manufactured Articles	27	46	1	18	292	262	619	15,379	68	110	-	100	231	282	791	15,377
Miscellaneous Articles, Containers	5,955	1,158	-	43	977	231	2,409	223,852	3,869	35,722	-	245	663	1,317	41,816	223,851
Unknown	-	4,725	-	529	10	4	5,268	53,183	24	-	-	16	-	32	72	53,183
Total	7,358	25,248	1	112,511	30,547	35,850	204,157	7,748,404	4,255	75,542	0	2,657	17,601	91,469	191,524	7,748,685

Note: K=Kanchanaburi, R=Ratchaburi, SS=Samut Songkhram, P=Petchaburi, PKK=Prachuap Khirikhan, C=Chumphon, WSB=Western Seaboard, and KT=Kingdom Total

Source: State Railway of Thailand

Table 9.5.12 DOH's Traffic Growth Forecasts for the WSB, 1997-2011

Province	Motorcycle			Passenger Car			Light Bus			Heavy Bus			Light Truck			Medium Truck			Heavy Truck			Total		
	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11
Kanchanaburi	10.7	8.6	7.7	9.8	8.1	7.4	5.7	5.3	5.3	7.8	6.8	6.6	10.2	8.3	7.6	8.9	7.5	7.0	9.9	8.1	7.4	9.5	8.7	7.3
Ratchaburi	10.9	8.7	7.9	10.0	8.2	7.6	5.8	5.4	5.5	7.9	6.9	6.7	10.4	8.4	7.8	9.1	7.6	7.3	10.2	8.2	7.7	9.7	8.8	7.4
Samut Songkram	11.2	9.4	7.4	10.2	8.9	7.1	5.7	5.8	5.1	7.9	7.5	6.3	10.6	9.1	7.3	9.2	8.2	6.8	10.3	8.9	7.1	9.9	9.1	7.5
Petchaburi	10.5	8.5	8.0	9.6	8.1	7.7	5.6	5.3	5.5	7.6	6.8	6.8	10.0	8.3	7.9	8.7	7.5	7.3	9.7	8.1	7.8	9.3	8.6	7.4
Prachuap Khirikhan	10.0	8.1	7.6	9.3	7.7	7.3	5.2	5.1	5.3	7.2	6.5	6.5	9.6	7.9	7.5	8.3	7.1	7.0	9.3	7.7	7.3	8.9	8.3	7.1
Chumphon	9.6	8.0	7.3	8.8	7.6	7.1	5.2	5.1	5.2	7.0	6.5	6.3	9.1	7.8	7.2	8.0	7.1	6.7	8.9	7.6	7.1	8.0	8.0	6.9

Note: (1) Forecasts rounded to one decimal place.
(2) Total based on weighted average of vehicle composition in the WSB: motorcycles, 19 per cent; passenger cars, 17 per cent; light buses, 3 per cent; heavy buses, 3 per cent; light trucks, 32 per cent; medium trucks, 8 per cent; and heavy trucks, 18 per cent.

Source: Department of Highways

Table 9.5.13 Traffic Growth Forecasts for the WSB, 1997-2011

Province	Motorcycle			Passenger Car			Light Bus			Heavy Bus			Light Truck			Medium Truck			Heavy Truck			Total		
	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11	97-01	02-06	07-11
Kanchanaburi	12.8	10.3	9.2	11.8	9.7	8.9	6.8	6.4	6.4	9.4	8.2	7.9	12.2	10.0	9.1	10.7	9.0	8.4	11.9	9.7	8.9	11.4	10.4	8.8
Ratchaburi	13.1	10.4	9.5	12.0	9.8	9.1	7.0	6.5	6.6	9.5	8.3	8.0	12.5	10.1	9.4	10.9	9.1	8.8	12.2	9.8	9.2	11.6	10.6	8.9
Samut Songkram	13.4	11.3	8.9	12.2	10.7	8.5	6.8	7.0	6.1	9.5	9.0	7.6	12.7	10.9	8.8	11.0	9.8	8.2	12.4	10.7	8.5	11.9	10.9	9.0
Petchaburi	12.6	10.2	9.6	11.5	9.7	9.2	6.7	6.4	6.6	9.1	8.2	8.2	12.0	10.0	9.5	10.4	9.0	8.8	11.6	9.7	9.4	11.2	10.3	8.9
Prachuap Khirikhan	12.0	9.7	9.1	11.2	9.2	8.8	6.2	6.1	6.4	8.6	7.8	7.8	11.5	9.5	9.0	10.0	8.5	8.4	11.2	9.2	8.8	10.7	10.0	8.5
Chumphon	11.5	9.6	8.8	10.6	9.1	8.5	6.2	6.1	6.2	8.4	7.8	7.6	10.9	9.4	8.6	9.6	8.5	8.0	10.7	9.1	8.5	9.6	9.6	8.3

Source: The Study Team

Table 9.5.14 Forecasts of Traffic Growth by Road Type

Units: %

Road Type	1997*-2001	2002-2006	2007-2011
1-digit	10.1	9.2	7.5
2-digit	6.1	5.2	3.7
3-digit	14.1	13.2	11.7
4-digit	11.1	10.2	8.7

*Also assumed for 1994 to 1996.
Source: The Study Team

Table 9.5.15 Forecast Growth in Road Freight Tonnages by Commodity Type

Units: %

Commodity Type	1997-2001	2002-2006	2007-2011
Agricultural Commodities	3.0	2.5	2.0
Construction Materials	12.0	10.0	9.5
Other Freight	12.0	10.0	9.5

Source: The Study Team

Table 9.5.16 Air Mode Split by Commodity Type for Thai Exports, 1994

Commodity Group	%Baht	%Tons	Commodity Group	%Baht	%Tons	Commodity Group	%Baht	%Tons
Live Animals	63.3	32.1	Soap Wash Prep Polish Candle	3.3	0.8	Prepared Feather & Article	13.6	2.2
Meat Edible Meat Offial	0.2	0.2	Albuminodal Substance Glue	5.6	0.6	Stone Cement Plaster Article	2.1	0.8
Fish Crustacean Mollusc	2.2	4.5	Explosive Pyrotech Product	3.0	2.0	Ceramic Product	4.7	0.5
Dairy Produce Bird Egg Honey	10.5	3.3	Photo and Cine Goods	61.2	16.1	Glass and Glassware	8.0	0.2
Produce of Animal Origin	5.0	0.5	Misc Chemical Product	6.2	19.3	Precious Stone & Metal	91.3	7.0
Live Tree and Other Plants	92.1	86.3	Artificial Resin & Plastic	3.6	0.8	Iron and Steel	1.3	0.6
Edible Vegetable	5.4	0.4	Rubber & Plastic	1.9	0.6	Article of Iron & Steel	6.3	4.6
Edible Fruit and Nut	27.8	33.2	Raw Hide Skin	19.5	10.4	Copper	2.5	1.5
Coffee Tea Spice	0.3	0.1	Article of Leather	29.4	14.4	Nickel	26.2	4.1
Cereal	0.0	0.0	Fur skin & Artificial Manufac	15.5	4.4	Aluminium	3.2	1.8
Product of Milling Industry	0.1	0.0	Wood & Article	4.9	6.2	Lead	2.3	-
Oil Seed Olsaginous Fruit	25.1	5.7	Cork & Article	39.5	80.0	Zinc	0.5	-
Raw Material for Dyeing Lac	0.1	0.0	Manufact of Plait Material	6.9	4.1	Tin	6.2	2.7
Vegetable "Plaiting Carying"	0.2	0.1	Pulp of Wood or Oth Fibrous	0.0	-	Other Base Material	33.6	0.6
Animal & Vegetable Fat & Oil	0.5	0.2	Paper Paperboard & Article	4.5	0.5	Tool Cutlery Fork Spoon	12.8	6.5
Prepared Meat Fish	3.4	4.4	Book Picture Newspaper	9.1	23.7	Misc Article Base Metal	9.0	1.6
Sugar and Confectionery	0.0	0.0	Silk & Silk Waste	52.1	18.6	Boiler Machinery	51.2	12.6
Cocoa and Preparations	0.3	0.2	Wool & Animal Hair	0.2	0.1	Electrical Machinery	42.3	13.8
Prep of Cereal Flour Starch	1.1	0.4	Cotton	2.3	0.9	Locomotive Rolling Stock	11.5	11.1
Prep of Veg Fruit Plant	0.5	0.1	Oth Veg Textile Material	0.6	0.0	Vehicle	1.9	3.4
Misc Edible Preparation	0.8	0.3	Man-Made Filament	1.8	0.6	Aircraft	99.7	88.6
Beverage Spirit Vinegar	3.3	0.2	Man-Made Staple Fibres	2.3	0.5	Ship Floating Structure	15.6	11.1
Waste From Food Industry	2.1	1.3	Wadding Rope Coated Fabric	1.8	1.0	Optical Photo Cine Apparat	38.8	22.4
Tobacco	0.2	0.2	Carpets & Oth Textile Floor	13.8	6.2	Clock Watch	80.0	35.9
Salt Sulphur Earth Cement	0.6	0.1	Special Woven Fabric	21.1	8.5	Musical Instrument	3.9	1.6
Metallic Ore Slag Ash	3.4	0.1	Impregnated Coated Cover	0.9	0.4	Arms Ammunition	62.2	8.0
Mineral Fuel Oil Wax	18.0	15.7	Knit & Clochet Goods	2.9	2.4	Furniture	9.3	7.0
Inorganic Chemical	1.8	1.1	Apparel & Clothing Acc	23.1	16.0	Toy Game Sport Requisite	8.8	5.1
Organic Chemical	6.5	0.9	Oth Textile Article	21.5	15.8	Misc. Manufactured Article	16.0	8.2
Pharmaceutical Product	20.5	3.6	Oth Made up Textile Article	11.7	4.5	Work of Art. Collectors	28.4	8.9
Fertilizer	2.0	2.7	Footwear	15.1	11.0	Special Transaction	77.6	20.3
Tanning Dyeing Extract Paint	42.5	4.5	Headgear	31.8	27.7	Total	25.8	2.0
Essential Oil Perfumery	11.0	3.0	Umbrella Sunshade Whip	21.0	20.4			

Note: Commodity groups are as provided by the Department of Customs.
Source: Department of Customs and the Study Team

Table 9.5.17 Proportion of the Value of Thailand's Trade Attributed to Trade with Western-Situated Countries, 1988 and 1994

Units: %

Region	Imports		Exports		Total	
	1988	1994	1988	1994	1988	1994
Indian Subcontinent	1.5	0.9	1.9	0.7	1.7	0.8
Middle East	4.1	2.5	5.4	2.6	4.7	2.5
Europe-West	19.3	13.3	20.6	13.2	19.9	13.2
Europe-East	1.6	1.7	0.7	1.1	1.2	1.4
Africa	1.5	0.9	3.0	1.4	2.2	1.1
Total of Western-Situated Countries	28.1	19.3	31.6	18.9	29.7	19.1
Total of Thailand's Trade with the World	100	100	100	100	100	100

Source: National Statistical Office and International Monetary Fund (Direction of Trade Statistics)

Table 9.5.18 Long List of Transport Projects by Subsector and Geographic Impact

Road Projects

Intraregional

R1[1] Roads to Support Specific Industrial Developments
R2 Links between Ratchaburi and other Provincial Capitals (i.e., Kanchanaburi, Samut Songkhram)
R3 Pathiu-Route 4 and Pathiu-Bang Saphan Links
R4 Hua Hin-Prachuap Khirikhan-Chumphon Scenic Road
R5 Secondary/Feeder Road Improvements
RP6A Urban Ring/Bypass Roads
RP6B Urban (Municipal) Road Project
R7 Rural Road Project
R8 Reinvestment in Existing Roads (e.g., Upgraded Road Maintenance)

Interregional

R9 Outer-Outer Orbital Route for the Extended Bangkok Metropolitan Region
R10 North-South Link(s) with the BMA
R11 Chumphon (Bang Saphan)-Ranong Links[2]

Subregional

RP12A Kanchanaburi-Tavoy/Dawei Link
RP12B Kraburi (Route 4)-Manang (Myanmar)-Victoria Point/Kawthaung Link
RP12C Kanchanaburi-Three Pagodas Pass-Moulmein/Mawlamyine Link

Road Transport Projects

Interregional Projects

RT1 Intercity and Rural Bus Transport Improvement Project
RT2 Truck Terminal Project
RT3 Road Safety Project

Water Transport Projects

Interregional

WT1 Prachuap Deep-Sea Port Extension Project
WT2 Chumphon Feeder Port Project
WT3 Samut Songkram Feeder Port Project
WT4 Ban Laem Feeder Port Project

Table 9.5.18 Long List of Transport Projects by Subsector and Geographic Impact (Continued)

WT5	Gulf of Thailand "Inland Navigation" Promotion Project
WT6	Mae Klong River Navigation Project
WT7	Hua Hin/Cha Am Tourist Pier Project
	Subregional
WT8	Tavoy/Dawei Deep-Sea Port Development
WT9	Ranong/Phangnga Port Development
	Railway Projects
	Interregional
RW1	Improvement of the Southern Main Line
RW2	Completion of Missing Link to Connect the Southern Line with the Northern and Northeastern Lines
RW3	Samut Songkram-Pak Tho Link
RW4	Development of Spur Lines or Long Loop Lines to Major Industrial Estates
RW5	Freight Transport Improvement
RW6	Tourist Train to Hua Hin/Cha Am
	Subregional
RW7	Thailand-Myanmar Railway Project
	Air Transport Projects
	Interregional
AT1	Aggressive Marketing of Chumphon (Pathiu) Airport
AT2	Expansion of Hua Hin Airport
AT3	Expansion of Ratchaburi Airport
	Subregional
AT4	Subregional Air Linkage Agreement

Notes: (1) The numbers generally indicate a reverse hierarchy from intraregional (i.e., within the WSB only), to interregional (i.e., between WSB and other regions of Thailand), to subregional (i.e., international). The numbers do not necessarily indicate project priority.

(2) Also subregional when linked with Ranong-Phangnga Port Development (WT9).

Source: The Study Team

Table 9.5.19 Long List of Transport Projects by Geographic Impact and Subsector

Intraregional

Road Projects

R1[1]	Roads to Support Specific Industrial Developments
R2	Links between Ratchaburi and other Provincial Capitals (i.e., Kanchanaburi, Samut Songkhram)
R3	Pathiu-Route 4 and Pathiu-Bang Saphan Links
R4	Hua Hin-Prachuap Khirikhan-Chumphon Scenic Road
R5	Secondary/Feeder Road Improvements
RP6A	Urban Ring/Bypass Roads
RP6B	Urban (Municipal) Road Project
R7	Rural Road Project
R8	Reinvestment in Existing Roads (e.g., Upgraded Road Maintenance)

Interregional

Road Projects

R9	Outer-Outer Orbital Route for the Extended Bangkok Metropolitan Region
R10	North-South Link(s) with the BMA
R11	Chumphon (Bang Saphan)-Ranong Links[2]

Road Transport Projects

RT1	Intercity and Rural Bus Transport Improvement Project
RT2	Truck Terminal Project
RT3	Road Safety Project

Water Transport Projects

WT1	Prachuap Deep-Sea Port Extension Project
WT2	Chumphon Feeder Port Project
WT3	Samut Songkram Feeder Port Project
WT4	Ban Laem Feeder Port Project
WT5	Gulf of Thailand "Inland Navigation" Promotion Project
WT6	Mae Klong River Navigation Project
WT7	Hua Hin/Cha Am Tourist Pier Project

Table 9.5.19 Long List of Transport Projects by Geographic Impact and Subsector (Continued)

Railway Projects

RW1 Improvement of the Southern Main Line
RW2 Completion of Missing Link to Connect the Southern Line with the Northern and Northeastern Lines
RW3 Samut Songkram-Pak Tho Link
RW4 Development of Spur Lines or Long Loop Lines to Major Industrial Estates
RW5 Freight Transport Improvement
RW6 Tourist Train to Hua Hin/Cha Am

Air Transport Projects

AT1 Aggressive Marketing of Chumphon (Pathiu) Airport
AT2 Expansion of Hua Hin Airport
AT3 Expansion of Ratchaburi Airport

Subregional

Road Projects

RP12A Kanchanaburi-Tavoy/Dawei Link
RP12B Kraburi (Route 4)-Manang (Myanmar)-Victoria Point/Kawthaung Link
RP12C Kanchanaburi-Three Pagoda Pass-Moulmein/Mawlamyine Link

Water Transport Projects

WT8 Tavoy/Dawei Deep-Sea Port Development
WT9 Ranong/Phangnga Port Development

Railway Transport Projects

RW7 Thailand-Myanmar Railway Project

Air Transport Projects

AT4 Subregional Air Linkage Agreement

Notes: (1) The numbers generally indicate a reverse hierarchy from intraregional (i.e., within the WSB only), to interregional (i.e., between WSB and other regions of Thailand), to subregional (i.e., international). The numbers do not necessarily indicate project priority.
(2) Also subregional when linked with Ranong-Phangnga Port Development (WT9).

Source: The Study Team

Table 9.5.20 Long List of Major Corridors for Transport Development (by Geographic Impact and Land/Water/Air Impact)

INTERREGIONAL

Land

L1 North-South (RP10, RW1, RW3)

L2 East-West via Outer-Outer Orbital Route for the Extended Bangkok Metropolitan Region (RP9, RW2, RW6)

L3 Chumphon-Ranong (RP10) (linking with Myanmar via WT9)

Water

W1 Chumphon/Prachuap-Laem Chabang/Map Ta Phut (see WT1-WT2, WT5)

W2 (Mae Klong River)/Samut Songkhram (or Ban Laem)/Laem Chabang (see WT6, WT3, WT4, WT5)

W3 Cha Am/Hua Hin-Bangkok (WT7)

W4 Chumphon/Prachuap-Songkhla (WT1-WT2, WT5)

Air

A1 Chumphon-Bangkok (AT_1)

A2 Hua Hin-Bangkok-Other Domestic (AT_2)

SUBREGIONAL/GLOBAL

Land

L4 (Ratchaburi)-Kanchanaburi-Tavoy/Dawei Corridor (RP12A and WT8) linking with Bangkok and Indochina to the east

L5 Kanchanaburi-Three Pagoda Pass-Mawlamyine Link (RP12C)

L6 Kraburi (Route 4)-Marang (Myanmar)-Kawthaung/Victoria Point link (RP12B)

Table 9.5.20 Long List of Major Corridors for Transport Development (by Geographic Impact and Land/Water/Air Impact) (Continued)

Water	
W5	Prachuap Port-(Laem Chabang)-Indochina-Eastern Situated Countries (e.g., Japan, United States)(WT1, WT5)(and to Singapore and the World)
W6	Tavoy-Dawei Port-Western Situated Countries (e.g., in the Indian Subcontinent, the Middle East, and Europe)(see WT8)(and to Singapore and the World)
W7	Ranong-Kawthaung/Victoria Point (see WT9)
W8	Ranong/Phangnga-Western Situated Countries (e.g., in the Indian Subcontinent, the Middle East, and Europe)(and to Singapore and the World)
Air	
A3	Chumphon-Dawei
A4	Chumphon-Penang
A5	Ratchaburi-International
A6	Hua Hin-International

Source: The Study Team

Table 9.5.21 Analysis of Highway Capacity Requirements in the North-South Corridor in the WSB

Location	Station Km	PCU (1994)	No. of Lanes in 1997	PCU			Lanes Required by Year		
				2001	2006	2011	2001	2006	2011
Bypass Don Krabuang (E)	76+400	52,151	4	102,276	158,813	227,997	8	10	12
Km.79+845 (Ban Pong Dist) Bupass E-ChangB	80+000	51,455	4	100,911	156,694	224,954	8	10	12
Bypass E-Chang (B) - Bypass E-Chang (E)	86+900	7,835	4	15,366	23,860	34,254	4	4	4
Bypass E-Chang	84+500	47,261	4	92,686	143,922	206,619	6	8	12
Bypass From Km.93+930 - Km.106+189	93+500	45,214	4	88,672	137,688	197,670	6	8	12
Bypass Ratchaburi	104+800	25,982	4	50,955	79,122	113,590	4	6	8
Bypass Ratchaburi (E) - Wang Manao Bridge	112+500	26,639	4	52,243	81,123	116,462	4	6	8
Wang Manao Bridge Km.49+447	136+500	34,618	4	67,891	105,421	151,345	6	8	10
Bypass Petchaburi	12+000	32,685	4	64,100	99,534	142,894	6	6	8
Bypass Petchaburi (E) -Junction Cha Am	179+500	34,141	4	66,956	103,968	149,260	6	8	10
Junction Cha Am-Junction to Nong Kae	216+920	21,709	4	42,576	66,110	94,909	4	6	6
Junction to ong Kae - Junction to Pranburi	251+100	29,166	4	57,199	88,818	127,510	4	6	8
Junction to Pranburi - Junction to Kuiburi	292+400	26,248	4	51,476	79,932	114,753	4	6	8
Junction to Kuiburi - Junction to Prachuap Khirikhan	314+200	40,552	4	79,529	123,491	177,288	6	8	10
Junction Thap Sakae - Km.364+486 (Chumphon Dist)	364+200	16,155	4	31,682	49,196	70,627	4	4	6
Junction to Bang Saphan - Km.423+600 Bridge	400+400**	15,023	4	29,462	45,749	65,679	4	4	6
Hoaiphraek Banhthaiai Bridge - Junction Tha Sae	465+700	13,007	4	25,509	39,610	56,865	4	4	6

Notes: (1) PCU (1994) from Table 9.5.5

(2) Traffic growth rates for Route 4 from Table 9.5.14

(3) Widening to 6 lanes assumed to be warranted with greater than 57,000 PCU per day, while widening to 8 lanes is assumed to be warranted with greater than 100,000 PCU per day. See PADECO Co., Ltd., *Preparation of an Investment Programme for the Department of Highways*, Final Report, Volume 1, Man Text, Asian Development Bank T.A. No. 1362-THA, p. B-24, April 1992. A prorating of capacities was applied for considering widening to 10 lanes and more, e.g., widening to 10 lanes required with 150,000 PCU per day and 12 lanes with 200,000 PCU per day.

Source: The Study Team

Table 9.5.22 Bus Terminals in the WSB

Province	Existing Situation	Terminal Improvement Plan
Kanchanaburi	One third-class terminal at Tambon Bannua, Amphoe Muang	One third-class terminal at Amphoe Thong Pa Phum
Ratchaburi	One (new) third-class terminal at Tambon Na Muang (Don Tako), Amphoe Muang	One third-class terminal at Ban Pong in 2001
Samut Songkram	None	One third-class terminal planned in 1995, but delayed due to land acquisition problems
Petchaburi	None	One third-class terminal at Amphoe Muang in 1998 and one at Hua Hin in 2001
Prachuap Khirikhan	None	One third-class terminal at Amphoe Muang in 1998
Chumphon	No official terminal, but reportedly an unofficial one is operated.	One first-class terminal at Amphoe Muang, construction begun in 1995, operation to commence in 1997.

Note: First-class terminals serve 10 or more bus lines, second-class terminals from 7 to 9 bus lines, and third-class terminals from 5 to 6 bus lines.

Source: Land Transport Department

Table 9.5.23 Preliminary Prioritization and Implementation Phasing of Transport Projects by Subsector and Geographic Impact

Projects	Priority	Implementation Phasing			Remarks
		1997-2001	2002-2006	2007-2011	
Road Projects					
Intraregional					
RP1 Roads to Support Specific Industrial Developments	High	×	×	×	The project is essential to support important industrial development projects (e.g., at Bang Saphan, Chumphon).
RP2 Links between Ratchaburi and other Provincial Capitals (Kanchanaburi-Samut Songkram)	Medium		×		The segment between Ratchaburi and Kanchanaburi is required to connect with the Kanchanaburi-Tavoy/Dawei Link (RP12A).
RP3 Pathiu-Route 4 and Pathiu-Bang Saphan Links	High	×			The project would provide essential support for the Chumphon (Pathiu) airport investment (both links) and Bang Saphan industrial estate investment (Pathiu-Bang Saphan link).
RP4 Hua Hin-Prachuap Khirikhan-Chumphon Scenic Road	Medium		×	×	Certain segments show reasonable economic rates of return (e.g., the Phetchaburi Coastal Road), while other segments (e.g., in Chumphon Province) will not need to be made into high-grade roads until late in the planning period.
RP5 Secondary/Feeder Road Improvements	High	×	×	×	With recent and forecast rapid traffic growth on three- and four-digit roads in the region, and considering the importance of such roads from the region's socioeconomic development, a high priority is attached to improvement of these roads.
RP6A Urban Ring/Bypass Roads	Medium		×	×	Although the need for development of urban ring/bypass roads in the region's main urban centers is not immediate, the provide support for sound urban planning in the future.
RP6B Urban (Municipal) Road Project	High	×	×	×	These improvements are given high priority in accordance with the strong emphasis on equity and decentralization in the Eighth Plan.
RP7 Rural Road Project	High	×	×	×	The project is accorded high priority for dispersal of the benefits of economic development throughout the region, especially in the provinces with the lowest rural road density (i.e., Kanchanaburi, Phetchaburi, Prachuap Khirikhan, and Chumphon).

Table 9.5.23 **Preliminary Prioritization and Implementation Phasing of Transport Projects by Subsector and Geographic Impact**

Projects	Priority	Implementation Phasing			Remarks
		1997-2001	2002-2006	2007-2011	
RP8 Reinvestment in Existing Roads (e.g., Upgraded Road Maintenance)	High	×	×	×	It is accepted and well-advised practice for maintenance activities to have "first call" on available financial and logistical resources.
Interregional					
RP9 Outer-Outer Orbital Route for the Extended Bangkok Metropolitan Region	High	×	×		From an interregional transport perspective, the route would facilitate the movement of interregional freight traffic with origins and destinations outside of Bangkok; from a metropolitan development perspective, the route would activate a number of medium-size cities with high development potential located about 50-100 km from Bangkok.
RP10 North-South Link(s) with the BMA	Medium	×	×	×	The main north-south artery in the WSB, Route 4, will have been widened into a four-lane divided highway throughout the region by the end of 1997; a capacity assessment undertaken in this study showed that various other projects should be implemented during the coming 15 years, although some could perhaps be delayed and others accelerated.
RP11 Chumphon-Ranong Links	Medium	×	×		Traffic is relatively low at present (e.g., 3,330-7,500 PCU per day) between the two neighboring provincial capitals; however, with the development of ports at Chumphon (WT2) and Ranong/Phangnga (WT9), as well as a coastal shipping network in the Gulf of Thailand (WT5), the feasibility of the project would be much enhanced.
Subregional					
RP12A Kanchanaburi-Tavoy/Dawei Link	High	×	×		The highest priority of the strategic east-west corridors to Myanmar, designed to support Thailand's proposal for Subregional Economic Cooperation; it is closest to Bangkok of the corridors. Detailed study is required to confirm feasibility, however.
RP12B Kraburi (Route 4)-Manang (Myanmar)-Victoria Point/Kawthaung Link	Low			×	While the project would open another strategic corridor, it should proceed only after completion of the first one (RP12A).

Table 9.5.23 Preliminary Prioritization and Implementation Phasing of Transport Projects by Subsector and Geographic Impact

Projects	Priority	Implementation Phasing			Remarks
		1997-2001	2002-2006	2007-2011	
RP12C Kanchanaburi-Three Pagoda Pass-Moulmein/Mawlamyine Link	Low			×	While the project would open another strategic corridor, it should proceed only after completion of the first one (RP12A).
Road Transport Projects					
Interregional Projects					
RT1 Intercity and Rural Bus Transport Improvement Project	Medium	×	×		Since bus terminals are a weak component in the intercity bus transport system, new terminals should be developed, beginning in 1997-2001; most problems in intercity and rural bus transport must be addressed at the national level, however.
RT2 Truck Terminal Project	Medium		×		While LTD puts a higher priority on developing truck terminals in other parts of the country, the WSB offers possible sites, especially at Ratchaburi (Bang Pong) and Kanchanaburi.
RT3 Road Safety Project	High	×	×	×	Road safety is an important transport and public health issue in the WSB, but only certain issues can be addressed at the regional level (e.g., addressing accident blackspots, implementing road user publicity campaigns, improving emergency medical services).
Water Transport Projects					
Interregional					
WT1 Prachuap Deep-Sea Port Extension Project	High	×	×		Prachuap Port is an essential component of the plan for the Bang Saphan Industrial Estate and for supporting other development in the port's hinterland. It is the most suitable site for deep-sea port development in the WSB.

Table 9.5.23 **Preliminary Prioritization and Implementation Phasing of Transport Projects by Subsector and Geographic Impact**

Projects	Priority	Implementation Phasing			Remarks
		1997-2001	2002-2006	2007-2011	
WT2 Chumphon Feeder Port Project	Medium	×	×		Chumphon is at present a suitable site for development of at least a ro-ro ferry port, with a 1993 study estimating an economic rate of return of 18.2 per cent for such an investment. Moreover, a larger coastal port may be warranted if additional traffic materializes (e.g., from the Chumphon industrial estate/free trade zone, opening a corridor to Ranong).
WT3 Samut Songkhram Feeder Port Project	Medium		×		Port development at Samut Songkram is hindered by the quantity of dredging required, but dredging for smaller vessels at least (e.g., 2,500-2,600 dwt ro-ro vessels) may be justified, especially if an industrial estate/free trade zone is developed there.
WT4 Ban Laem Feeder Port Project	Low			×	Port development at Ban Laem is hindered by the quantity of dredging required.
WT5 Gulf of Thailand "Inland Navigation" Promotion Project	High	×	×	×	The project is consistent with the (draft) water transport development strategy of the Eighth Plan (e.g., by easing Bangkok traffic congestion and promoting multimodal transport), is expected to promote the Thai shipping industry, and will have subregional as well as interregional effects as Laem Chabang begins to serve as a gateway to Indochina.
WT6 Meklong River Navigation Project	Medium		×		A 1988 study found an economic rate of return of 15.0 per cent for the project, but recommended waiting until establishment of a sugar terminal at Laem Chabang. With such a terminal now in place, the project may be viable; one concern, however, is that the earlier study may have over-estimated future sugar traffic.
WT7 Hua Hin/Cha Am Tourist Pier Project	Medium		×		The project could assist the promotion of tourism in the Hua Hin/Cha Am area.

Table 9.5.23 Preliminary Prioritization and Implementation Phasing of Transport Projects by Subsector and Geographic Impact

Projects	Priority	Implementation Phasing			Remarks
		1997-2001	2002-2006	2007-2011	
Subregional					
WT8 Tavoy/Dawei Deep-Sea Port Development	High	×	×		The project is an essential element of the highest priority of the strategic east-west corridors to Myanmar (RP12A), designed to support Thailand's proposal for Subregional Economic Cooperation; detailed study is required to confirm feasibility, however.
WT9 Ranong/Phangnga Port Development	Medium		×		While a planned coastal port development in Ranong appears suitably sized to serve likely demand in the near future, with a strengthened land link between Chumphon and Ranong (RP11), there may be merit in building a deep-sea port in the Phangnga area, particularly if the western port were connected with a new deep-sea port at Khanom on the east coast.
Railway Projects					
Interregional					
RW1 Improvement of the Southern Main Line	Medium	×	×	×	This project, the highest priority of the railway proposals, includes short- and long-term components; it is an interregional project with subregional (and regional) components, as the Southern Main Line leads to Malaysia and Singapore (and is part of the Trans-Asian Railway promoted by ESCAP).
RW2 Completion of Missing Link to Connect the Southern Line with the Northern and Northeastern Lines	Low			×	The project involves new railway construction, which is quite costly, although it provides a missing link that would enable some interregional railway traffic to bypass Bangkok.
RW3 Samut Songkram-Pak Tho Link	Low				The project involves especially costly new railway construction since major bridges are required.
RW4 Development of Spur Lines or Long Loop Lines to Major Industrial Estates	Low				The forecast traffic density at Bang Saphan, perhaps the most suitable location to be served, may still be less than required to justify a spur line, although it could be expected that more traffic would move by rail if a spur line was constructed.

Table 9.5.23 **Preliminary Prioritization and Implementation Phasing of Transport Projects by Subsector and Geographic Impact**

Projects	Priority	Implementation Phasing			Remarks
		1997-2001	2002-2006	2007-2011	
RW5 Freight Transport Improvement	Medium	×	×	×	The project involves a number of cost-effective measures to increase rail freight traffic.
RW6 Tourist Train to Hua Hin/Cha Am	Low				The project has become increasingly difficult to justify with the upgrading of road transport to Hua Hin/Cha Am in recent years.
Subregional					
RW7 Thailand-Myanmar Railway Project	Low				The project is a very long-term proposal that would provide a missing link of the Trans-Asia Railway.
Air Transport Projects					
Interregional					
AT1 Aggressive Marketing of Chumphon (Pathiu) Airport	Medium	×			The project is designed to derive maximum benefits from newly constructed infrastructure.
AT2 Expansion of Hua Hin Airport	Low				With the decreasing mode share of air for travelers to Hua Hin/Cha Am, and with the high costs of runway extension, the project is not likely to be feasible.
AT3 Expansion of Ratchaburi Airport	Low				The operator of the Ratchaburi Airport may pursue certain "niche" markets (e.g., aviation education and training) within the existing runway configuration.
Subregional					
AT4 Subregional Air Linkage Agreement	Low (for WSB)			×	Although a Subregional Air Linkage Agreement should be implemented as soon as possible, it will be well into the next century before benefits will accrue to WSB airports.