

Royal Government of Cambodia

TRAFFIC CHARACTERISTICS AROUND PUOK MARKET



Rural Transport Infrastructure Research
Puok District, Siem Reap Province, Kingdom of Cambodia



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TRAFFIC CHARACTERISTICS AROUND PUOK MARKET

Rural Transport Infrastructure Research

By

Bas Rozemuller

Sovithea Khun

Samrith Yan

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Executive Summary

This study examines traffic characteristics around Puok market in Puok district, Siem Reap. Puok market is the second largest market in the Siem Reap province and an important trade centre for rural and town people. The results are largely descriptive and provide insight into rural travel patterns in Cambodia.

Traffic count teams were set up in five locations along roads leading to and from the market to assess traffic type and volume. Origin and Destination surveys were conducted on road users around the market area to gather more detailed information about journey types and transport load. In light of the heavy school related traffic, surveys were also conducted amongst the teachers and students of local schools.

The traffic counts revealed that the busiest times on the roads are in the mornings. Half of all daily traffic was recorded before 11 a.m. Bicycles and motorcycles were the most common vehicles. Heavier vehicles like trucks or cars were more likely to travel to Puok market along National Highway 6 or rural road 602 suggesting that supplies for the market are mainly transported along these roads. Traffic numbers also suggest that Puok market is more important to those living west rather than east of the market. School travel resulted in significant travel patterns around the Puok market area.

The O&D survey found that a third of vehicles in the Puok market area were carrying produce or products. All vehicle types were used for transporting goods, with differences in weight and type of goods carried. The most frequent of these was rice. Figures indicate that National Highway 6 is important not just for the Puok market traffic but for district travel in general. Eighty percent of market-bound traffic originated in Puok district and the majority of this originated in Puok commune. Motorcycles are the most popular form of transport in communes further from the district centre. Bicycles are more common in communes closer to Puok centre.

Generally, the people from the furthest communes visited the market less frequently. The average travel time to the market from the villages in Puok commune was 12 minutes and villages made an average of 2.3 market trips per day.

The school surveys found that students travelled 16.2 minutes to get to school. Most travelled by bicycle or walked. High school students go to school twice a day, increasing school related travel. There are significant variations in school travel time between communes.

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INTRODUCTION

The International Labour Organisation (ILO) has been building and maintaining rural roads in Siem Reap Province since 1993. All these initiatives have used Labor Based Appropriate Technology (LBAT). To complement this construction and maintenance, the ILO introduced a planning methodology called IRAP – Integrated Rural Accessibility Planning. IRAP is designed to prioritise Rural Transport Infrastructure (RTI) investments. The ILO UPSTREAM Project, primarily funded by the Swedish International Development Cooperation Agency (SIDA) with additional financial and technical assistance support from the Netherlands, Ireland and Australia, began infrastructure planning activities in the Puok district of Siem Reap province in 1999.

A series of socioeconomic studies began in conjunction with the IRAP activities. These RTI studies all related to IRAP and other ILO UPSTREAM activities. This report presents the first results of these research activities.

The object of this RTI research was to obtain a detailed profile of the vehicular traffic around Puok market. A Pilot was conducted in September 1999 to test the research instruments. The questionnaires were developed by the socioeconomic team and piloted in Kandal and Siem Reap. This provided information on the time needed to complete the surveys and contributed to the planning of data collection. The pilot also provided information on the different vehicle types used in rural Cambodia. Following the pilot, some changes were made to improve the instruments.

Three activities were used to gather data - a traffic count study, an Origin & Destination (O&D) survey and a school survey. The first two studies were carried out simultaneously and took place over one week in October 1999. Upstream Project teams recorded and interviewed road users from 5 a.m. until 6 p.m. on National Highway 6 and the rural roads leading to Puok market. During the seven day survey, approximately 450,000 vehicle movements were recorded and 120,000 road users were interviewed. The school survey - intended to get travel information from students and teachers - was completed after the roadside surveys.

These studies are largely descriptive. The aim was to collect data about the traffic around Puok market including vehicle origin and destination, load carried, travel time and frequency. Puok market is the largest rural market in the province. In terms of stalls, it is second only to Leuh market in Siem Reap town. It is the commercial centre of Puok district which is a major agricultural area producing wet and dry season rice, fish, maize, pigs and poultry. Furthermore, Puok district with approximately 110,000 inhabitants, has the largest population of the twelve districts in Siem Reap province.

These surveys increase the understanding of rural travel patterns in Cambodia and serve as a baseline for future impact assessments. They also help inform the IRAP procedure since studies like O&D surveys are primarily planning tools. The methodologies used in these studies will be included in a manual written for the Ministry of Rural Development covering social and economic planning, management and monitoring of the rural transport programme.

TRAFFIC COUNT

To study the traffic flows around Puok district centre, the traffic count team observed all vehicle movements at five locations on the roads leading to Puok market. Two of these locations were on National Highway 6. Three were on ILO rehabilitated and maintained rural roads that lead to the Puok district centre (see map, Appendix 1). The team divided the traffic into ten different vehicle categories based on the information from the pilot study. Table 1 shows these categories.

No.	Vehicle Type
1	Bicycle
2	Motorbike
3	Motor trailer (remorque)
4	Animal drawn cart ¹
5	Car
6	Pickup
7	Koyun ²
8	Truck
9	Handcart
10	Other

Table 1: Vehicle Categories

The study counted 452,520 vehicle movements over seven days. Traffic volume was similar on different days of the week. On average, about 65,000 vehicles passed the cordon points daily (in both directions). On Sunday, there was less traffic on National Highway No. 6, although there was no difference in traffic density on rural roads 602, 603 or 606.

Time of Day

The traffic count began at 5 a.m. and finished at 6 p.m. A comparison of traffic density at different hours of the day shows that on all roads, peak hour is 6 to 7 a.m. Over ten percent of the daily traffic passed the observation posts during this hour (see Figure 1).

¹ In Cambodia, oxen, horses or water buffalo pull carts. To simplify coding, the term ‘animal drawn carts’ is used throughout the report.

² A *koyun* is a local vehicle that uses an irrigation pump engine - *ko* is the Khmer for ox and *yun* means machine.

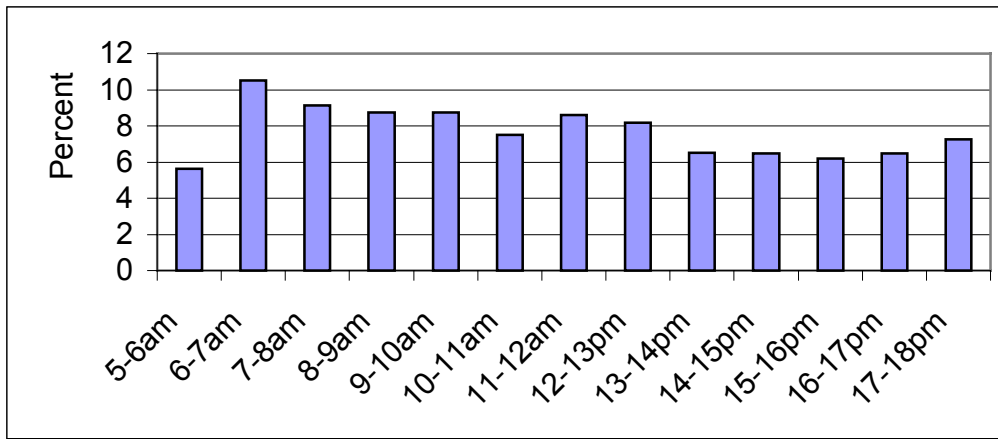


Figure 1: Percentages of Total Traffic by Hour

In general, the roads were busier in the morning. Figure 1 shows that the number of vehicles per hour was higher before 1 p.m. If this information is put in a cumulative table, the distinction is clearer - half of the daily vehicles passed the traffic count teams before 11 a.m.

Hour of the Day	Percentage of Total Traffic	Cumulative Percentage of Traffic
5-6 a.m.	5.62 %	5.62 %
6-7 a.m.	10.52 %	16.14 %
7-8 a.m.	9.13 %	25.27 %
8-9 a.m.	8.76 %	34.03 %
9-10 a.m.	8.76 %	42.79 %
10-11 a.m.	7.51 %	50.30 %
11-12 p.m.	8.61 %	58.91 %
12-1 p.m.	8.17 %	67.08 %
1-2 p.m.	6.51 %	73.59 %
2-3 p.m.	6.47 %	80.06 %
3-4 p.m.	6.20 %	86.26 %
4-5 p.m.	6.47 %	92.73 %
5-6 p.m.	7.27 %	100 %

Table 2: Traffic Density Percentages by Hour

Traffic Density at Different Locations

There was little difference in traffic density according the days of the week, however there were significant differences in traffic numbers recorded at the five locations. The busiest location by a substantial margin was the cordon point on National Highway No. 6, west of Puok district centre. Table 3 compares the total number of vehicles at the two checkpoints on National Highway No. 6 for the seven survey days.

Time	National Highway No 6 Location 1			National Highway No 6 Location 2		
	Inbound	Outbound	Total	Inbound	Outbound	Total
5-6 a.m.	2,480	3,286	5,766	6,652	3,962	10,614
6-7 a.m.	3,317	6,532	9,849	13,422	10,156	23,578
7-8 a.m.	3,907	3,919	7,826	10,080	9,315	19,395
8-9 a.m.	3,741	3,350	7,091	8,719	10,409	19,128
9-10 a.m.	3,415	3,532	6,947	9,012	10,156	19,168
10-11 a.m.	4,813	3,648	8,461	7,970	11,075	19,045
11-12 p.m.	5,846	3,602	9,448	8,308	7,844	16,152
12-1 p.m.	2,671	2,622	5,293	5,356	6,822	12,178
1-2 p.m.	2,290	3,541	5,831	5,696	5,364	11,060
2-3 p.m.	2,361	2,188	4,549	5,002	5,997	10,999
3-4 p.m.	2,999	2,399	5,398	5,688	5,760	11,448
4-5 p.m.	3,175	2,562	5,737	6,164	8,268	14,432
5-6 p.m.	3,483	2,544	6,027	5,894	6,290	12,184
Total	44,498	43,725	88,223	97,963	101,418	199,381
<i>Aver/day</i>	<i>6,357</i>	<i>6,246</i>	<i>12,603</i>	<i>13,995</i>	<i>14,488</i>	<i>28,483</i>

Table 3: Traffic Density at the National Highway Traffic Count Locations

There were more than double the number of vehicles counted on the west of Puok district centre (towards Banteay Meanchey province) than counted on the east side of Puok (towards Siem Reap). This was true of both inbound and outbound traffic. This finding demonstrates that Puok centre is more important for people to the west of Puok than to those east. This is explained as communities east of Puok district centre also have Siem Reap town as a socioeconomic centre in their vicinity, while those in the west have only Puok.

Table 3 shows that school children account for a significant part of the traffic movements around Puok centre. There are large differences between the in and outgoing traffic during the morning hours of 6 to 7 a.m., 10 to 12 a.m. and the afternoon hours 1 to 2 p.m. and 3 to 6 p.m. The other hours are fairly balanced. The largest schools are located east of the district centre (Siem Reap side). The National Highway traffic count location east of Puok counted many outbound vehicles in the early morning and early afternoon and then substantial inbound traffic late morning and late afternoon. The opposite was true for the National Highway traffic count location west of Puok.

Time	Rural Rd 602 Location 3			Rural Rd 603 Location 4			Rural Rd 606 Location 5		
	in	out	total	in	out	total	In	out	total
5-6am	3,222	1,967	5,189	1,901	754	2,655	718	509	1,227
6-7am	4,362	2,993	7,355	2,286	1,731	4,017	1,869	954	2,823
7-8am	3,035	2,926	5,961	2,951	2,462	5,413	1,562	1,175	2,737
8-9am	2,103	3,463	5,566	1,860	3,287	5,147	1,350	1,359	2,709
9-10am	1,850	3,357	5,207	1,507	3,502	5,009	992	1,178	2,170
10-11am	1,574	4,612	6,186	1,422	2,985	4,407	877	1,283	2,160
11-12am	1,522	4,275	5,797	1,404	2,318	3,722	838	1,003	1,841
12-1pm	2,582	1,753	4,335	1,505	2,122	3,627	2,695	3,076	5,771
1-2pm	2,357	1,641	3,998	1,455	2,003	3,458	2,396	2,548	4,944
2-3pm	2,337	1,713	4,050	1,421	2,013	3,434	2,264	2,743	5,007
3-4pm	2,207	1,663	3,870	1,402	2,066	3,468	2,655	2,458	5,113
4-5pm	2,286	2,229	4,515	1,563	2,169	3,732	2,061	2,422	4,483
5-6pm	2,338	1,720	4,058	1,067	2,653	3,720	2,501	3,534	6,035
Total	31,775	34,312	66,087	21,744	30,065	51,809	22,778	24,242	47,020
<i>Aver/day</i>	<i>4,539</i>	<i>4,902</i>	<i>9,441</i>	<i>3,106</i>	<i>4,295</i>	<i>7,401</i>	<i>3,254</i>	<i>3,463</i>	<i>6,717</i>

Table 4: Traffic Density at Rural Road Traffic Count Locations

Table 4 contains the results of the traffic counts along rural roads 602, 603 and 606. It shows the importance of road 602 to the district centre and the National Highway. In traffic volume, it scores close to the Highway observation post on the Siem Reap town side of Puok, as the next figure shows.

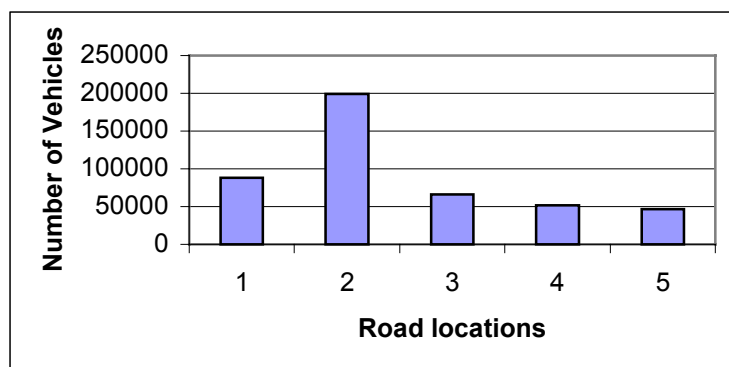
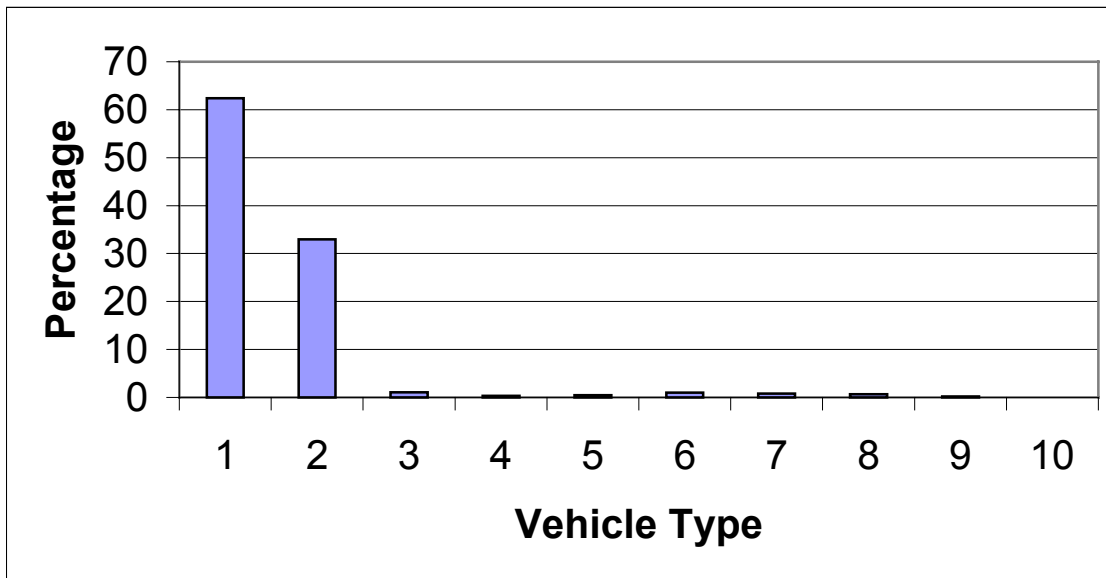


Figure 2: Traffic Volume at Five Observation Posts

Vehicle Type

Bicycles were the most frequent type of vehicle counted on the four roads around the market. Bicycles and motorbikes together accounted for over 95 percent of all vehicles. The third most frequent were remorques and the fourth was pickups. Figures 3 and 4 compare the vehicle types.



1 - Bicycle, 2 - Motorbike, 3 - Remorque, 4 - Animal drawn cart, 5 - Car, 6 - Pickup, 7 - Koyun, 8 - Truck, 9 - Handcart, 10 - Other.

Figure 3: Comparison of all Vehicle Types

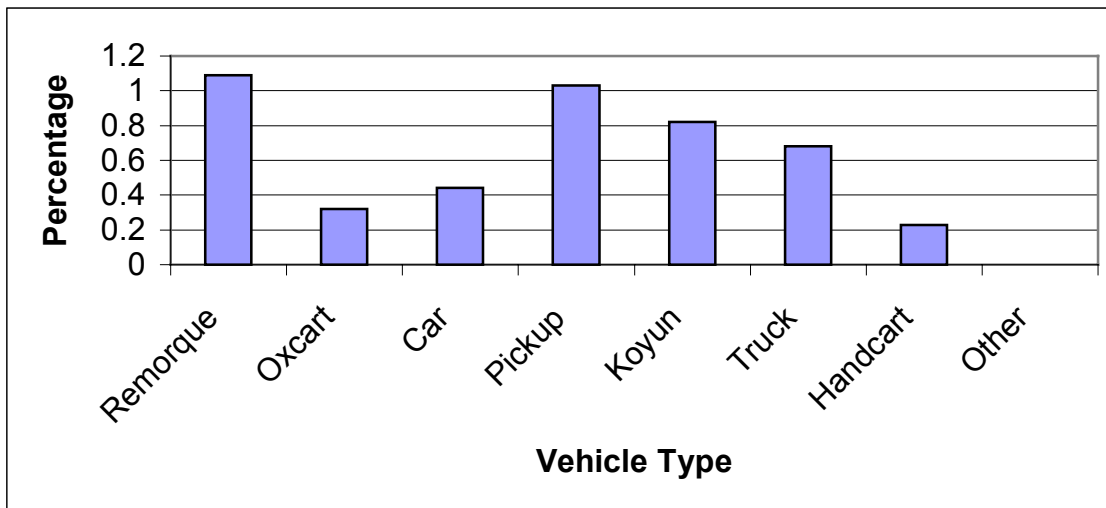


Figure 4: Comparison of Eight of the Vehicle Types

In comparing the locations, it is interesting to note that in terms of vehicle type division, road 602 is closer to the National Highway than to the other rural roads. Both roads 603 and 606 have a significantly higher share of bicycles (about 70%) than road 602 (about 60%). The next two tables show the numbers of vehicles at the different locations.

Vehicle Type	National Highway No 6 Location 1			National Highway No 6 Location 2		
	in	out	total	in	out	total
1	25,743	25,348	51,091	57,923	62,940	120,863
2	17,269	16,852	34,121	35,914	30,057	65,971
3	319	338	657	762	1,719	2,481
4	31	12	43	144	149	293
5	200	222	422	443	939	1,382
6	522	469	991	1,120	1,956	3,076
7	106	114	220	644	1,561	2,205
8	212	282	494	764	1,690	2,454
9	96	88	184	248	407	655
10	0	0	0	1	0	1
Total	44,498	43,725	88,223	97,963	101,418	199,381

1 - Bicycle, 2 - Motorbike, 3 - Remorque, 4 - Animal drawn cart, 5 - Car, 6 - Pickup, 7 - Koyun, 8 - Truck, 9 - Handcart, 10 - Other.

Table 5: Vehicle Frequency at each Highway Location

A close examination of traffic volume for heavier vehicles (vehicle types 3-9) at location 2 on the highway, reveals a discrepancy. Many more vehicles are leaving Puok district centre than entering. This is not balanced by a heavier inflow at highway location 1. This is because the traffic count finished at 6 p.m. After six, many large vehicles drove into Puok and left westwards in the morning packed with people and products.

Vehicle Type	Rural Rd 602 Location 3			Rural Rd 603 Location 4			Rural Rd 606 Location 5		
	in	out	total	in	out	total	in	out	total
1	19,238	21,299	40,537	15,393	21,219	36,612	16,607	16,760	33,367
2	11,687	11,736	23,423	5,392	7,459	12,851	5,874	6,913	12,787
3	374	537	911	247	331	578	98	211	309
4	86	139	225	266	429	695	72	142	214
5	56	45	101	35	36	71	14	24	38
6	69	131	200	43	169	212	33	48	81
7	175	369	544	296	366	662	46	68	114
8	13	17	30	61	40	101	3	5	8
9	77	39	116	6	16	22	31	68	99
10	0	0	0	5	0	5	0	3	3
Total	31,775	34,312	66,087	21,744	30,065	51,809	22,778	24,242	47,020

1 - Bicycle, 2 - Motorbike, 3 - Remorque, 4 - Animal drawn cart, 5 - Car, 6 - Pickup, 7 - Koyun, 8 - Truck, 9 - Handcart, 10 - Other.

Table 6: Vehicle Frequency at the Rural Road Locations

In general, the inbound traffic at the two observation posts along the National Highway -142,461 vehicles - outnumbered the combined inbound traffic on the three rural roads - 76,297 vehicles. The difference is even larger when examining the Average Daily Traffic of vehicles with two or more axles (ADT-2 axles). The busiest point on the National Highway has an ADT-2 axles count of about 1,300. Rural road 602 has

80, road 603 has 49 and road 606 had 34. The combined ADT-2 axles count for the rural roads was 163. This could indicate that the National Highway is more important for the supply of Puok market than the rural roads. However, these figures do not necessarily imply that all vehicles are destined for the market or other locations in Puok centre. This topic will be dealt with in the next section, presenting the results from the Origin & Destination Survey.

ORIGIN & DESTINATION SURVEY

The traffic count provides basic information about traffic flows around the market including vehicle types, direction and time of passing. However, observing and counting the passing traffic does not provide information about time and frequency of travel, origin and destination or the type and quantity of vehicle loads.

To get this data, two Origin and Destination (O&D) surveys were conducted. First, drivers passing the five traffic count locations were interviewed. The vehicles were stopped for no longer than a minute to minimise traffic disruption. In addition, drivers arriving and departing from the four sides of Puok market were interviewed.

The market O&D survey was conducted for two reasons. First, to collect more information about traffic flows in the area around the market and to answer questions like where and when do different vehicles with different products stop? Secondly, this data complemented the interview data collected at the roadside locations. Due to traffic circumstances at the two cordon points on the National Highway, project staff were not able to interview the drivers of heavier traffic (vehicle types 3-9 in the traffic count). The market O&D survey provided data on these vehicle types at the market.

This section will first address some general issues about vehicular traffic in Puok district. The paper will then focus on the market and generated traffic. Findings from the different aggregate levels, from the district to the village will be presented. Inter district travel, i.e. the traffic from the other districts in Siem Reap Province to Puok district will also be shown. At the Puok district level, the paper examines vehicle movements between Puok commune and other communes. Finally, we will examine traffic flows on the village level within Puok commune.

General Characteristics of the Surveyed Traffic

The teams interviewed approximately 120,000 road users along the roads and on the market site during the Origin and Destination surveys. This section examines some of the general features of vehicles on the roads around Puok market. Geographical aspects of trips will be discussed in later paragraphs. This section provides general data on vehicle types, their average travel time, travel frequency and load characteristics.

The ten vehicle classifications used in the traffic count were used for the O&D surveys (see Table 1). The proportion of vehicle types surveyed was about equal to the traffic count. The average travel time for all vehicles was approximately 43 minutes (see Table 7).

No.	Type of Vehicle	Average Travel Time/Trip	Average Frequency (per day)
1	Bicycle	40.9 minutes	2.0 times
2	Motorbike	43.4 minutes	2.1 times
3	Remorque	31.9 minutes	2.3 times
4	Animal drawn cart	139.1 minutes	1.5 times
5	Car	49.1 minutes	1.8 times
6	Pickup	55.5 minutes	1.9 times
7	Koyun	27.6 minutes	2.6 times
8	Truck	48.9 minutes	2.1 times
9	Handcart	27.8 minutes	2.3 times
10	Other	34.9 minutes	1.9 times
	Average	42.7 minutes	2.0 times

Table 7: Comparison of Travel Time and Frequency

On average, animal drawn carts made the longest trips in terms of time - around 140 minutes. Koyun made the shortest average trips - about 28 minutes. The trip frequency for all road users was around twice per day. Animal drawn carts showed the lowest trip frequency, probably due to their lengthy travel time. Koyun had the highest trip frequency, travelling on average 2.6 times daily.

The O&D survey questioned drivers about the load they were transporting. Loads were divided into the following categories: empty vehicles, vehicles carrying passengers and vehicles carrying products. The products were divided into 19 subcategories. The next table shows these categories, subcategories and codes.

Code	Classification of Vehicle Load
0	Empty
1	Fresh vegetables
2	Bulbs/roots/pulses/tubers
3	Rice/paddy
4	Other grains
5	Fruit
6	Fresh fish/crustaceans
7	Dried and smoked fish/crustaceans
8	Meat (pork/beef/chicken/duck/bird)
9	Livestock (poultry/pig/cow)
10	Passengers
11	Dried/processed foods (inc. herbs/spices/cooking oils)
12	Beverages
13	Cloth/clothes
14	Other household and capital goods
15	Tobacco
16	Construction materials
17	Firewood/charcoal
18	Fuel
19	Ice
20	Other

Table 8: Categories of Vehicle Load

The study found that the load characteristics of the three main categories were similar in proportion. Vehicles transporting passengers were a third of the total sample (33.6%), empty vehicles were just under a third (29.5%) and vehicles carrying products were just over a third of the total (36.9%).³

There were three main subcategories of products transported. The product most frequently transported in Puok district was rice/paddy. Over eight percent of vehicles transporting products carried rice/paddy. The second most transported product was fresh fish (3.5%) and third was fresh vegetables (3.1%). This is based on the number of vehicles carrying these products, not on the quantity of products transported. This is discussed in the next section when the study examines market traffic.

The quantities transported varied largely between the vehicle types. This was true for passengers and products. The average load varied from about 30 kilogrammes for bicycles to about 2,500 kilogrammes for trucks. The next table shows the average load for the nine vehicle types.

No.	Vehicle Type	Average Vehicle Load
1	Bicycle	29.3 kg
2	Motorbike	58.7 kg
3	Remorque	298.9 kg
4	Animal drawn cart	266.8 kg
5	Car	820.2 kg
6	Pickup	1,056.3 kg
7	Koyun	1,564.0 kg
8	Truck	2,548.9 kg
9	Handcart	179.6 kg

Table 9: Average Vehicle Load (products)

It is important to consider the type of product transported when analysing vehicle loads. The study determined the three products each vehicle type transported the most. The table below shows the product ranking for each vehicle type.

No	Vehicle	Product 1	Product 2	Product 3
1	<i>Bicycle</i>	Rice/paddy	Fresh vegetables	Fresh Fish/crustaceans
2	<i>Motorbike</i>	Rice/paddy	Fresh Fish/crustaceans	Poultry/pig/cow
3	<i>Remorque</i>	Construction materials	Rice/paddy	Cloth/clothes
4	<i>Animal drawn cart</i>	Firewood/charcoal	Rice/paddy	Construction materials
5	<i>Car</i>	Fresh fish	Construction material	Rice/paddy
6	<i>Pickup</i>	Construction materials	Rice/paddy	Fruit
7	<i>Koyun</i>	Construction materials	Firewood/charcoal	Rice/paddy
8	<i>Truck</i>	Construction materials	Firewood/charcoal	Rice/paddy
9	<i>Handcart</i>	Cloth/clothes	Beverages	Rice/paddy

Table 10: Ranking of Products per Vehicle

³ In other areas of analysis, the project found that the three main categories were similar in size.

Table 10 illustrates the types of products transported per mode of transport. However for some vehicles, transporting products is only a small part of their business. For cars and pickups, the majority of their transport involves passengers. The next table shows the average number of passengers carried by each vehicle type.

No.	Vehicle Type	Average Passenger Load
1	Bicycle	1.2 passengers
2	Motorbike	1.7 passengers
3	Remorque	9.9 passengers
4	Animal drawn cart	2.6 passengers
5	Car	5.5 passengers
6	Pickup	8.5 passengers
7	Koyun	18.4 passengers
8	Truck	7.2 passengers
9	Handcart	2.8 passengers

Table 11: Average Passenger Load

Puok Market Traffic Flow

Puok market opens at around 5:30 a.m. The first loaded vehicles arrive around 5 a.m. to deliver supplies for the 500 market stalls. Half of the vehicles carrying products and persons arrive at the market within the first four hours. The table below shows the arrival of vehicles at different hours of the day.

Time	Vehicles	Percentage of Traffic	Cumulative Percentage
5-6 a.m.	4,762	11.60 %	11.60 %
6-7 a.m.	6,560	15.98 %	27.58 %
7-8 a.m.	5,136	12.51 %	40.09 %
8-9 a.m.	4,508	10.98 %	51.07 %
9-10 a.m.	3,736	9.10 %	60.17 %
10-11 a.m.	3,083	7.51 %	67.68 %
11-12 p.m.	2,225	5.42 %	73.10 %
12-1 p.m.	1,970	4.80 %	77.90 %
1-2 p.m.	2,258	5.50 %	83.40 %
2-3 p.m.	1,769	4.31 %	87.71 %
3-4 p.m.	1,773	4.32 %	92.03 %
4-5 p.m.	1,950	4.75 %	96.78 %
5-6 p.m.	1,322	3.22 %	100 %
Total	41,052	100 %	

Table 12: Market Arrivals at Different Hours of the Day

The patterns in table 12 are similar to the traffic density findings in table 2, although the market is busier in the early hours than the roads. Table 12 also shows the largest numbers of vehicles between 6 and 7 a.m. As expected, there was a large difference in the number of vehicles loaded with products compared to general traffic. About one third of vehicles were carrying produce, one third were empty and one third

carried passengers. In comparison, only 2.4 percent of the vehicles arriving at the market were empty, 34.8 percent carried passengers and 62.8 percent were transporting products.

The survey teams were located at the four sides of the market at locations A, B, C and D (see Map, Appendix 1). Location B, in front of the market, was the busiest point. About 70 percent of the total daily traffic of 13,000 vehicles stopped here to deliver goods or passengers. Location A, at the side of the market along road 603, was the second busiest point (see table 13).

No	Market Location	Percentage of Total Market Traffic
1	Location A	17.5%
2	Location B	70.3%
3	Location C	5.1%
4	Location D	7.1%
	Total	100%

Table 13: Comparison of Market Locations

This survey concentrated on transport in the market area rather than market transport specifically. However, information was gathered on the quantities arriving at the market. On average about 566,000 kilogrammes is brought to Puok market daily. Some products are delivered to shops around the market and not to the market itself. This is the case for construction materials, firewood, charcoal and fuel. They are sold on market territory or in neighbouring shops. Table 14 shows the quantities of goods arriving at or near the market.

No. ⁴	Type of product	Quantity ⁵
1	Fresh vegetables	30,254 kg
2	Bulbs/roots/pulses/tubers	14,165 kg
3	Rice/paddy	112,948 kg
4	Other grains	4,718 kg
5	Fruit	21,435 kg
6	Fresh fish/crustaceans	42,332 kg
7	Dried and smoked fish/crustaceans	9,667 kg
8	Meat (pork/beef/chicken/duck/bird)	3,760 kg
9	Livestock (poultry/pig/cow)	19,151 kg
11	Dried/processed foods (incl. herbs/spices/cooking oils)	20,116 kg
12	Beverages	4,887 kg
13	Cloth/clothes	22,399 kg
14	Other household & capital goods	13,314 kg
15	Tobacco	5,219 kg
16	Construction materials	124,934 kg
17	Firewood/charcoal	62,662 kg
18	Fuel	6,378 kg
19	Ice	7,404 kg
20	Other	40,539 kg
	Total for all products	566,282 kg⁶

Table 14: Daily Quantities of Products Arriving At Puok Market

Inter District Traffic

Approximately 100,000 road users were interviewed around the market. About half were inbound and half outbound. This analysis concentrates on inbound vehicles, those travelling towards the market. The results showed that about 60 percent of the combined inbound traffic on all surveyed roads were market oriented. About 29,000 of the 50,000 inbound road users visited the market. The remaining 21,000 had different destinations - other villages, communes or districts. This was true for the National Highway and for the three rural roads. This demonstrates the important local function of the highway in this district.

Most market bound traffic originated in Puok district, about 24,000 vehicles (80%) of the total 29,000 vehicles. About 5,000 vehicles (20%) came from elsewhere. A small percentage of vehicles, (0.5%) came from outside Siem Reap Province. From this small proportion, most were from Banteay Meanchey Province - transporting construction materials. Most of the vehicles from Banteay Meanchey came from Svay Chek, a district bordering Thailand. Other common origins were Battambang - mostly construction materials, Phnom Penh - mainly household and capital goods and Kompong Cham - mainly fruit.

⁴ Number 10 represents passengers carried and was not included.

⁵ Liquids have been converted from litres to kilogrammes for easier comparison.

⁶ Figures collected were based on drivers' estimates of the total quantity transported, not traded at the market. To ensure an accurate picture of the total quantity traded at Puok Market – both in weight and in value, the socioeconomic team will conduct a follow-up study among its market traders.

Figure 5 shows the proportion of traffic originating in Puok district compared to the other origins combined.

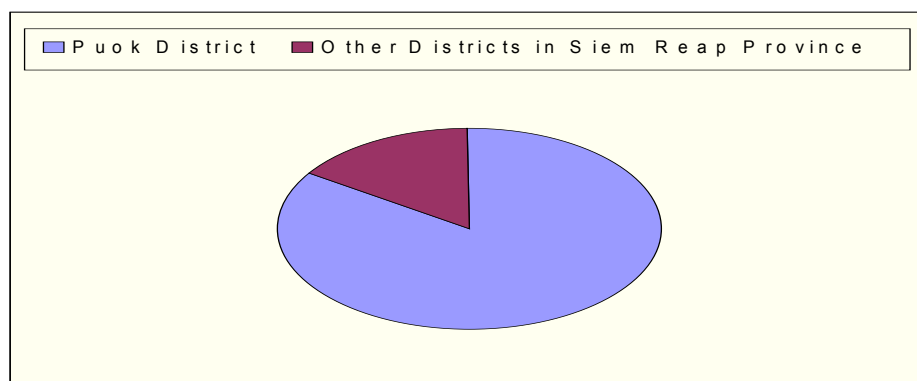


Figure 5: Origin of Market Destined Traffic

Vehicles from every district in Siem Reap Province visit Puok market. There are 12 districts in Siem Reap. Puok district was the most common origin of market bound vehicles. The three next most common origins were Siem Reap, Angkor Thom and Prasat Bakong. Together they account for more than 60 percent of the remaining market bound traffic.

No.	District	Number of Road Users	Percentage (%)	Cumulative Percentage (%)
1	Siem Reap	1,045	22.9	22.9
2	Angkor Thom	1,020	22.4	45.3
3	Prasat Bakong	804	17.6	62.9
4	Srei Snam	481	10.6	73.5
5	Banteay Srei	330	7.2	80.7
6	Angkor Chum	324	7.1	87.8
7	Kralanh	208	4.6	92.4
8	Varin	155	3.4	95.8
9	Chi Kraeng	125	2.7	98.5
10	Svay Leu	45	1.0	99.5
11	Soutr Nikom	20	0.5	100.0
	Total	4,557	100	

Table 15: Puok Market Bound Road Users per District

Vehicles came from different communes within each district. Table 16 shows the commune of origin for traffic from districts other than Puok. The three most common communes are shown.

No.	District	Commune No. 1 (%)	Commune No. 2 (%)	Commune No. 3 (%)
1	Siem Reap	Siem Reap (91.0)	Svay Dankun (3.5)	Chreav (2.9)
2	Angkor Thom	Svay Chek (96.3)	Leang Dai (3.4)	Peak Snaeng (0.2)
3	Prasat Bakong	Bakong (93.3)	Trapeang Thum (3.9)	Roluos (1.4)
4	Srei Snam	Moung (99.0)	Tram Sasar (0.6)	Slaeng Spean (0.4)
5	Banteay Srei	Run Ta Aek (99.4)	Tbaeng (0.6)	-
6	Angkor Chum	Ta Saom (68.8)	Char Chhuk (22.2)	Srae Khvav (3.7)
7	Kralanh	Ta An (71.6)	Krouch Kor (6.7)	Kampong Thkov (5.8)
8	Varin	Varin (91.6)	Lvea Kraeng (4.5)	Svay Sa (3.2)
9	Chi Kraeng	Kouk Thlok Kraom (29.6)	Pongro Leu (24.0)	Kang Pong Kdei (20.8)
10	Svay Leu	Boeng Meala (100)	-	-
11	Soutr Nikom	Chan Sar (55.0)	Dam Daek (30.0)	Ta Yaek (15.0)

Table 16: Ranking of Communes of Origin per District

Internal Puok District Traffic

This section will examine the characteristics of the 24,000 Puok market visitors who came from within Puok district. The communes of origin will be compared, the type of vehicles used, travel times, travel frequency and the different vehicle loads will be analysed.

Commune Comparison of Market Visits

The lion's share of Puok district traffic visiting the market came from Puok commune. As the next table shows, over 40 percent of road users originated in Puok commune. The other road users came from the 13 other communes in the district. Our survey sample recorded no road users from Pou Treay or Kdei Run communes, which are both remote. People from these communes may visit Puok market, however the data suggests these visits are infrequent.

No.	Commune	Number of Road Users	Percentage (%)
1	Puok	9,879	41.15
2	Doun Kaev	3,379	14.08
3	Lvea	2,303	9.59
4	Samrong Yea	2,280	9.50
5	Tek Vil	1,922	8.01
6	Kaev Poar	1,549	6.45
7	Reul	978	4.07
8	Khnat	782	3.26
9	Trei Nhoar	238	0.99
10	Prey Chruk	229	0.95
11	Sasar Sdam	228	0.95
12	Krabei Riel	144	0.60
13	Mukh Paen	49	0.20
14	Yeang	46	0.20
15	Pou Treay	0	0
16	Kdei Run	0	0
	Total	24,006	100

Table 17: Market Bound Road Users per Commune

Comparison of Vehicles Types by Commune

As the table above shows, almost 10,000 vehicles visiting the market came from Puok commune. From this, 43 percent were bicycles and 27 percent were motorbikes. Remorques accounted for 13 percent and nine percent were handcarts. The remaining seven percent were vehicles from the other six categories. The next table shows a cross tabulation of communes and different vehicle types.

No	Commune	Percentage of Vehicle Type (vehicle codes below)										Total
		1	2	3	4	5	6	7	8	9	10	
1	Puok	42.91	27.33	12.84	0.84	0.78	2.06	3.07	0.53	9.47	0.17	100
2	Doun Kaev	58.47	14.96	13.91	2.40	0.73	1.51	4.58	0.53	2.91	-	100
3	Lvea	69.72	21.53	4.41	0.68	0.20	0.68	1.03	0.28	1.43	0.04	100
4	Samrong Yea	37.97	50.86	5.16	1.03	0.57	1.03	3.01	0.13	0.16	0.08	100
5	Tuek Vil	59.29	32.40	4.10	0.28	0.81	1.01	1.01	0.09	1.01	-	100
6	Kaev Poar	23.30	65.85	6.25	0.67	0.49	1.16	1.90	0.13	0.25	-	100
7	Reul	54.94	21.52	2.47	19.22	0.09	0.44	0.88	0.35	0.09	-	100
8	Khnat	43.86	27.88	10.25	1.02	2.03	10.15	1.57	2.68	0.56	-	100
9	Trei Nhoar	42.15	44.44	3.45	5.36	1.15	0.38	0.38	0.77	1.92	-	100
10	Prey Chruk	38.47	45.42	6.23	0.36	0.36	1.10	8.06	-	-	-	100
11	Sasar Sdam	73.47	19.18	5.71	-	0.41	-	1.23	-	-	-	100
12	Krabei Riel	37.70	20.49	18.85	4.51	1.23	2.87	9.02	2.05	3.28	-	100
13	Mukh Paen	15.85	34.15	7.32	41.46	-	-	1.22	-	-	-	100
14	Yeang	32.65	61.23	2.04	-	-	4.08	-	-	-	-	100

1 - Bicycle, 2 - Motorbike, 3 - Remorque, 4 - Animal drawn cart, 5 - Car, 6 - Pickup, 7 - Koyun, 8 - Truck, 9 - Handcart, 10 - Other.

Table 18: Division of Vehicle Types per Commune

Bicycles outnumbered motorbikes in eight of the 14 communes. In communes further from the district centre, motorbikes tend to dominate and the numbers of other vehicles decrease.

The high number of animal drawn carts (category 4) from Reul and Mukh Paen communes is worth noting. Combining this information with vehicle load data (table 23) shows that oxcarts are used extensively for transporting firewood and charcoal to the district centre. If vehicle numbers are a guide, this is the most important product transported from these two communes.

Travel Time to Puok Market

The average travel time was 24.18 minutes for the 24,000 surveyed road users originating in Puok district. This is the weighted average⁷ for all the vehicles surveyed. More detailed information on the vehicle level will be given later in this section.

Not surprisingly, Puok commune vehicles took the shortest times to arrive at the market. Their average travel time was under 12 minutes. Vehicles from Yeang commune (northwest Puok district) took over one and a half hours to reach Puok market. The next figure shows the average travel times for 14 communes in Puok district.

⁷ Taking the frequencies into account.

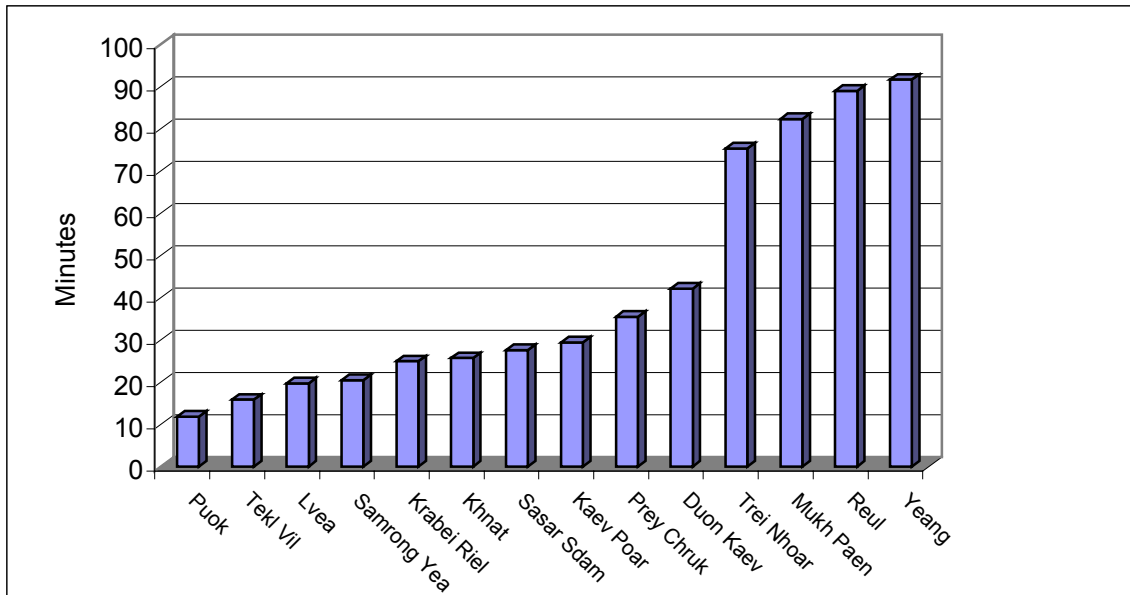


Figure 6: Commune to Market Travel Time⁸

Comparing commune travel times by vehicle shows that differences between vehicles increase when distances increase. For example, the difference between motorbike and bicycle travel time is marginal for Puok commune but increases for communes further from the district centre. The following table shows the average travel times for the most frequently used vehicle types.

No.	Commune	Average Travel Time (minutes)	
		Bicycle	Motorbike
1	Puok	12.77	10.40
2	Doun Kaev	44.95	32.89
3	Lvea	21.00	15.73
4	Samrong Yea	23.25	18.51
5	Tek Vil	16.57	14.67
6	Kaev Poar	34.67	27.05
7	Reul	84.70	61.82
8	Khnat	27.97	20.31
9	Trei Nhoar	78.64	64.53
10	Prey Chruk	28.24	24.01
11	Sasar Sdam	28.82	23.55
12	Krabei Riel	27.15	20.32
13	Mukh Paen	81.15	38.96
14	Yeang	122.75	75.10

Table 19: Average Market Travel Time for Bicycle and Motorbike

A similar table shows the travel times for the remaining vehicle types.

⁸ The vehicles in each commune influence this figure. However, it gives an overall picture of travel time differences by commune.

No.	Commune	Average Travel Time to Puok Market (minutes)							
		3	4	5	6	7	8	9	10
1	Puok	12.25	25.16	12.94	15.03	14.7	10.37	15.23	17.48
2	Doun Kaev	25.29	64.66	29.52	27.75	32.77	49.11	14.52	-
3	Lvea	24.68	38.97	14.58	22.41	22.70	19.00	47.94	25.00
4	Samrong Yea	19.16	25.05	15.72	12.50	17.78	17.50	23.75	23.50
5	Tek Vil	20.37	75.15	24.71	26.00	23.33	22.50	58.90	-
6	Kaev Poar	31.55	98.75	22.50	25.96	21.96	26.00	185.00	-
7	Reul	64.38	125.07	43.00	52.50	64.00	82.50	180.00	-
8	Khnat	19.12	113.57	15.25	20.00	44.71	21.56	45.36	-
9	Trei Nhoar	69.50	126.67	58.00	60.00	90.00	95.00	-	-
10	Prey Chruk	28.24	150.00	35.39	25.00	21.36	-	-	-
11	Sasar Sdam	37.50	-	60.00	-	20.00	-	-	-
12	Krabei Riel	30.94	76.67	19.25	18.57	42.55	25.74	91.05	-
13	Mukh Paen	75.00	163.33	-	-	72.50	-	-	-
14	Yeang	85.00	-	-	70.00	-	-	-	-
3 - Remorque, 4 – Animal drawn cart, 5 - Car, 6 - Pickup, 7 - Koyun, 8 - Truck, 9 - Handcart, 10 - Other.									

Table 20: Average Market Travel Time for eight Vehicle Types

Frequency of Market Travel

Puok commune road users visited the market on average 2.3 times a day. Communes further away generally visited Puok market less frequently. Road users from Krabei Riel seem to visit Puok market more frequently (2.4 times per day) even though they are further away. On average, road users visit Puok market roughly twice per day. The next table shows the frequency of visits to Puok market by commune.

No.	Commune	Frequency
1	Puok	2.3
2	Doun Kaev	1.8
3	Lvea	1.8
4	Samrong Yea	2.1
5	Tek Vil	1.9
6	Kaev Poar	2.1
7	Reul	1.6
8	Khnat	1.8
9	Trei Nhoar	1.6
10	Prey Chruk	1.7
11	Sasar Sdam	1.5
12	Krabei Riel	2.4
13	Mukh Paen	1.7
14	Yeang	1.2
	Weighted Average	2.04

Table 21: Frequency of Visits to Puok Market

Vehicle Load

The survey also investigated vehicle load. Although there were many different load subdivisions, first will be looked at the three main load categories: the vehicle was carrying products, transporting people or was empty. In general, the figures showed the same trend for different communes. Approximately one third of the vehicles carried products, mainly agricultural, one third transported people and about one third were empty. The following table shows the percentages of vehicles in each category for the 14 communes.

No.	Commune	Products (%)	People (%)	Empty (%)
1	Puok	33.4	29.9	36.7
2	Doun Kaev	29.3	28.0	42.7
3	Lvea	41.7	29.0	29.3
4	Samrong Yea	48.9	29.0	22.1
5	Tek Vil	25.4	34.7	39.9
6	Kaev Poar	62.0	27.7	10.3
7	Reul	37.8	30.6	31.6
8	Khnat	36.1	32.8	31.1
9	Trei Nhoar	19.0	49.2	31.8
10	Prey Chruk	45.2	34.6	20.2
11	Sasar Sdam	48.2	23.0	28.8
12	Krabei Riel	20.3	41.3	38.4
13	Mukh Paen	47.0	30.6	22.4
14	Yeang	39.1	45.7	15.2

Table 22: Comparison of Load by Commune

If the figures for the products carried are subdivided, it provides an overview of the origin of products transported in Puok district.

No	Commune	Ranking of Products Transported (%)		
		Number 1	Number 2	Number 3
1	Puok	fresh vegetables 23 %	cloth/clothes 10 %	rice/paddy 9 %
2	Doun Kaev	firewood/charcoal 20 %	fresh vegetables 13 %	rice/paddy 12 %
3	Lvea	fresh fish 36 %	rice/paddy 10 %	dried fish 9 %
4	Samrong Yea	fresh fish 24 %	fresh vegetables 21 %	rice/paddy 19 %
5	Tek Vil	fresh vegetables 33 %	fruit 17 %	rice/paddy 10 %
6	Kaev Poar	fresh fish 63 %	dried fish 12 %	rice/paddy 7 %
7	Reul	firewood/charcoal 26 %	poultry/pig/cow 17 %	rice/paddy 11 %
8	Khnat	fresh vegetables 28 %	fruit 21 %	bulbs/roots 9 %
9	Trei Nhoar	rice/paddy 34 %	bulbs/roots 9 %	poultry/pig/cow 9 %
10	Prey Chruk	poultry/pig/cow 20 %	firewood/charcoal 18 %	rice/paddy 18 %
11	Sasar Sdam	firewood/charcoal 39 %	fresh vegetables 19 %	rice/paddy 9 %
12	Krabei Riel	rice/paddy 21 %	fruit 11 %	fresh fish 11 %
13	Mukh Paen	firewood/charcoal 26 %	beverages 13 %	fresh vegetables 9 %
14	Yeang	rice/paddy 45 %	poultry/pig /cow 22 %	bulbs/roots 11 %

*Table 23: Ranking of Products Transported*⁹

⁹ Dried fish includes smoked fish. Fresh fish includes crustaceans. Bulbs/roots includes pulses and tubers.

Internal Puok Commune Traffic

The lowest geographical level of analysis in this survey is the village level. After looking at the traffic flows on the provincial, district and commune levels, this section compares the different villages in Puok commune. Puok commune consists of 11 villages.¹⁰ The table below shows the number of vehicles travelling from each village to Puok market.

No.	Village	Road Users	Percentage (%)
1	Chambak Haer	1,574	15.9
2	Kouk Thmei	1,464	14.8
3	Kuok Srok	1,267	12.8
4	Kampong Ta Yang	1,164	11.8
5	Puok Chas	1,064	10.8
6	Ou Ta Prak	994	10.1
7	Kuok Chuon	893	9.0
8	Ta Tok	626	6.3
9	Kuok Dong	461	4.7
10	Puok	237	2.4
11	Puok Thmei	104	1.1
12	Prayut	31	0.3
	Total	9,879	100

Table 24: Number of Market Bound Road Users by Village

The average travel time to the market for villages in Puok commune is 11.94 minutes. There was little variation in travel time for different villages. The average frequency of market trips was 2.3 trips per day. Again, there was little deviation from this number across villages. There was some variation between villages in the vehicle used to visit the market. The next table shows a village comparison by vehicle.

No	Village	Vehicle Type (%) (explanation of codes below)									
		1	2	3	4	5	6	7	8	9	10
1	Chambak Haer	31.18	21.43	15.71	0.42	1.16	2.18	2.07	0.98	24.80	0.07
2	Kouk Thmei	68.13	29.07	1.07	-	-	0.27	0.33	0.33	0.73	0.07
3	Kuok Srok	30.02	30.47	18.42	1.60	0.63	4.32	3.92	0.28	10.29	0.05
4	Kampong Ta Yang	32.76	41.70	10.03	1.08	1.01	1.66	6.43	0.36	4.18	0.79
5	Puok Chas	59.69	27.34	10.18	0.33	0.49	0.33	0.66	0.08	0.90	-
6	Ou Ta Prak	55.40	20.81	7.26	0.73	0.32	1.53	6.61	0.16	7.18	-
7	Kuok Chuon	41.93	27.74	18.57	0.65	0.89	2.11	2.43	0.32	5.36	-
8	Ta Tok	34.43	38.10	14.30	1.01	0.76	2.15	3.55	0.51	4.43	0.76
9	Kuok Dong	73.54	22.30	2.70	-	0.21	0.42	0.62	0.21	-	-
10	Puok	34.90	18.16	16.04	5.19	2.83	3.54	3.30	3.30	12.50	0.24
11	Puok Thmei	32.69	17.31	28.37	0.48	0.96	8.17	1.92	-	10.10	-
12	Prayut	14.02	4.88	48.17	2.44	2.44	4.88	9.76	0.61	12.80	-

1 - Bicycle, 2 - Motorbike, 3 - Remorque, 4 - Animal drawn cart, 5 - Car, 6 - Pickup, 7 - Koyun, 8 - Truck, 9 - Handcart, 10 - Other.

Table 25: Division of Vehicle Types per Village

¹⁰ The table shows twelve villages instead of eleven because the area around Puok market (Puok) is included.
Traffic Characteristics around Puok Market

No.	Villages	Products %	People %	Empty %
1	Chambak Haer	27.3	34.2	38.5
2	Kouk Thmei	31.3	23.0	45.7
3	Kuok Srok	39.2	28.4	32.4
4	Kampong Ta Yang	32.8	34.3	32.9
5	Puok Chas	28.0	27.1	44.9
6	Ou Ta Prak	39.5	31.3	29.2
7	Kuok Chuon	36.9	30.7	32.4
8	Ta Tok	33.1	32.8	34.1
9	Kuok Dong	46.6	24.5	28.9
10	Puok Market	31.0	34.3	34.7
11	Puok Thmei	12.5	36.5	51.0
12	Prayut	6.6	36.7	56.7

Table 26: Comparison of Load Types by Village

The division of the different load types is given above. It follows similar patterns found elsewhere in the study.

No	Village	Ranking of Products Transported (%)		
		Number 1	Number 2	Number 3
1	Chambak Haer	Rice/paddy (13.5)	Fresh vegetables (9.5)	Cloth/clothes (7.0)
2	Kouk Thmei	Fresh vegetables (15.3)	Bulbs/roots (12.8)	Dried/processed food (10.5)
3	Kuok Srok	Cloth/clothes (25.3)	Fresh vegetables (24.5)	Fresh fish (8.4)
4	Kampong Ta Yang	Fresh vegetables (28.1)	Cloth/clothes (12.8)	Fresh fish (10.7)
5	Puok Chas	Fresh vegetables (45.7)	Fruit (14.3)	Rice/paddy (9.6)
6	Ou Ta Prak	Dried/processed food (14.7)	Fresh vegetables (12.2.)	Rice/paddy (11.9)
7	Kuok Chuon	Fresh vegetables (39.8)	Cloth/clothes (11.9)	Bulbs/roots (11.1)
8	Ta Tok	Fresh vegetables (29.0)	Cloth/clothes (21.5)	Dried/processed food (9.7)
9	Kuok Dong	Fresh vegetables (22.3)	Fresh fish (18.7)	Rice/paddy (8.8)
10	Puok Market	Fresh fish (15.2)	Cloth/clothes (11.0)	Rice/paddy (9.7)
11	Puok Thmei	Fresh fish (23.2)	Rice/paddy (15.2)	Bulbs/roots (15.2)
12	Prayut	Rice/paddy (50.0)	Charcoal (50.0)	-

Table 27: Ranking of Products Transported ¹¹

Table 27 shows the three most frequently transported products from each village. Most products are agricultural although cloth/clothes are also frequently transported. Most of the cloth/clothes transported to the market are stored in homes close to the market and later transported to the market by handcart. This accounts for the high number of handcarts observed around the market.

¹¹ Dried fish includes smoked fish. Fresh fish includes crustaceans. Bulbs/roots includes pulses and tubers.

SCHOOL SURVEY

The traffic count revealed the impact of school bound children on the overall traffic flow. At certain times of day, the roads around the district centre are filled with children travelling to or from school. Because of this, a school survey was conducted to complement the other studies. Education centres are also one of the foci of the IRAP procedure. Therefore, additional school travel information is useful for the continuation of the IRAP cycle.

At the completion of the roadside and market surveys, the research team visited three schools near Puok market - Tea Banh Primary School, Puok Primary School and Puok High School. These three schools combined have 3,598 students and 142 teachers. Questionnaires were given to school directors who distributed them to teachers. Teachers explained the survey forms to students, who then completed them. When the survey forms were returned, 374 students and two teachers were found to be absent during the survey period (around 10%). The next table shows the numbers of survey respondents.

No	School	Village	Number of Students	Number of Teachers	Total
1	Puok Primary School	Kouk Thmei	670	25	695
2	Tea Banh Primary School	Prayut	1,169	39	1,208
3	Puok High School	Prayut	1,385	76	1,461
	Total		3,224	140	3,364

Table 28: Students and Teachers Surveyed

Three Schools in Puok District

The questionnaires dealt with four subjects: the origin of the student or teacher (village), the mode of transport used, the time taken to travel to school and the frequency of travel.

On average, it took the 3,364 respondents approximately 16.2 minutes to travel to school. Most traveled to school by bicycle (63.2%), either their own (57.7%) or someone else's (5.5%). Many students walked to school (31.1%). The next table shows the percentages for each mode of travel. It also shows the average travel time for each mode of transport.¹²

No	Transport Mode	Percentage	Cumulative Percentage	Average Travel Time
1	Own Bicycle	57.7 %	57.7 %	18.7 minutes
2	Other's Bicycle	5.5 %	63.2 %	11.5 minutes
3	Own Motorbike	2.5 %	65.7 %	12.8 minutes
4	Other's Motorbike	2.9 %	68.6 %	7.7 minutes
5	Remorque	0.1 %	68.7 %	17.0 minutes
6	Foot	31.3 %	100 %	13.5 minutes
	Total	100 %		16.2 minutes

*Table 29: Different Modes of Transport for School Staff and Students*¹³

¹² Remarks on the aggregate level about frequency of travel and origin are of little use because the schools have different time schedules and geographical coverage. These issues will be dealt with in subsequent paragraphs.

¹³ Teachers generally fell into category 1 or 3.

Puok Primary School

Puok Primary School is in Kuok Thmei village. It is located on National Highway No. 6, west of Puok district centre. Our survey included 695 students and teachers. Most came from the 11 villages in Puok commune, while some came from Khnat, Krabei Riel or Lvea communes, as the next table shows.

No	Commune	Percentage	Cumulative Percentage
1	Puok	98.84 %	98.84 %
2	Lvea	0.72 %	99.56 %
3	Krabei Riel	0.29 %	99.85 %
4	Khnat	0.15 %	100 %

Table 30: Communes of Origin for Students and Staff of Puok Primary School

No.	Village	Percentage
1	Puok Chas	0.4 %
2	Prayut	0.1 %
3	Kouk Chuon	1.3 %
4	Kampong Ta Yang	0.6 %
5	Kouk Srok	3.4 %
6	Ta Tok	0.6 %
7	Kouk Dong	4.7 %
8	Kouk Thmei	40.7 %
9	Puok Thmei	22.0 %
10	Chambak Haer	24.3 %
11	Ou Ta Prak	1.9 %
	Total	100 %

Table 31: Villages of Origin – Puok Primary School

As expected, most school students lived in Kouk Thmei. Two other important villages for Puok Primary School were Chambak Haer and Puok Thmei. Because the students live nearby, most walk to school - more than 61 percent. Another large group travels by bicycle, as the next table shows.

No	Transport Mode	Percentage of Total	Cumulative Percentage	Average Travel Time
1	Own Bicycle	27.6 %	27.6 %	8.2 minutes
2	Other's Bicycle	4.9 %	32.5 %	9.4 minutes
3	Own Motorbike	1.8 %	34.3 %	3.8 minutes
4	Other's Motorbike	4.0 %	38.3 %	5.1 minutes
5	Remorque	0.1 %	38.4 %	10.0 minutes
6	On Foot	61.6 %	100 %	8.8 minutes
	Total	100 %		8.4 minutes

Table 32: Different Modes of Transport – Puok Primary School

The average school journey time for the different modes of transport is roughly eight and a half minutes. In total this means around 17 minutes of school related travel time per day. For primary schools, there is only one school session per day – either morning or afternoon. High School students have classes both in the morning and afternoon.

Tea Banh Primary School

This is a larger primary school located on the opposite side of Puok district centre in Prayut village. Most students come from Puok commune (95%) while a few are from Khnat or Doun Kaev communes. The students from within the commune mainly come from Puok Chas or Prayut villages. The next table shows the percentage of students from each village.

No.	Village	Percentage
1	Puok Chas	25.2 %
2	Prayut	25.1 %
3	Kouk Chuon	11.0 %
4	Kampong Ta Yang	18.1 %
5	Kouk Srok	4.8 %
6	Ta Tok	0.7 %
7	Kouk Dong	0.1 %
8	Kouk Thmei	1.2 %
9	Puok Thmei	0.2 %
10	Chambak Haer	4.8 %
11	Ou Ta Prak	8.8 %
	Total	100 %

Table 33: Villages of Origin – Tea Banh Primary School

Almost half the students walk to school, while another large group travels by bicycle, either their own (31.7%) or with someone else (11.7%). The table below shows around seven percent commute to school by motorbike and a small number travel by remorque.

No	Transport Mode	Percentage of Total	Cumulative Percentage	Average Travel Time
1	Own Bicycle	31.7 %	31.7 %	16.6 minutes
2	Other's Bicycle	11.7 %	43.4 %	12.0 minutes
3	Own Motorbike	0.9 %	44.3 %	7.0 minutes
4	Other's Motorbike	5.9 %	50.2 %	8.8 minutes
5	Remorque	0.3 %	50.5 %	18.8 minutes
6	On Foot	49.5 %	100 %	17.1 minutes
	Total	100 %		15.8 minutes

Table 34: Different Modes of Transport – Tea Banh Primary School

Students from Tea Banh Primary School travel to school once per day. They spend over 30 minutes on average per day travelling to and from school.

Puok High School

Puok High School was the largest of the three schools surveyed. It is located next to Tea Banh Primary School in Prayut village. It is the district high school and has the widest catchment area. Students come from 12 of the 16 communes in Puok district. The majority come from Puok commune.

No.	Commune	Percentage
1	Sasar Sdam	0.1 %
2	Doun Kaev	3.6 %
3	Kdei Run	0.3 %
4	Kaev Poar	5.6 %
5	Khnat	19.1 %
6	Lvea	2.4 %
7	Puok	54.9 %
8	Prey Chhruk	0.2 %
9	Reul	0.6 %
10	Samraong Yea	12.7 %
11	Tuek Vil	0.1 %
12	Trei Nhoar	0.4 %
	Total	100 %

Table 35: Communes of Origin – Puok High School

The majority of high school students travel to school by bicycle. A few travel to school on their own motorbikes (4.2%). An even smaller proportion (1.9%) walks to school. On average, it takes students slightly more than 20 minutes to get to school. Since most students attend two school sessions per day, they spend an average 1 hour and 20 minutes on school related travel per day.

No	Mode of Transport	Percentage	Cumulative Percentage	Average Travel Time
1	Own Bicycle	93.6 %	93.6 %	20.7 minutes
2	Other's Bicycle	0.3 %	93.9 %	13.0 minutes
3	Own Motorbike	4.2 %	98.1 %	15.7 minutes
4	Other's Motorbike	0 %	98.1 %	-
5	Remorque	0 %	98.1 %	-
6	On Foot	1.9 %	100 %	10.8 minutes
	Total	100 %		20.3 minutes

Table 36: Different Modes of Transport – Puok High School

Another way to classify these data is – as in the Origin and Destination Survey – to take the average travel times for the different communes of origin. The next figure shows this.

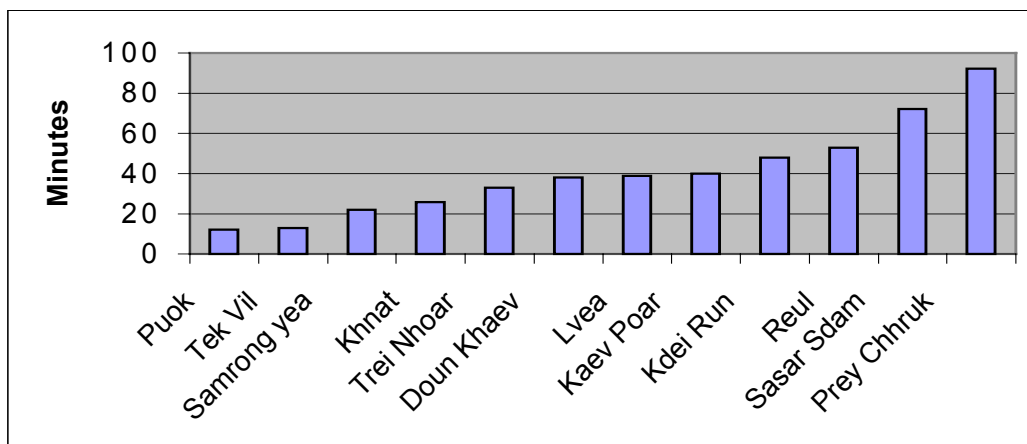


Figure 7: Travel Time to School by Commune

Figure 7 shows the same pattern as the travel time comparison by commune to Puok market (Figure 5). There are differences for some communes, but these are probably due to the different vehicles used to travel to school or market. There is also some variation due to the different geographical locations of the school and the market within the district.

As in the earlier commune comparison, there are substantial differences in travel time between communes. Students from Puok commune only take one sixth of the time to travel to school compared to those from Prey Chhruk commune. The high number of students from Puok commune influences the average travel time of 20 minutes. However, we have to bear in mind the spread of the scores for the individual communes in Puok district.

CONCLUSIONS

Puok market seems to have a greater socioeconomic importance for the inhabitants west of Puok district centre than for those on the east (the Siem Reap side). This conclusion is based on the number of market bound vehicles from the two survey locations on National Highway No 6.

Around 60 percent of the inbound traffic interviewed were travelling to Puok market. In this respect, there was no difference between the National Highway and the rural roads. The traffic characteristics (origin/travel time/frequency of vehicles) on the National Highway also show that the highway has important local functions.

Approximately 20 percent of market bound traffic comes from outside Puok district. Of this 0.5 percent comes from outside Siem Reap Province. The rest comes from other districts within Siem Reap Province, most frequently from Siem Reap, Angkor Thum and Prasat Bakong Districts. Within Puok district, Puok commune accounts for about 40 percent of all vehicles visiting the market.

The ILO rehabilitated Road 602 resembles the National Highway in traffic volume and vehicle division. It is important for the supply of produce for Puok market. For example, the enormous amounts of fish sold at the market mainly arrives via this road. The other two rural roads 603 and 606 have less traffic but also play an important role in the supply of the market. For instance, most of the firewood and charcoal comes to the market via these roads.

The most transported product by vehicle number in Puok district is rice/paddy. The second most transported product is fresh fish and the third is fresh vegetables.

The most transported product to Puok market by quantity is construction material. The second is rice/paddy and the third is firewood/charcoal.

More than half of the total daily traffic passed the traffic count locations before 11 a.m. However, more than half of the vehicles delivering products to the market arrived by 9 a.m.

About 63 percent of the vehicles arriving at Puok market transported products. Around 35 percent carried passengers and only two percent were empty. The overall percentages for all vehicles surveyed were roughly equal – 30 percent products, 30 percent people and 30 percent empty.

Puok market is visited on average by around 13,000 vehicles per day. Products supplied to the market daily total about 566,000 kilogrammes. Not all products are sold that day; traders take durable goods like cloth/clothes home again every night. Puok market is also a wholesale centre for traders in the region.

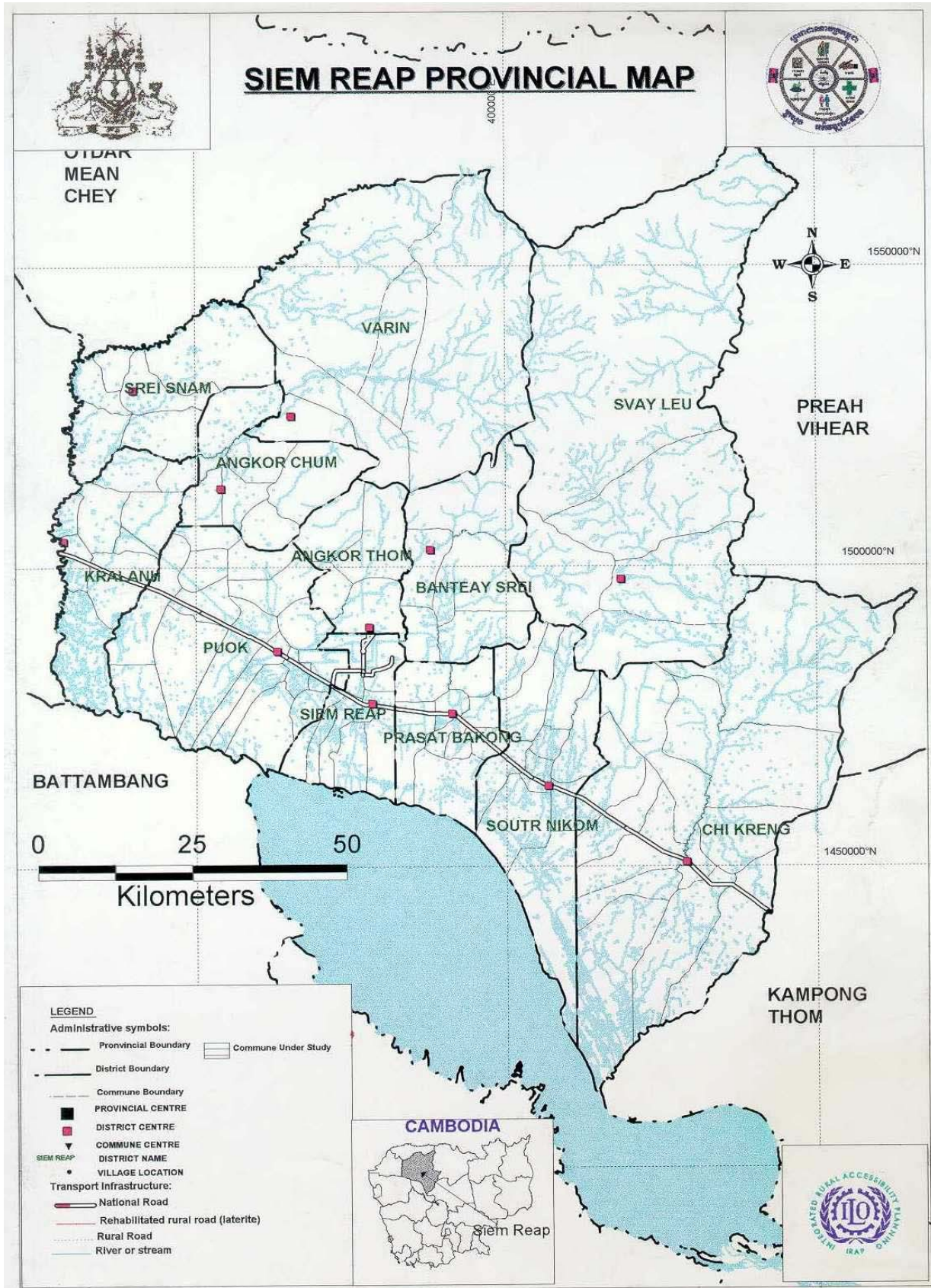
On average, vehicles in the survey spent about 43 minutes on the road per one way trip. Their average trip frequency to the market was about twice per day. The two most common vehicles on all roads were bicycles and motorbikes - over 95 percent of the total traffic. Bicycles carried on average 30 kilogrammes of produce, motorbikes carried 60 kilogrammes. Bicycles and motorbikes were most frequently used for the transport of rice/paddy and fresh fish. Bicycles carried an average of 1.2 passengers and motorbikes 1.7 passengers.

Appendices

Appendix 1



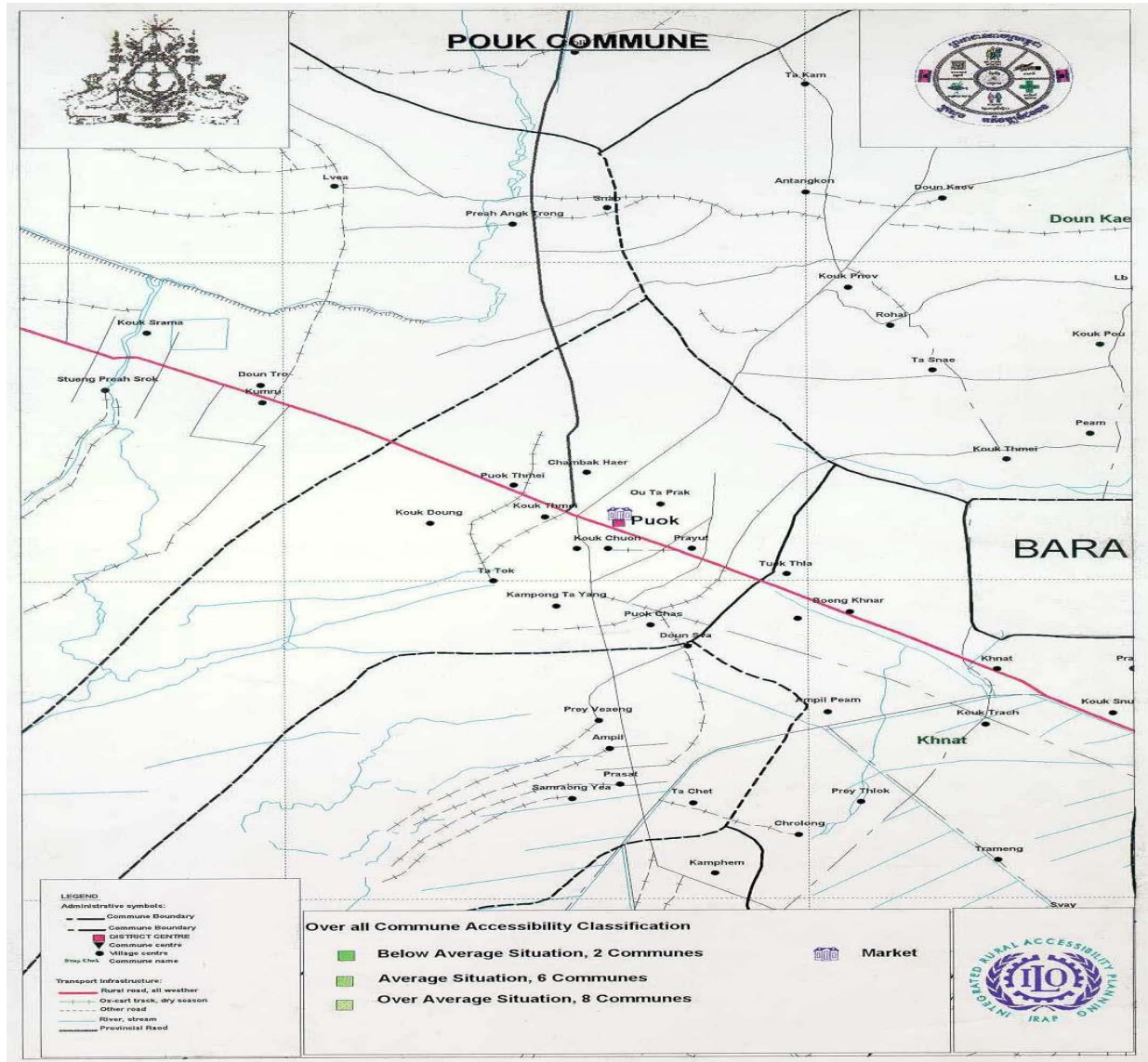
Appendix 2



Appendix 3

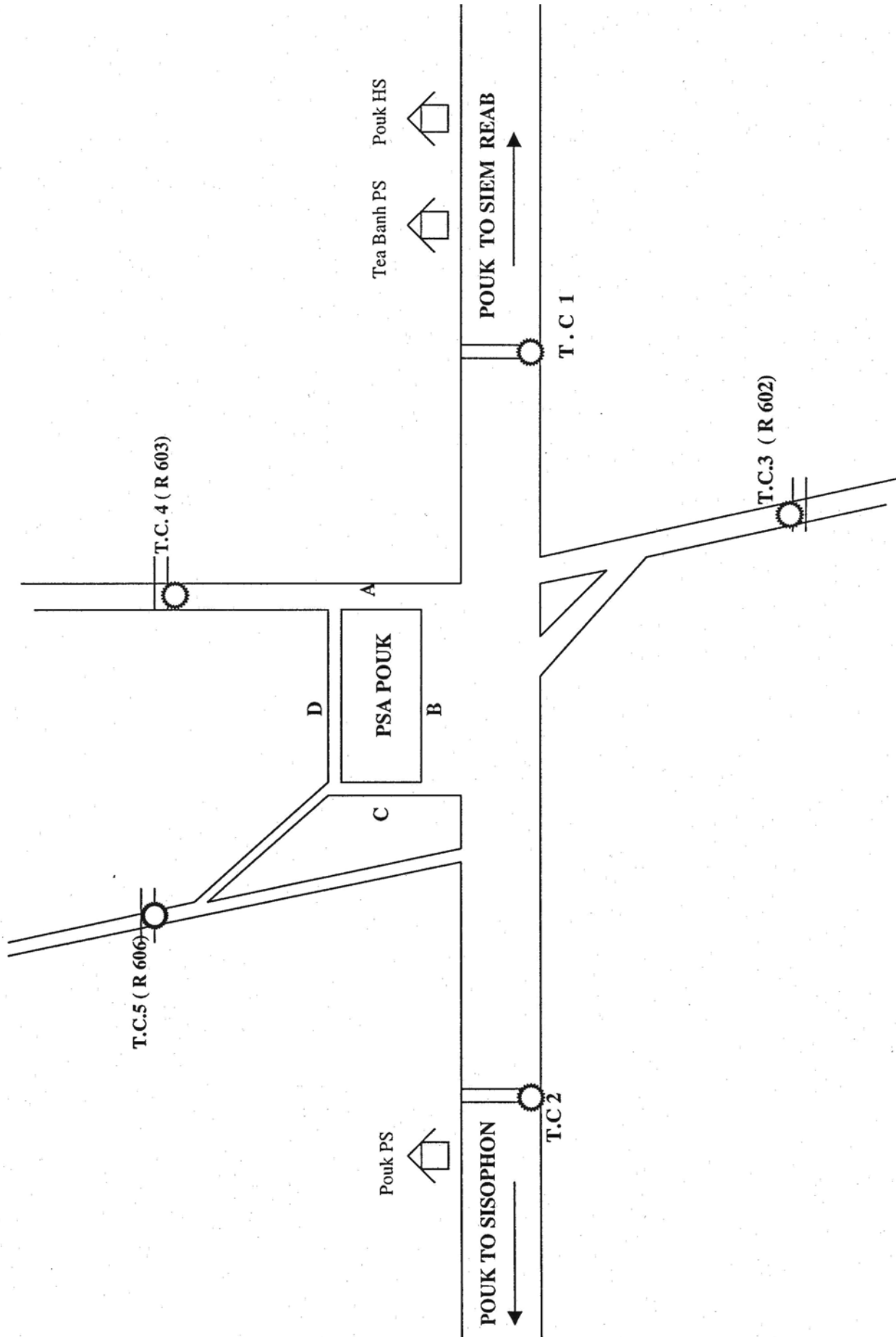


Appendix 4



Appendix 5

Map of Survey Location



Appendix 6

International Labour Organisation Upstream CMB/97/M02/SID
Origin and Destination Survey

Traffic Count Form

Day of Week

Date

Name of Enumerator

Location

Time

In/Out

Sheet

1-Bicycle																						
2- Motorbike																						
3- Mototrailer																						
4-Ox/bufallo/horsecart																						
5-Car																						
6- Pick-Up																						
7- Koyun																						
8-Truck																						
9-Handcart																						
10-Other																						

Appendix 6: Survey Questionnaire Forms

International Labour Organisation Upstream CMB/97/M02/SID
Origin and Destination Survey

Road Side Survey Form

Day of Week	
Name of Enumerator	
Location	

Interview sample of passing traffic

Time

Date

In/Out

Sheet

1	2	3	4	5	6	7	8	9	10
N°	Vehicle Type (Code)	Origin of Vehicle	Destination of Vehicle			Travel Time	Travel Frequency	Type of Commodity (Code)	Weight (Kg/Person)
			Pouk Market	Pouk district Center	Other				
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

International Labour Organisation Upstream CMB/97/M02/SID
Origin and Destination Survey

Market Survey Form

Day of Week

Name of Enumerator

Location

Only interview those not yet interviewed !

Time

Date

In/Out

Sheet

1	2	3	4		5		6	7	8	9
N°	Vehicle Type	Already interviewed? (Yes/No)	Origin of Vehicle		Destination Vehicle		Travel Time	Travel Frequency	Type of commodity (Code)	Weight (Kg)
			Pouk Market	Other	Pouk Market	Other				
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

International Labour Organization Upstream CMB/97/M02/SID
School Survey Form

Day of Week

Date

Time

Survey all Students and Teachers

School

Grade

Sheet

N°	Name of Student	Vehicle Type	Origin(Village and Comm.)	Travel Time	Travel Frequency	Which road do you travel?
<u>1</u>						
<u>2</u>						
<u>3</u>						
<u>4</u>						
<u>5</u>						
<u>6</u>						
<u>7</u>						
<u>8</u>						
<u>9</u>						
<u>10</u>						
<u>11</u>						
<u>12</u>						
<u>13</u>						
<u>14</u>						
<u>15</u>						
<u>16</u>						
<u>17</u>						
<u>18</u>						
<u>19</u>						
<u>20</u>						

Note: The Vehicle code:

1 -Own Bicycle

2 - Other's Bicycle

3 - Own Motorbike

4 - Other's Motorbike

5 - Remorque

6 - By foot

The **Socio Economic Series** is an initiative of the *Ministry of Rural Development* (MRD) and the *Upstream Project* of the *International Labour Organisation* (ILO). It comprises a series of studies that measure the potential impacts arising from investments in rural transport infrastructure.

- SE Series No. 1:** *Traffic Characteristics around Puok Market* by Bas Rozemuller, Sovithea Khun and Samrith Yan.
- SE Series No. 2:** *Employment in ILO Supported Road Construction and Maintenance* by Judith Zweers and Alebachew Kassie (CAS).
- SE Series No. 3:** *Household Travel and Transport Analysis* by Bas Rozemuller, Panha Thou and Samrith Yan.

Ministry of Rural Development

Corner Rd. 169 and Soviet Blvd
Phnom Penh

Kingdom of Cambodia

Tel: 855-23-366 792

Fax: 855-23-428 049

Contact person:

H.E. Suos Kong

Under Secretary of State

Email: skong_mrd@forum.org.kh

International Labour Organisation

No.8 Street 352 off Norodom Blvd

PO Box 877 (UNDP)

Phnom Penh, 12302

Kingdom of Cambodia

Tel: 855-23-211 484, 428 210

Fax: 855-23-427 632

Contact person:

Bas Rozemuller

Associate Expert Socio Economic Studies

Email: basr-ilo@bigpond.com.kh

Employment-Intensive Investment Branch (EMP/INVEST)

Recovery and Reconstruction Department (EMP/RECON)

International Labour Office

4, Route des Morillons,

CH-1211 Geneva 22, Switzerland

Tel: +41-22-799 6546, Fax: +41-22-799 6489