開発途上国におけるオートバイの
都市交通手段としての役割と限界に関する研究

資　料　集

平成15年6月

はじめに

　東南アジア地域のいくつかの国では、オートバイが都市生活の中で重要な交通手段となっており、その動向が交通安全、市街地の発展、都市環境などへ与える影響も大きいと考えられる。しかしながら、都市交通全体におけるオートバイの位置づけは必ずしも明らかでなく、また道路設計や交通管理においても自動車が中心とされており、オートバイは殆ど考慮されていないのが現状である。

　そこで、本研究では東南アジア、特にタイ・ベトナム・カンボジアを対象に、オートバイが現在、都市交通手段としてどのような役割を担っているのか、そして、経済発展・都市開発・安全・環境面を踏まえて、将来どういう役割があるのか、またその限界がどこにあるのかを、マクロとミクロの2つの視点から考察することを目的に、研究を進めた。

　研究調査活動の結果、保有構造や安全教育の動向の把握、オートバイタクシーの実態や交差点での飽和交通流率の解析などで多くの新しい知見を得られた。しかし、地域政策とオートバイの役割との関係、交通手段選択におけるオートバイやオートバイタクシーの需要動向、交差点での挙動特性、安全教育の効果分析などといった点で、さらなる研究調査の必要性が明らかとなった。

　本資料集は、平成14年度の研究調査活動の概要および参考資料等を集めたものである。なお、本研究の成果は、国際交通安全学会誌 IATSS Review Vol.29, No.2 に掲載予定である。

研究組織

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※ ［　］内は執筆担当／資料提供者

第 I 編　概　要

I-1　ベトナム・タイにおけるオートバイの使用状況に関する導入調査

日本大学理工学部機械工学科専任講師　関根太郎

1．はじめに

　開発途上国におけるオートバイの都市交通手段としての役割と限界を検討する導入調査として、オートバイの使用状況について現地視察するとともに、メーカーへの現地実態についてのヒアリングによりその現状を把握した。

2．視察調査（詳細については、記録ビデオ参照）

　ハノイ（ベトナム）　市内交通状況視察・交差点交通状況記録（2002 年 8 月 6－8 日）

　バンコク（タ　イ）　市内交通状況視察・交差点交通状況記録（2002 年 8 月 8－10 日）

3．ヒアリング調査

　タイ・カンボジア・ベトナムを中心とした東南アジアの二輪車の生産・販売・利用等の実態について　依田勝久氏（本田技研工業　アセアン地域業務室二輪アセアンブロック）

　シンガポール・タイ・ベトナムにおけるホンダの安全運転教育普及活動について　斉藤好久氏、鳥屋原登氏（本田技研工業　安全運転普及本部）

4．知見

　ハノイでの交通状況視察から、空港付近の幹線道路など郊外では、オートバイの乗車人数は 1～2 名、速度域は 40～50km/h 程度で比較的高速である。それに対し、市内幹線道路では、交通密度の 80%以上をオートバイが占め、速度域は 20～30km/h 程度で比較的低速である。また、オートバイの道路占有率が多数であることに関連して、信号制御されている交差点においても、右折などは、オートバイの流れによって実現されているのが現状である。車両運動特性に着目すると乗車定員オーバーや大きな荷物を車載しているなど、車両としての走行安定性の低下が見受けられる。しかし、市内では速度域が低速であるため、上記のような搭載状態で転倒、接触などがあっても死亡事故につながることは少なく、逆に郊外では、乗車人数が少ないが走行速度が高いため死亡事故が発生しているとのことである。市内市街地などにおいても、乗用車の占有率が増加することでの平均走行速度が上昇した場合、死傷率向上の可能性がある。

　使用されている車両は、100cc 程度の 4 ストロークエンジン搭載がほとんどを占めているが、メーカー製品と模造品との比較などについては今回の現地調査では、把握するに至らなかった。

　バンコクの市内では、幹線道路では公共交通機関の発達に加え、乗用車の増加傾向が見られ、結果として渋滞が発生している。オートバイは、オートバイタクシーとして利用されているが、使用形態として、幹線道路に対する比較的長距離をターゲットとしたものと、幹線に直交するソイに沿って運行されている比較的短距離をターゲットとしたソイバイクに分類される。オートバイでのヘルメット着用義務があるように、道路交通法の整備がされているため、視察した市内で

は、乗車定員オーバーなどの事例を見かけることはなかった。

　走行速度域は 60km/h を越えた程度で、幹線道路での車両間のすり抜けなど渋滞状況下での機動性が見受けられ、使用車両もパワーを発生しやすい 2 ストロークエンジン搭載車両が中心であった。視察した地域では大気への排出ガスの問題が懸念される状況であった。なお、メーカー関係者のヒアリングによれば、現在では新規販売は環境問題などから 4 ストロークエンジン搭載車としているとのことである。

　安全教育環境に関しては、ヒアリングによると、交通事故統計は把握されておらず、メーカー他が独自に調査をしているのが現状である。従って、事故類型別の安全対策や安全教育を政府レベルで実行するには至っていない。一方で、正規ディーラーで車両購入する場合には、注意シートなどを利用した安全講習を行うなどの方策が採られているが、受講が任意ということや中古車や無免許などで乗る場合が多々あるため、全体としては今後改善を要する点である。また、その内容も、交通標識や交通ルールを教えるレベルなど、受講者のレベルが限界域の車両挙動などまで視野に入れた日本国内とは異なるため、現地ノウハウの取得・確立は非常に重要である。以上のような現状から日本国内のような安全運転教育センターなどの設置による効果も出てきているが、全体に対する効果はまだ低いのが現状である。

5．今後の検討点

　上記で知り得た現地状況は、モータリゼーション発展時の日本の状況と類似している部分が見受けられる。従って、今回よりも詳細な現地調査とともに以下に示す日本での検討事例を比較することで、安全対策などの面から途上国におけるオートバイの交通手段の限界と役割を見いだすことが可能となると考える。

- ・　ライダーの安全知識レベルの把握
- ・　オートバイ道路占有率と交通事故事例
- ・　安全対策実施方法と効果測定

＜参考資料編の II-1 参照＞

I-2 わが国とタイ(バンコク)における自動車保有状況の比較検討

東京女子大学文理学部社会学科教授　竹内　健蔵

1．問題意識

　一国における乗用車やオートバイの保有の状況がどのように変化するかについては、さまざまな要因が考えられる。第1に、その国を取り巻く社会経済環境の変化がその保有状況に大きな影響を与えるであろう。たとえば、その国の人口、経済成長の変化、道路などのインフラの整備の状況、車両の価格などがそれらに当ると思われる。第2に、乗用車とオートバイはある程度代替的な関係にあると思われるので、乗用車（オートバイ）の保有の変化はオートバイ（乗用車）の保有の変化に影響を与えるであろう。そうしたさまざまな要因を探ることによって乗用車あるいはオートバイの保有の変化を考察することが、本プロジェクトの重要な目的の1つである。また、日本とタイ（バンコク）を比較することによって、たとえばタイ（バンコク）は日本と同じような保有状況の変化のパターンを歩むのであろうか、などという点も関心事である。とりわけこの点を考えることは、今後急速な経済成長を遂げる可能性を秘めている東南アジアの諸国において、日本と同様の交通問題への対応の失敗という轍を踏まないための処方箋を与えてくれる有力な手がかりとなることが予想される。

　平成14年度の調査においては、社会経済環境の変化の中でももっとも車両の保有台数に影響を与えるであろう経済指標である、GDP（国内総生産）あるいはGPP(県内総生産)を取り上げて分析した。そして、乗用車とオートバイとの代替関係を調べるために、各車両の保有の関係の分析を試みた。また、需要の所得弾力性の計測に近似するものとして、GDP（GPP)の車両の保有に対する弾性値を計測した。

2．分析結果

　図1はバンコクにおける県内総生産と1,000人当たりの乗用車ならびにオートバイの保有台数の関係を図示したものである。この乗用車に関する回帰曲線は次のとおりである(y：1000人当たり乗用車保有台数、x：バンコクの県内総生産（バーツ））。

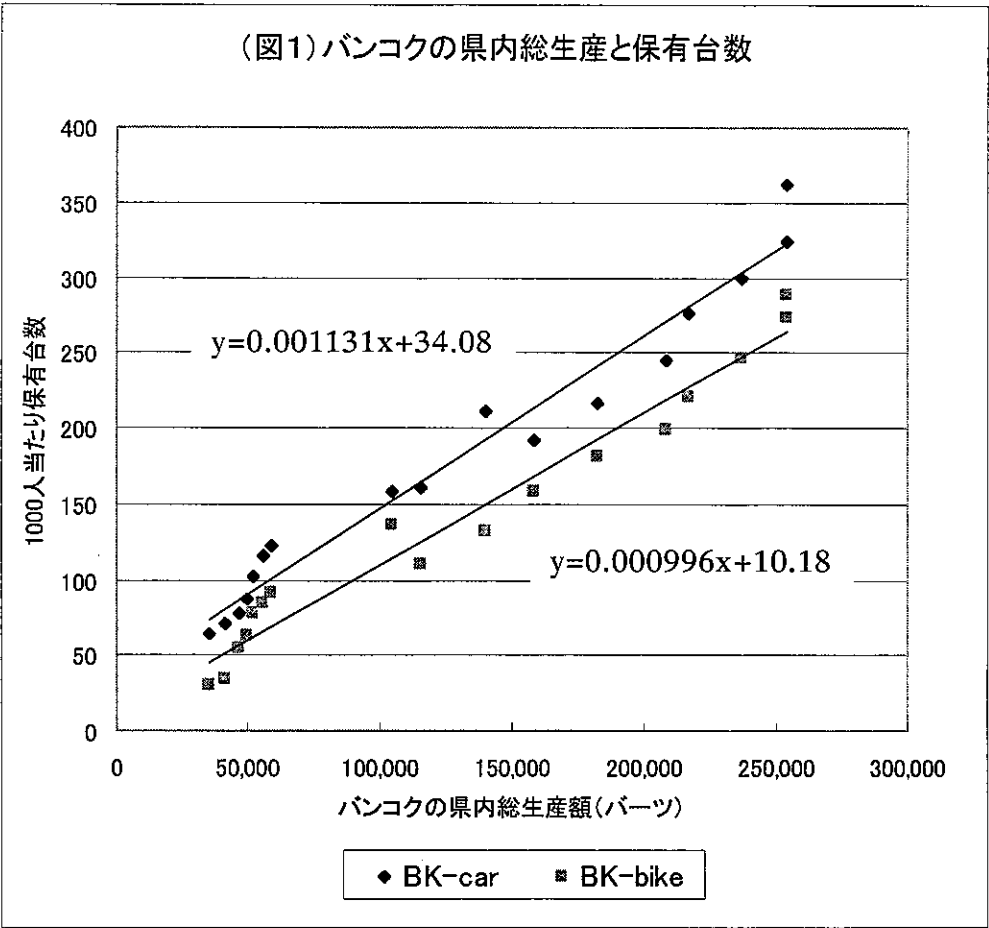$$y＝0.001131x+34.08443　　（R^2＝0.965853）$$

$$（20.59807）　（4.071067）$$

なお、カッコ内はt値である。同様に、オートバイに関する回帰曲線は次のとおりである

（y：1,000 人当たりオートバイ保有台数、x：バンコクの県内総生産（バーツ））。

$$y＝0.000966x＋10.18647 \quad （R^2＝0.96416）$$

$$（20.08796）（1.347648）$$

このように、県内総生産と保有台数の間には非常に相関が強い。

（図1）バンコクの県内総生産と保有台数

同じことを日本においてみてみることにしよう。図2は日本の実質国内総生産と1,000人当たりの乗用車ならびにオートバイの保有台数の関係を示したものである。乗用車に関する回帰曲線は、次のとおりである(y：1,000 人当たり乗用車保有台数、x：日本の実質国内総生産（単位 10 億円、平成 2 年価格）)。

$$y＝0.000838x－52.5563 \quad （R^2＝0.926104）$$

$$（13.71088）（－2.151）$$

相関はバンコクのそれよりも劣るが、それでもなお、GDP との相関がかなり高く説明力が高い。しかしながら、オートバイの場合、状況は若干異なる。図 2 を見るかぎり、1985年と 1986 年を境として 1985 年までは保有台数は増加、1986 年以降に保有台数は減少となっている。1985 年までの回帰曲線は次のとおりである(y：1,000 人当たりオートバイ保

有台数、x：日本の実質国内総生産（単位 10 億円、平成 2 年価格）)。
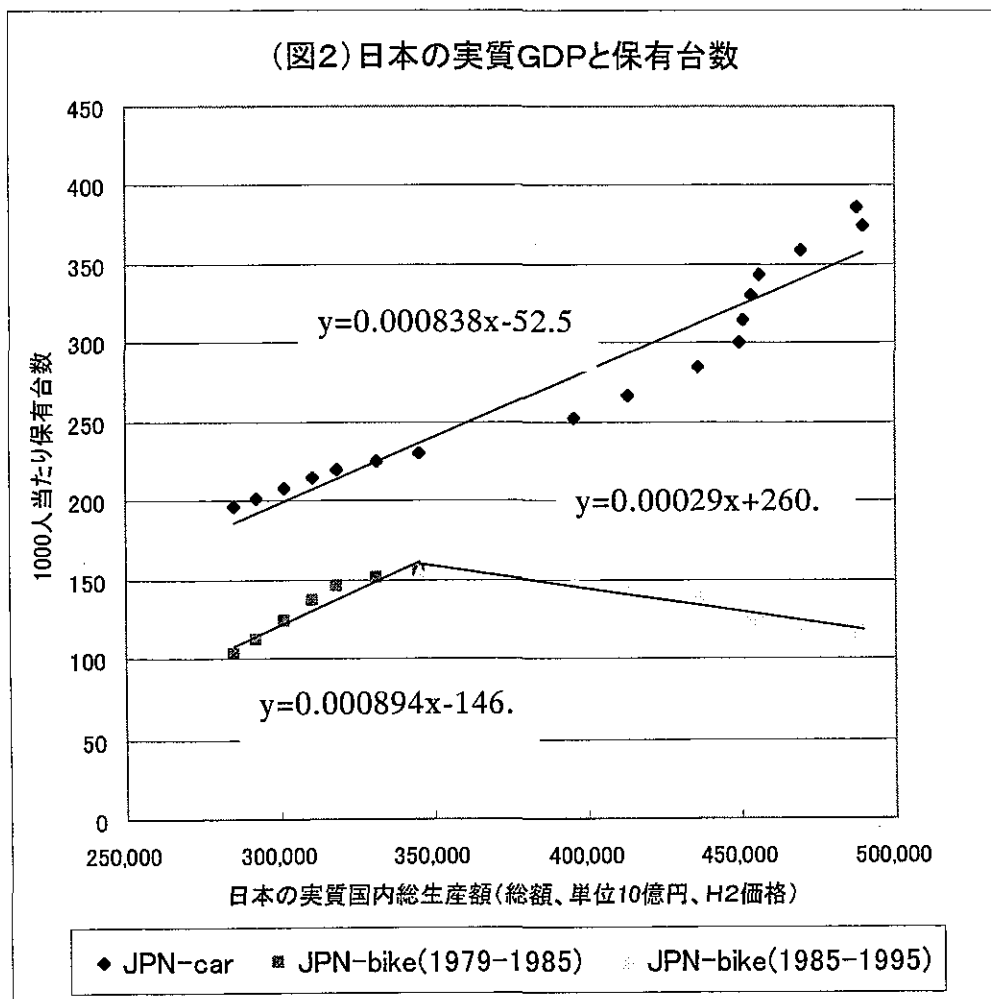
$$y＝0.000894x－146.949 \quad (R^2＝0.923646)$$

$$(7.777199) \quad (－4.08537)$$

また、1986 年以降の回帰曲線は次のとおりである。

$$y＝－0.00029x＋260.1193 \quad (R^2＝0.90174)$$

$$(－9.08811) \quad (18.50706)$$

1985－1986 を境に 2 つの回帰曲線として分析した場合、それぞれにかなりの相関を持っていることがわかる。したがって、このオートバイの保有のピークについて、それが生じた原因を探る必要がある。

（図2）日本の実質GDPと保有台数

次に、自動車とオートバイに代替的な関係があることを予想して、両者の保有に関する分析を行った。これは図 3 に示されている。縦軸（y）に 1,000 人当たりのオートバイ保有台数をとり、横軸（x）に 1,000 人当たりの乗用車の保有台数を取る。バンコクの場合、回帰曲線は、

$$y = 0.87221x + 18.3286 \quad (R^2 = 0.97963)$$

$$(26.85845) \quad (-2.77998)$$

であり、やはり良好な相関を示している。ただ、これは正の相関であるので、もちろん双方が代替財の関係にあるということは考えにくい。双方とも時系列的に一貫している伸びを示しているのは、両者が補完的な役割を果たしているのか、あるいは経済成長その他の要因によってともに保有台数が伸びているのか、などということがその理由として候補に挙がるが、これらについては更なる精査が必要である。一方、日本の場合は状況が異なっている。図2と同様に1985－1986年をターニングポイントとして、明確な傾向の違いが見られる。1985年までの回帰式は、
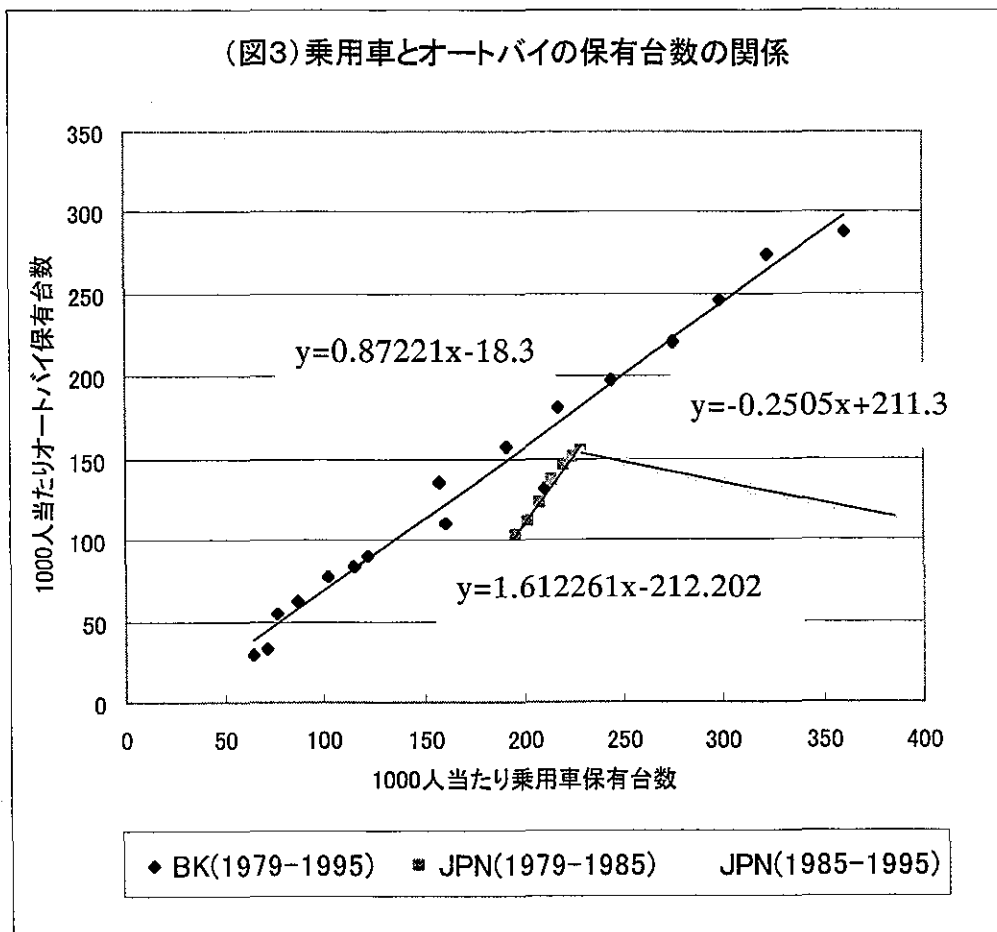
$$y = 1.612261x - 212.202 \quad (R^2 = 0.985757)$$

$$(18.60248) \quad (-11.4447)$$

であり、1986年以降の回帰式は、

$$y = -0.2505x + 211.3016 \quad (R^2 = 0.997254)$$

$$(-57.167) \quad (152.2572)$$

（図3）乗用車とオートバイの保有台数の関係

y=0.87221x-18.3

y=-0.2505x+211.3

y=1.612261x-212.202

1000人当たりオートバイ保有台数

1000人当たり乗用車保有台数

◆ BK(1979-1995)　　■ JPN(1979-1985)　　　JPN(1985-1995)

となっている。1985年までは自家用車とオートバイはともにその保有台数を増やしているが、バンコクと比べて、乗用車に対する自家用車の伸びが著しい。しかし、1986年からは一転してオートバイの保有台数は乗用車に対して減少となっている。1986年以降、オートバイは乗用車と代替的な関係になったのかどうか即断はできないが、ともあれ、このターニングポイントをより詳細に分析する必要がある。

　最後にGDP（GPP）の各車両の保有台数に関する弾性値を測定した。これらは各年において算出した各弾性値を単純平均したものである。この弾性値は経済成長が 1%進んだときに保有台数（1,000 人当たり）が何％増加したかを示す数値である。これを表1に示す。

（表1）GDP（GPP）の保有台数に関する弾性値

バンコク・オートバイ（1979-1996）	1.523739
バンコク・乗用車（1979-1996）	1.157512
日本・オートバイ（1979-1985）	2.14753
日本・オートバイ（1985-1997）	-1.96288
日本・乗用車（1979-1997）	2.573601

　これまでの分析から明らかなように、表1においても日本のオートバイの保有の変化が特徴的である。また日本の乗用車はバンコクのオートバイ、乗用車よりも高い弾性値を示していることもまた特徴的である。

3．今後の課題

　上記のような分析を試みることによってある程度の知見を得ることができたが、それ以上にさまざまな分析がさらに必要になることが明らかになっている。

　第1に、経済成長は確かに各車両の保有台数ときわめて良好な相関を持っているが、それ以外の要因は車両の保有台数にどれくらいの相関を持つことができ、有意に説明できるかどうか確認することが必要である。第2に、日本のデータは1979年以降のものであり、日本がまだ開発途上にあった終戦直後からのデータは取られていない。これらデータによる分析で、開発途上にある東南アジア諸国のオートバイの動向について更なる知見を得る可能性が高い。第3に、日本のオートバイの伸びは1985－1986年を境に激変したが、その原因はどこにあるのかが未解決のままである。第4に、乗用車とオートバイが補完的な

関係にあるのか、代替的な関係にあるのか、全く独立な関係としてよいのか、などについ
ての調査が必要である

　以上のような課題を処理していくことによって、東南アジアの交通政策を考察するにあ
たってより良い情報を提供することが可能になると考えられる。

I-3　タイにおけるオートバイ保有および安全に関する調査の概要

PL　　　日本大学理工学部社会交通工学科助教授　　　福田　敦

協力　　日本大学理工学部社会交通工学科助手　　　　長井　裕美子

　　　　日本大学大学院工理学研究科　修士1年　　　岡田　裕香

　　　　日本大学大学院工理学研究科　修士1年　　　端野　良彦

1. はじめに

タイの首都バンコク都の住民を対象に、モーターバイクの保有・利用実態および安全に関する実態を明らかにすることを目的に、アンケート調査を実施した。なおこの調査では、比較のために自家用車に関しても同時に調査した。また、地域比較のため地方都市であるチェンマイ市およびコンケン市の住民に対しても同様の調査を実施した。

2. アンケート調査概要

対象地域：バンコク都・チェンマイ市・コンケン市

実施期間：2002 年 8 月 1 日から 9 月 5 日（アンケート回収終了日までを実施期間とする。）

現地調査実施者：岡田裕香、端野良彦

現地での調査協力者：

【バンコク】Dr. Sorawit Narupiti、チュラロンコン大学助教授および大学院学生 2 名

　　　　　　Miss Wandee , Kaurinbuilding マネージャー

【チェンマイ】Dr. Rungsun Udomsri、チェンマイ大学助教授および大学院学生 2 名

【コンケン】Dr. Pongrid Klangboonkrong、コンケン大学助教授

　　　　　　Mr. Thaned Satiennam、コンケン大学講師および学部学生

　アンケート調査票は、世帯構成の属性（年齢、職業、収入、性別）、通勤・通学での交通手段、通勤・通学先までの時間、バイク、自家用車の保有実態（購入目的、支払い方法、購入費、管理費、利用目的、最大利用距離、使用年数、通勤通学以外の利用目的、将来自家用車を保有したいか）に関しての質問を中心に作成した。また、安全面（バイクおよび自家用車の免許の有無、安全教育指導の有無、バイクおよび自家用車運転開始年齢等）に関する質問も含めた。アンケート調査は日本語（添付資料 17）と英語（添付資料 18）で作成したものをタイ語（添付資料 19）に翻訳した。

　アンケートは、バンコク、チェンマイでは大学を中心に、校内で直接回答者に手渡し、その場で記入して頂いた。その他にバンコクでは、20 社の企業を訪問し、その社員に同様に回答して頂いた。コンケンに関しては、上記期間中にアンケートを送付し、現地大学の方に調査を行って頂いた。

3. アンケート結果

- 回答者の移動目的は、バンコクとコンケンに関しては、通勤と通学が約半分の割合となったが、チェンマイに関しては、大学を中心に調査をしたため、100％通学となった。世帯構成者の職業は、どの地域も大学生の割合が高く、次に多かった職業はバンコクでは会社員、チャンマイでは公務員と自営業、コンケンでは公務員と会社員の割合が高くなった（資料1）。
- 世帯の平均収入はバンコク 37,697 バーツ、チェンマイで 285,823 バーツ、コンケン 24,237 バーツとなっており、首都と地方都市での格差が見られた（資料2）。
- 世帯におけるバイク保有台数は、どの地域においても 2 台保有している割合が高く、どの所得の人でも平均的に保有していた。自家用車保有台数は所得の高い世帯ほど保有台数は多い（資料3）。
- バイクおよび自家用車購入価格は、どの地域も大差はなく、バイクの平均購入価格は、33,715 バーツで、自家用車の平均購入価格は、483,747 バーツとなった。自家用車の購入価格は、バイク購入価格の約 15

倍で、地方都市の月収の約17ヶ月分に相当した（資料4）。

- バイク使用年数は、どの地域でも0~5年が最も多く、次は5～10年であった。自家用車に関しても、同様に0~5年が最も多く、次は5～10年であった（資料5）。

- バイクの維持費は、どの地域も100～500バーツの割合が高い。また自家用車の維持費は2000～3000バーツの割合が最も高く、これはバイクの維持費のおよそ10倍に当たる（資料6）。

- バイクの購入理由の中で最も高い割合を示したのは、「快適・便利だから」という理由だった。次に「通勤・通学・業務のため」という割合が高い。自家用車の購入理由は、「通学・通勤・業務のため」が最も高い割合を示し、次に「快適・便利だから」という割合となった（資料7）。

- バイクおよび自家用車を通勤・通学以外の目的で使用する理由としては、両者とも、どの地域でも「どこへ行くときも」という理由が最も多い（資料8）。

- バイクの最大利用距離は、どの地域でも10～20km.までが最も多く、自家用車の最大利用距離は200～400km.となった（資料9）。

- バイクおよび自家用車を購入する場合の支払い方法は、バンコク・チェンマイではバイク・自家用車の何れも7割、コンケンではバイクが9割、自家用車が6割の割合で、一括払いであった（資料10）。

- 現在バイクのみを保有している世帯に対して、「将来自家用車を保有したいか」聞いてみたところ、バンコクに比べ地方都市の方が、保有希望者が多い（資料10）。

- バイク免許取得率はバンコク42.3%、チェンマイ78.1%、コンケン54.6%と免許取得者の割合はかなり低い。自家用車免許取得率に関しては、バイクよりも取得者が多く、バンコク75.8%、チェンマイ80.6%、コンケン63.3%という結果であった。また免許を取得したときに安全教育を受けたかの有無に関しては、免許取得者と同じ割合となった（資料11）。

- バイクの運転開始年齢は、どの地域も約14歳であった。また自家用車運転開始年齢は、地域ごとに差があり、バンコクでは20歳以上、チェンマイでは14～20歳、コンケンでは14~17歳の割合が高い（資料12）。

- バイクのヘルメット着用率に関しては、着用しない割合が、バンコクでは17%、チェンマイでは9%、コンケン6%となっており、バンコクの方が地方都市に比べて高い割合を示した。また、「ヘルメット未着用で警察の取締りを受けたことがあるか」に関して、取締りを受けたことがある率は、バンコクでは26.1%、チェンマイは55.4%とバンコクの約2倍、コンケンは64.7%とバンコクの約3倍の割合であった（資料13）。

- バイクの規定乗車人数を守っているかに関しては、「いつも守らない」割合がバンコクでは6%、チェンマイでは0%、コンケンでは3%となっており、全体的に割合が低い。またバイクの定員オーバーで警察の取締りを受けたことがあるかに関して、「受けたことがある」割合はバンコクで29%、チェンマイで19%、コンケンで15%という割合であった（資料14）。

- シートベルト着用率に関しては、「いつも着用しない」はバンコクで2%、チェンマイで0%、コンケンで3%とほとんどいない。またシートベルト未着用で警察の取り締まりを受けたかに関しては、「受けたことがある」と答えた割合は、バンコクでは18%、チェンマイでは11%、コンケン3.3%と地方都市の方が低い（資料15）。

- 自家用車の規定乗車人数を守っているかに関しては、「いつも守らない」の割合がバンコクでは20%、チェンマイでは3%、コンケンでは0%となっておりバンコク以外はほとんどの人が守っている。また自家用車の定員オーバーで警察の取締りを受けたことがあるかに関しては、「受けたことがある」の割合はバンコクで8%、チェンマイで0%、コンケンで0%とバンコク以外は0%となった（資料16）。

4. おわりに

　上記の通り、アンケート調査によってバンコクにおけるオートバイ保有・利用の実態および安全に対する意識を明らかにすることができた。

＜資料1～19は参考資料編 II-2 に掲載。参考資料編 II-4 参照＞

I-4　ベトナムにおけるオートバイ保有および安全に関する調査の概要

PL　　　日本大学理工学部社会交通工学科助教授　　　福田　敦

協力　　日本大学理工学部社会交通工学科助手　　　　長井　裕美子

　　　　日本大学大学院工理学研究科 修士1年　　　　岡田　裕香

1. はじめに

ベトナム国社会主義共和国の首都ハノイ市を対象に世帯のモーターバイク、保有・利用実態を明らかにする為に、アンケート調査を実施した。なおこの調査では、比較のために乗用車・自転車の保有・利用に関しても合わせて調査した。また、地域比較の観点からホーチミン市においても同様の調査を実施した。

2. アンケート調査概要

対象地域：ハノイ市、ホーチミン市

実施期間：2003 年 3 月 17 日から 22 日に実施した。

現地調査実施者：長井裕美子、岡田裕香

現地での調査協力者：

【ハノイ】Mr. Khuat Viet Hung、ハノイ交通大学助教授

　　　　　Miss. Le Thu Huyen、ハノイ交通大学助教授および同大学の学部生 10 名

　アンケートの調査票は、世帯構成の属性（年齢、職業、収入、バイク及び車の免許有無）、およびバイク、自動車の保有実態（購入費、管理費、利用者及び利用目的）関する A 票。通勤者の通勤可能な交通手段（バス、タクシー、バイクタクシー、自家用車、自家用バイク、自家用自転車）と、その手段に関する質問（待ち時間、通勤時間等）B 票。通学者を対象として、B 票と同様の質問を伺う C 票を準備した。アンケート調査票は、（添付資料49）日本語および（添付資料50）英語で作成した後、ベトナム語に翻訳した。調査は調査員が家庭を訪問し、口頭で質問に対する回答を答えてもらい、家族構成と属性に応じて、調査票B 及びC を調査世帯に残して後日回収に行った。アンケート回収率は、90％以上であった（資料20）。

3. アンケート結果

（調査票 A の結果）

- 世帯構成人数は 4 人の世帯が多く、世帯当りの月収は 100~200 万ドン（8,000~16,000 円）が大部分を占めた。これを世帯一人当たりに換算すると、1,600 円～6,500 円／人に相当し、それ以下の世帯は非常に少なかった（資料21）。
- モーターバイクの保有率は97％を占め一人当りの二輪車保有台数は0.2～0.5 台／人に相当した（資料22）。
- バイクの運転免許取得が可能な年齢以上のバイク免許保有率は 40~60％の世帯が多い（資料22）。
- バイク購入費は、2,500～3,000 万ドンで月当たりの管理費は 10～15 万ドンが多い。管理費は所得の 5~10％に相当する（資料23）。
- バイクの利用実態では、1 台のバイクを 2 人以上の人が利用しているケースが半数以上を占めた。バイクの第一利用者（主に利用している人）の利用目的は、通勤及び通学が多い（資料24）。
- バイクの第一利用者以外の利用目的は、通勤および通学は少なく、様々な理由で利用されている。特にリラックスのためにバイクを利用している人が多く見られる（資料25）。
- バイクの第一利用者以外のうち、女性の利用目的は買物及びリラックスの為が多い。男性の利用目的も、リラックスのためも高いは多いが、買い物は非常に少ない（資料26）。
- 世帯合計所得とバイク保有台数は所得が上がるほど、複数保有の割合が高くなっている。また、世帯構成人数とバイクの保有台数では、人数が多い方が複数保有の割合が高くなった（資料27）。
- 一人当たりに換算した所得とバイク保有台数の関係は、所得が上がるほど複数保有の割合が増えるという傾向は見られなかった。また世帯一人当たりの所得とバイク保有率（一人当たり使用できるバイク台

数）も同様の傾向を示した（資料28）。

- 車の保有に関しては、全回答世帯において車保有おらず、車免許を保有している者も全くいなかった。
- 世帯で保有している自転車数は1台が多かった。自転車保有率は一人当たり0.2~0.3台となった。また、世帯人数と自転車保有台数では、人数が増えるほど自転車の複数保有が多い結果となった。自転車の世帯収入と自転車保有台数は、収入が少ないほうが保有台数の保有率が高くなる結果となった（資料29）。
- 自転車購入費は50~75万ドンが多い。管理費は大差がなく、非常に低い値（40~78円）であり、所得に対する管理費の割合も0.5%未満と非常に低い（資料30）。
- 自転車第一利用者（主に利用している人）の利用目的は、通学（40%）で、次に買物（25%）く、利用者の性別は女性の割合のほうが高く、利用者年齢も25歳以下の人が多い（資料31）。
- 自転車第一利用者以外の利用目的は、リラックスの為（33%）、買物（30%）となり、通勤通学の割合は低い。利用者の性別は男性の方が高く、利用年齢は20~25歳が多い（資料32）。

（調査票Bの結果）

- バスで通勤が可能な人の通勤時間は20~30分、タクシーで通勤が可能な人の場合は10~20分、車で通勤可能な人の場合は、100分以上が最も多い（資料33）。バイクタクシーで通勤可能な人の通勤時間は10~20分、自家用バイクで通勤可能な人の場合は10~20分、自家用自転車で通勤可能な人の場合は10~20分であった（資料34）。
- 公共機関を利用した場合の運賃は、バスの場合一律2,500ドン、乗り合いバスは一律1,000ドンである。タクシーの場合40,000~50,000ドン、バイクタクシーの場合5,000~6,000ドンであった（資料35）。
- 利用形態で、車の場合はその他、自転車、バイクの場合は自分で運転が多い（資料36）。
- バスを利用する事が可能な人の割合は34%、バイクタクシーを利用する事が可能な人は49%（資料37）。
- バスに関する結果として、バス停までにかかる時間は0~10分、バス停での待ち時間は10~15分、バス停を降りてから会社までかかる時間は5~10分が多い（資料38）。
- バスが利用不可な人の代替交通手段は、主に自家用バイクによる送迎が多く、バス利用不可能な理由としては、目的地に着くまでに適切なバス路線がない、乗車環境が悪いなどが挙げられた（資料39）。
- バイクタクシーに関しては、バイクタクシーを利用するまでにかかる時間は0~5分、乗車時間は10~15分、降りてから目的地にかかるまでの時間は0~5分が多い（資料40）。

（調査票Cの結果）

- バスで通学が可能な人の通学時間は20~30分、タクシーで通学が可能な人は10~20分、車で通学可能な人は、100分以上が最も多い（資料41）。バイクタクシーで通学可能な人の通学時間は10~20分、自家用バイクで通学可能な人は10~20分、自家用自転車で通学可能な人は10~20分となった（資料42）。
- 公共機関を利用した場合の運賃は、バスの場合一律2,500ドン、乗り合いバスは一律1,000ドンである。タクシーの場合20,0000ドン以下はなく、20,000~30,000ドン、バイクタクシーの場合5,000~10,000ドンが最も多い（資料43）。
- 利用形態は、車の場合は家族が運転、自転車、バイクは自分で運転の割合が最も多い（資料44）。
- バス利用可能者は33%、バイクタクシー利用者は67%であった（資料45）。
- バスに関しては、家からバス停までにかかる時間は0~5分、バス停での待ち時間は5~10分、バス停を降りてから学校までかかる時間は0~5分が最も多い（資料46）。
- バイクタクシーが利用可能な人は、代替交通手段の自家用バイクによる送迎が最も多く、バス利用不可能な人の理由としては、自宅から目的地に着くまでに適切なバス路線がないという理由が多い（資料47）。
- バイクタクシーに関しては、バイクタクシーを利用するまでにかかる時間は0~5分、平均乗車時間は10~15分、バイクタクシーを降りてから学校までにかかる時間は0~5分が最も多い（資料48）。

4. おわりに

　上記の通り、アンケート調査によってハノイにおけるオートバイ保有・利用の実態を明らかにすることができた。

＜資料20~48は参考資料編II-3に掲載。参考資料編II-4参照＞

I-5　プノンペンおよびバンコクにおけるバイクタクシーに関する分析

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1．分析概要

　ここでは、カンボジアのプノンペンおよびタイのバンコクにおけるバイクタクシーに関する調査分析を行った結果を掲載した。

　プノンペンでは、マーケット近傍路上でのバイクタクシー利用者へのアンケート調査、同路上でのバイクタクシー運転者へのアンケート調査、都心部主要事業所や商業地でのアクセス交通手段調査の3種類のアンケート調査を実施し、バイクタクシーの利用実態とドライバーの実態の把握を試みた。関連して、バンコクやハノイのバイクタクシーとの違いや教育制度の違いについて、資料でわかる範囲での比較を試み、プノンペンのバイクタクシーの政策的な課題をまとめた。II-5（参考資料編）は、これらの調査をもとにした、横浜国立大学大学院国際社会学研究科インフラストラクチャーマネジメントコースの修士学生の修士論文本体である。また参考までに彼が修士論文発表会で用いたパワーポイント資料をII-6（参考資料編）に添付した。

　バンコクについては、都心部路上で夕方ピーク時に、ＢＴＳ（高架鉄道）および幹線バスで郊外に帰宅する通勤者を対象に、その日の朝に利用した交通機関と、帰宅時に利用予定の交通機関について尋ねた。ＢＴＳあるいはバス利用の場合、駅あるいは停留所を降車後に自宅まで徒歩、バイクあるいは他の交通機関を利用することになるが、それらについても尋ねた。2（次頁）はそのアンケート調査結果の概要で、II-7（参考資料編）は実際に用いた調査票である。徒歩とバイクの手段選択状況の把握に主眼をおいた、手段選択の違いにどのような要因が効いているのかを検討した結果をまとめている。

2. バンコクのソイバイク利用アンケート調査分析結果

交通行動アンケート調査の概要
調査日時：２００２年１２月１１日〜１３日
調査場所：バンコク、シーロムロード（バンコクのビジネスエリア）
調査対象：バスまたはスカイトレインを用いて来られた方
抽出方法：無作為抽出
調査項目：個人属性、交通手段、所要時間、費用、選択理由など
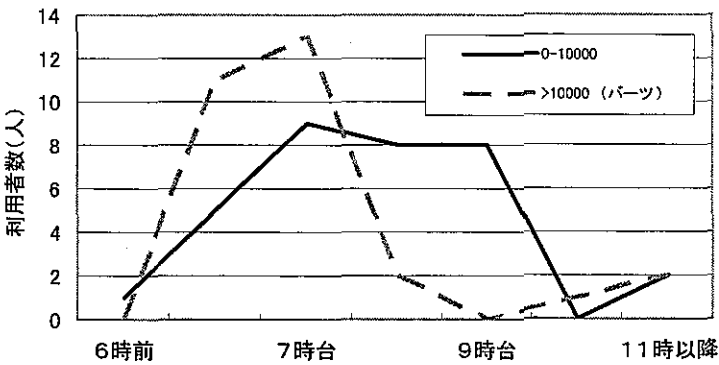有効票数：５０１票（男性：２０５票、女性：２９６票）

図１：バイクタクシー利用者に関する所得別利用時間帯分布
　　　（以下月収１万バーツ以下を低所得者とする）
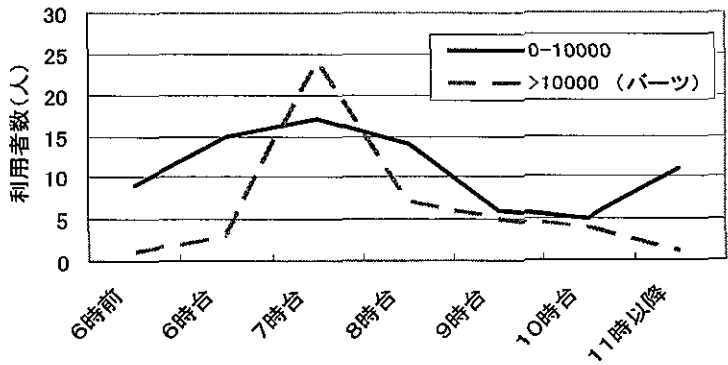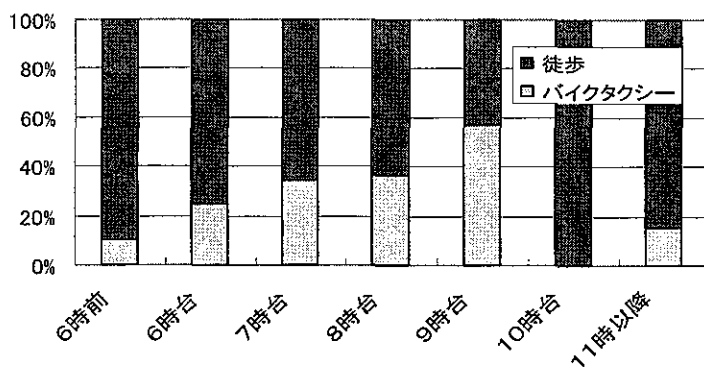

図２：徒歩移動者に関する所得別移動時間帯分布
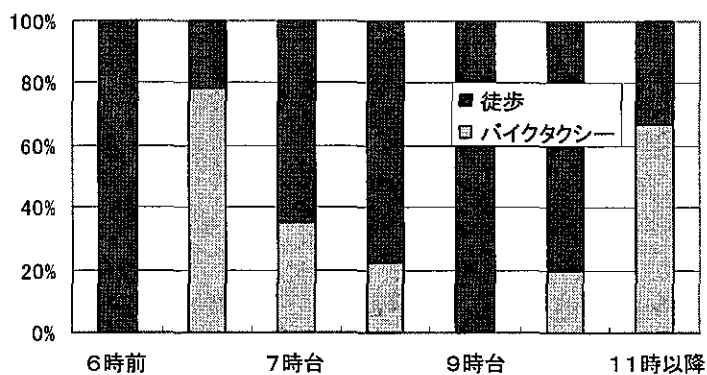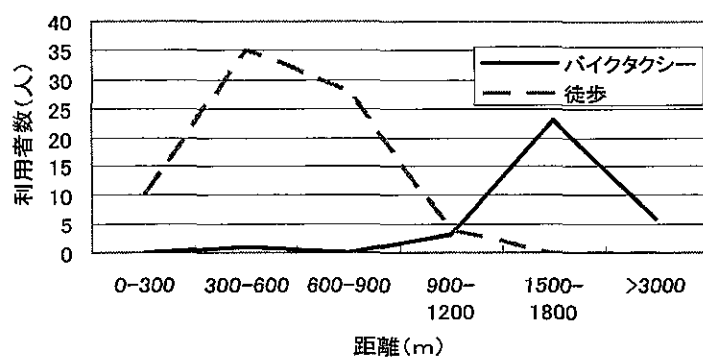
図3：低所得者層に関する時間帯別手段分担率
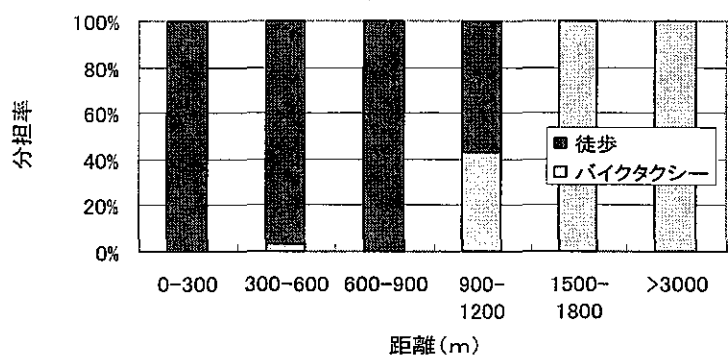

図4：高所得者層に関する時間帯別手段分担率

図5：低所得者層に関する手段別利用距離帯分布

15

図6：低所得者層に関する距離別手段分担

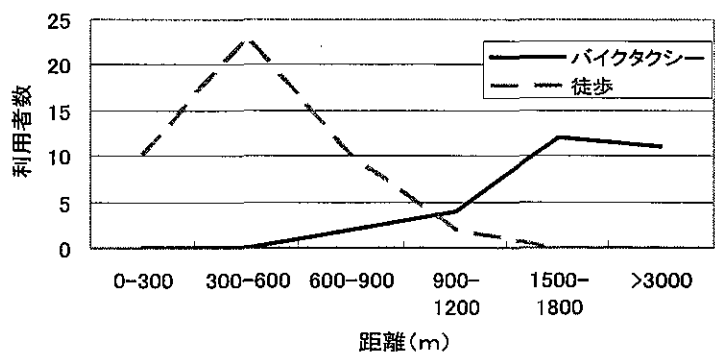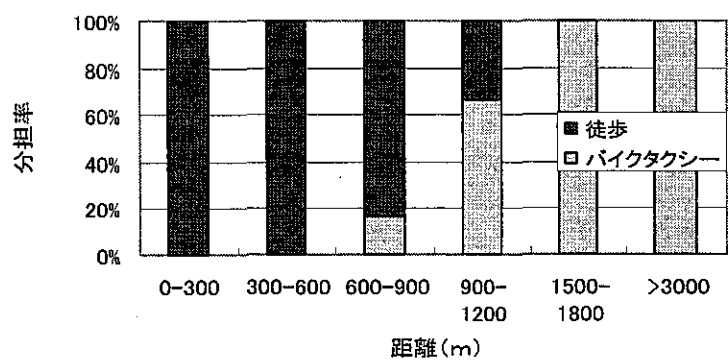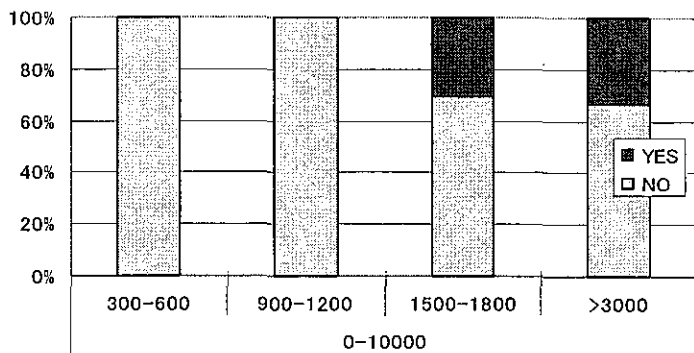図7：高所得者層に関する手段別利用距離帯分布
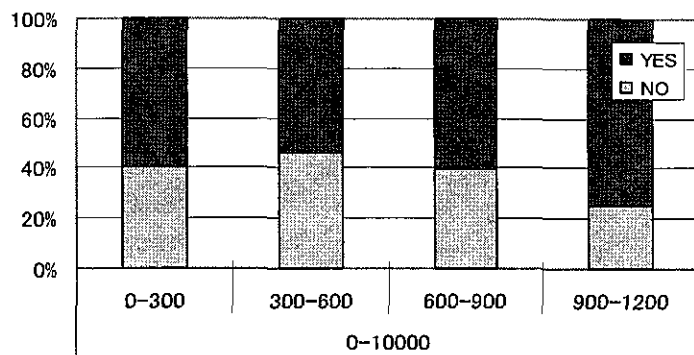

図8：高所得者層に関する距離別手段分担
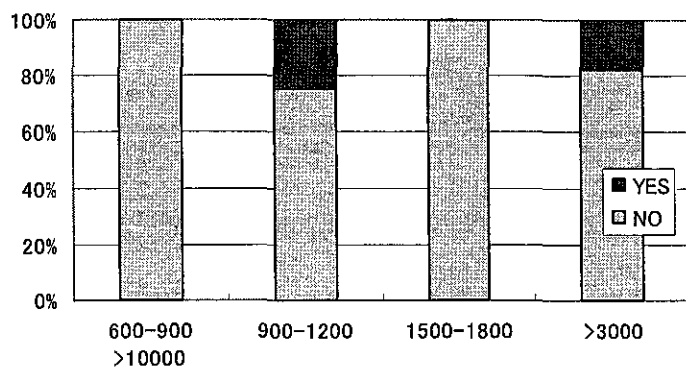
図9：距離別回答割合（バイクタクシー利用者・低所得者）
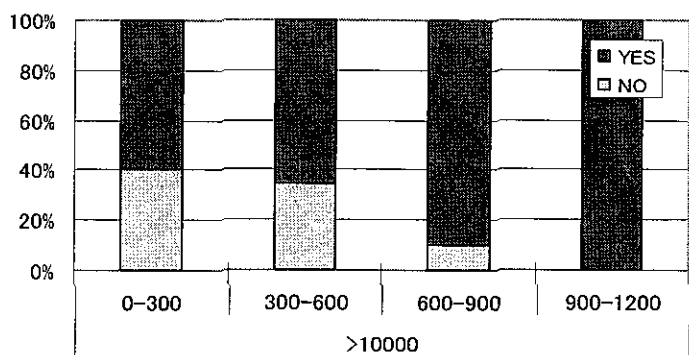

図10：距離別回答割合（徒歩移動者・低所得者）
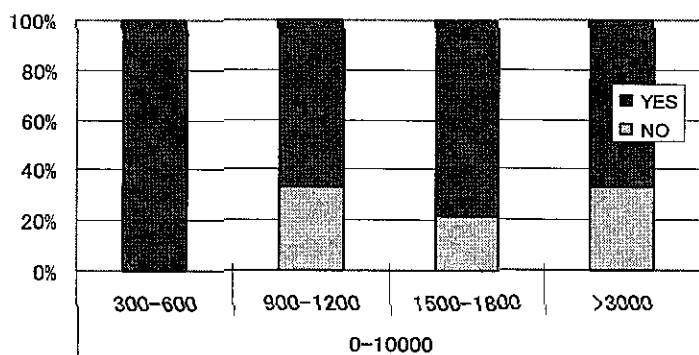

図11：距離別回答割合（バイクタクシー利用者・高所得者）

図１２：距離別回答割合（徒歩移動者・高所得者）

図１３：距離別回答割合（バイクタクシー利用者・低所得者）
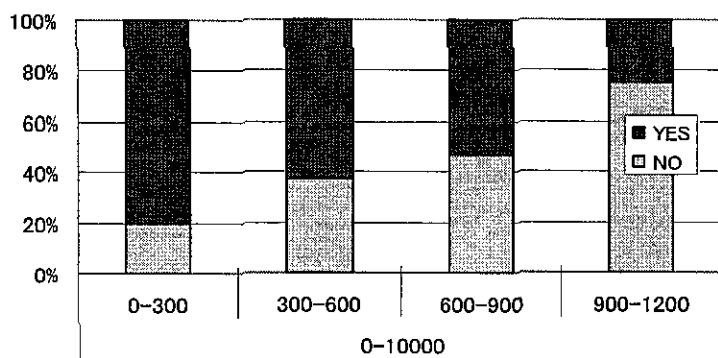
図１４：距離別回答割合（徒歩移動者・低所得者）

18
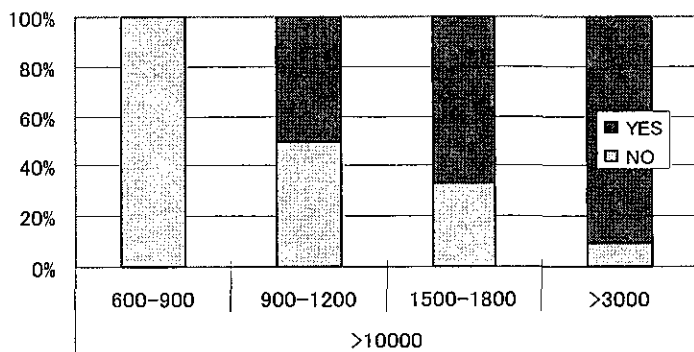
図15：距離別回答割合（バイクタクシー利用者・高所得者）
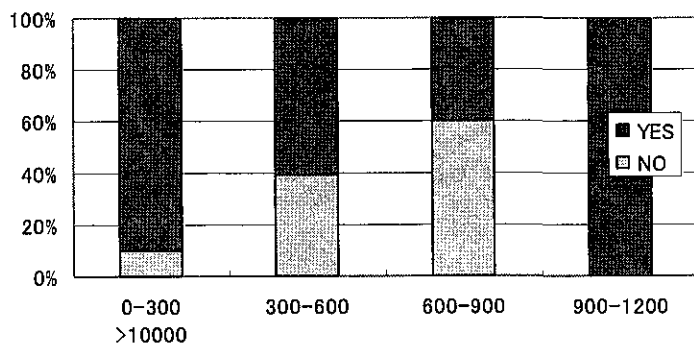
図16：距離別回答割合（徒歩移動者・高所得者）

I-6 オートバイ混入率と信号交差点における交通容量の関係把握調査

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1. はじめに

　本稿では，バンコクの信号交差点における調査を通じて，オートバイの乗用車換算係数を求めた．続いて，プノンペン，ハノイを加えた３都市において，オートバイ混入率の違いによる交差点運用効率の違いを観測した．さらに，各車両の乗車人数を調査し，オートバイ混入率が変化する場合の断面通過人員の変化を求めた．

　東南アジア各国においては，オートバイが急激に普及し，交通流の中に占めるオートバイの割合は先進国と比較して高い水準にある．このような状況下で，信号制御や交通規制といった交通運用を効率的に実施するためには，オートバイを含む交通流の実態について把握する必要がある．そこで，バンコクにおいて交差点交通流調査を実施し，オートバイの乗用車換算係数を推定した．その結果，換算係数はオートバイの混入率，台数やスプリットの違いによって大きく変動するが，おおよそ 0.1～0.3 程度であることがわかった．

　交差点の運用効率に関しては，先進国と比較して東南アジアではその効率が低いとされている．そこで，バンコク，プノンペン，ハノイの信号交差点において，オートバイ混入率ならびに飽和交通流率に関する簡易な調査を実施し，上記の換算係数を用いて交通容量を推計することで，オートバイ混入率の異なる３都市における交差点運用効率の違いを観測した．観測の結果，オートバイの混入率が高いほど交差点運用効率が低くなる傾向があることを確認した．

　最後に，今後はオートバイの普及と合わせて四輪車の普及も想定され，四輪車が普及した場合には激しい交通渋滞が発生するものと考えられる．そこで，上記にて獲得した交差点容量に加えて，オートバイ，乗用車，バス等の平均乗車人員を調査し，交差点の断面通過人員を求め，今後の四輪車普及に伴う断面通過可能人員の変化を予測した．その結果，交通流に占める四輪車の割合が高くなるに従って交差点通過可能人員は減少するということが解った．今後，現在と同程度の通過人員数を確保するためにはバスに代表されるハイオキュパンシーな公共交通の整備が欠かせないという結論を得た．

2．1．オートバイの乗用車換算係数

　バンコク市内の交差点において，オートバイも含めた交通流を対象として，飽和交通流率の調査を実施した．調査の結果を図１に示す．図１は３レーンあるアプローチで，それぞれ青開始直後の 20 秒間，それ以降の 20 秒間に停止線を通過した４輪，２輪の車両台数を示したものである．いずれの結果も決定係数が低く信頼できるものではないが，図に示すように青開始直後の 20 秒間（0.11；図２参照）とそれ以降（0.26；図３参照）とではオートバイの乗用車換算係数に大きな違いが認められた．このことから，オートバイの進入するタイミングによって換算係数は大きく異なる可能性があると考えられる．今後は，さらにデータを収集し，状況別により正確に乗用車換算係数を推定を行っていきたい．
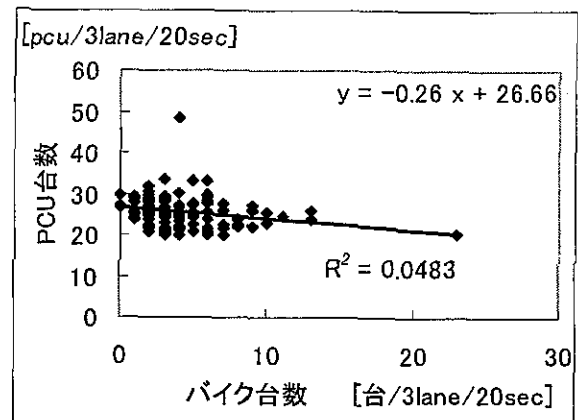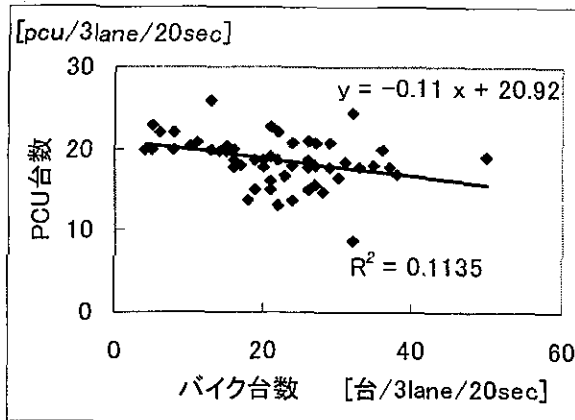
図1　20秒間(左：青開始後0－20秒　右：青開始後20秒以降)の停止線通過台数

図2　青開始前と青開始直後の交通状況

図3　青開始から時間が経過した時の交通状況

２．２．交差点の運用効率

　バンコク，プノンペン，ハノイの各都心部における交差点の飽和交通流率を観測した結果を図４に示す．図の横軸は各都市の４輪車の混入率（全通過車両に対する４輪車の割合）を示している．また，飽和交通流率はオートバイの乗用車換算係数の違いによって大きく異なるので，それぞれ乗用車換算係数を 0.1,0.2,0.3 として計算した場合の pcu を計算した．乗用車換算係数を 0.2 とした場合には，４輪車混入率の少ない順であるハノイ，プノンペン，バンコクの順に飽和交通流率が大きくなっていることが読み取れる．すなわち，４輪車の混入率が上がるほど（２輪車の占める割合が小さくなるほど），交差点の運用効率も上がっていることを確認した．
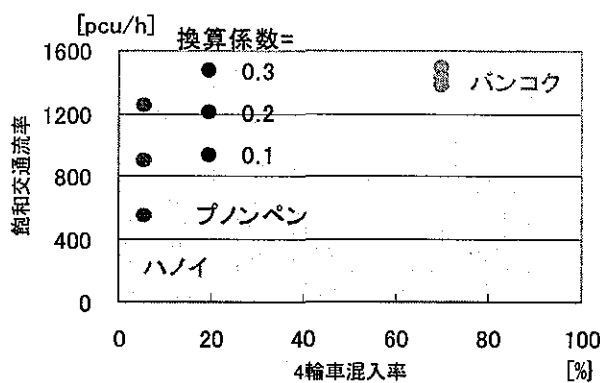
図４　交差点の運用効率の比較

２．３．断面通過人員

　バンコクにおいて各車両の乗車人員を調査した結果，時間帯によって多少の変動が認められるものの，乗用車は 1.5 人/台，オートバイは 1.2 人/台程度であるとの結果を得た．また，プノンペンにおけるオートバイの乗車人員は 1.5 人/台程度であった．交通状況がプノンペンに近いと考えられるハノイに関しては，オートバイの乗車人数をプノンペンと同様に 1.5 人/台と仮定し，ハノイの交差点において，飽和交通流率に相当する一時間あたりの通過可能最大人数を計算すると 3750 人/時間/レーンとなった．また，交通容量の視点で考えると，４輪車はオートバイ数台程度に相当するものの，その平均乗車人員はオートバイとほぼ同等で 1.5 人程度であることから，４輪の混入率が上昇すれば，交差点通過可能人員は減少することになる．図５には，乗用車換算係数を 0.2 とした場合の，３都市における４輪車混入率と飽和交通流率の関係を示す．また，ハノイにおいて４輪，２輪とも現状と同程度の乗車人員であるとした場合に，現状の通過人員を確保するために必要となる交差点の飽和交通流率を実線で示す．図に示すように，現在の通過人員を確保するために必要となる飽和交通流率は，４輪車の混入率の増大と共に増加し，バンコク並みに４輪車混入率が 70%になった場合には，2,800pcu/h/lane 程度の飽和交通流率が要求される．しかしながら，2,000pcu を超える流率を確保することは事実上不可能であり，今後，４輪車が普及していった場合には，公共交通など乗車密度の高い乗り物の普及による４輪車の乗車密度の向上が不可欠となる．

22
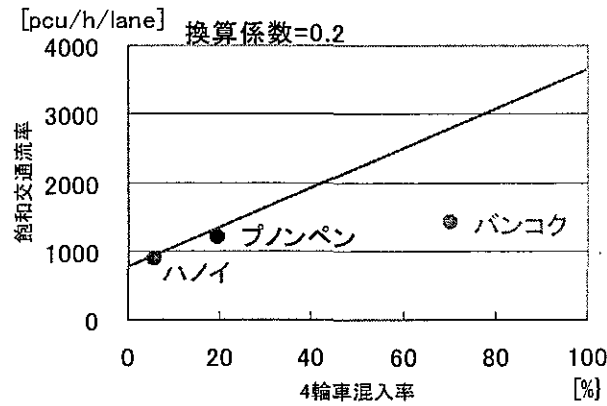
図3　4輪車混入率と通過可能人員の関係

3．今後の展望

　本稿では，簡易な調査に基づいて，オートバイの乗用車換算係数や飽和交通流率（pcu ベース）の観測を行い，4輪車の普及により交差点の運用効率が高くなること，ならびに4輪車が普及していくためには，運用効率の上昇だけでなく公共交通等の普及によって断面通過可能人員を確保することが必要であることを確認できた．

　今後は，追加の調査を実施し，青開始直後か否かといった交差点における交通状況の違いによって変化するオートバイの乗用車換算係数についてさらなる解析を進めていきたい．

＜参考資料編 II-8 参照＞

第Ⅱ編　参考資料

II-1　ハノイとバンコクの交通状況（写真）

(1) 資料写真（ハノイ）

①ハノイにおける交差点交通状況（2002年8月7日午前7時）

②積載方法不備による脱落事故（ハノイ）

④複数乗車状況（ハノイ）

（上段2名/下段3名）

③積載状況（ハノイ）

⑤自動車，オートバイ，自転車の混合交通

(2) 資料写真（バンコク）
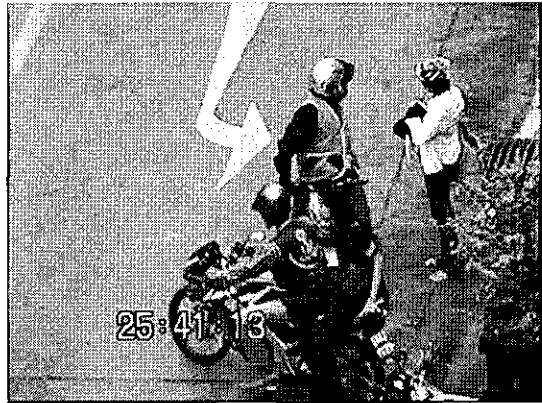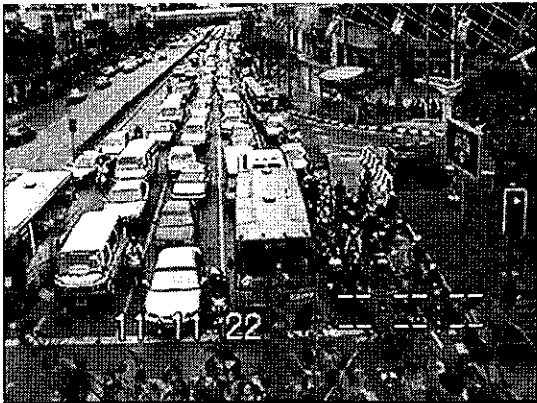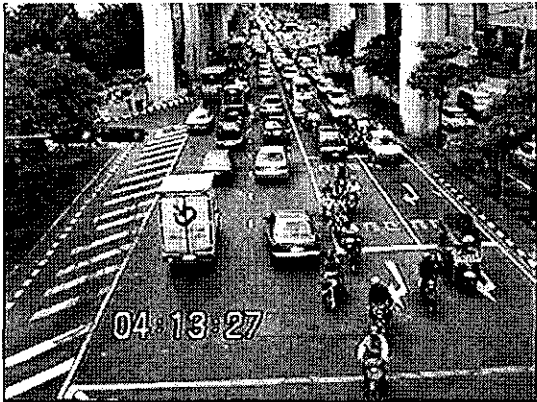
⑥市街渋滞時でのオートバイの挙動

オートバイ走行時の安全性の欠落
（上段　反対車線走行
　下段　ソイバイク乗客の斜め乗車）

⑦自動車専用道（高架）での走行状況

(3)
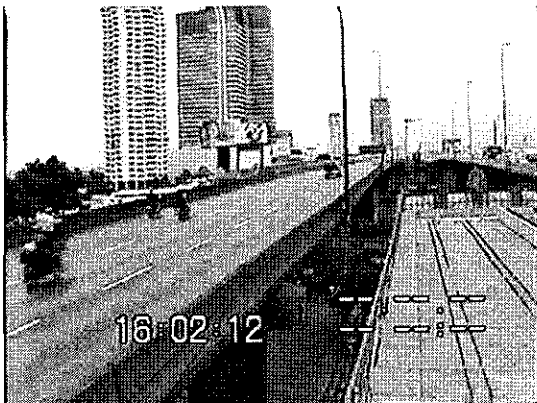
II-2　タイ調査資料

資料1　アンケート回答者の特性

（各地域の回答者数と交通目的）

サンプル数	バンコク	チェンマイ	コンケン
	82	81	119

各地域の回答者数と交通目的

凡例：通勤／通学

	バンコク	チェンマイ	コンケン
通学	39	0	59
通勤	43	81	60

（世帯構成者の職業）

バンコク

- 公務員 14%
- 会社員 24%
- 自営業 11%
- 専門職 3%
- 大学生 18%
- 大学生以外の学生 14%
- 無職 3%
- その他 3%

チェンマイ

- 公務員 18%
- 会社員 6%
- 自営業 14%
- 専門職 1%
- 大学生 33%
- 大学生以外の学生 9%
- 無職 4%
- その他 6%

コンケン

- 公務員 16%
- 会社員 14%
- 自営業 8%
- 専門主婦 11%
- 大学生 20%
- 大学生以外の学生 12%
- 無職 4%
- その他 15%

資料2 世帯収入

世帯所得（バンコク）

世帯所得（チェンマイ）

世帯所得（コンケン）
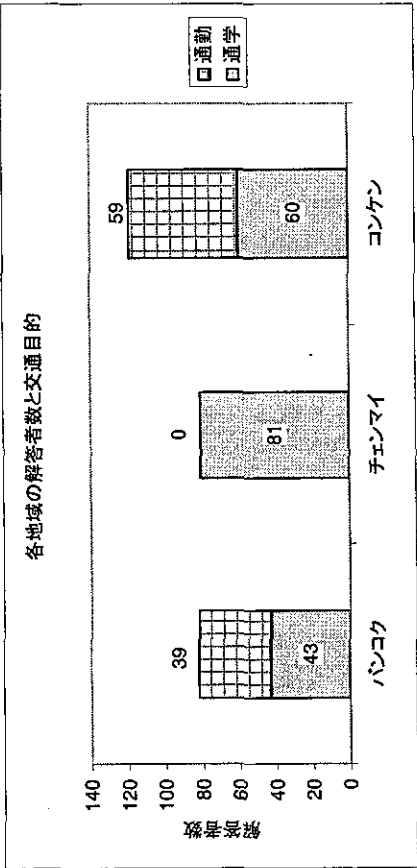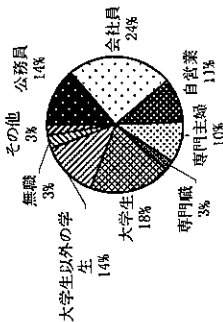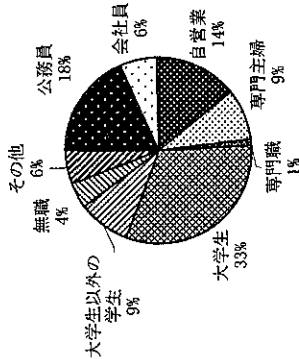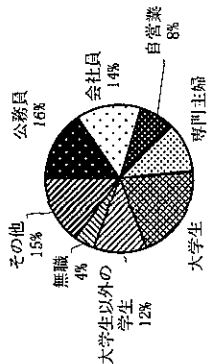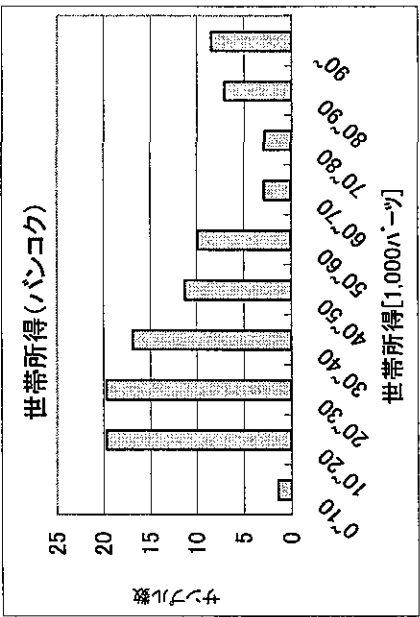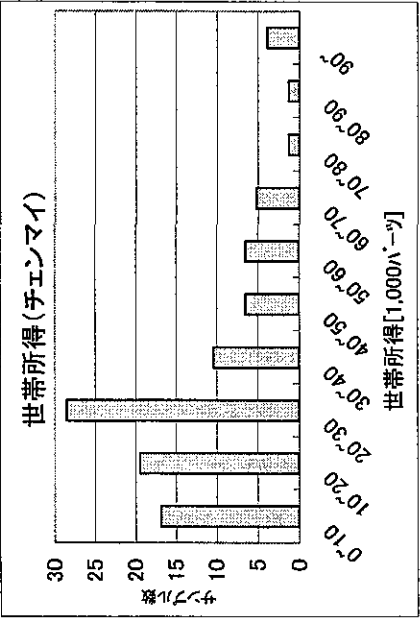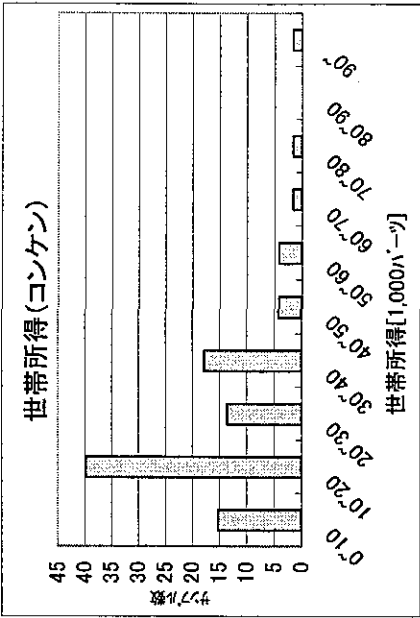
	バンコク	チェンマイ	コンケン
平均所得（バーツ）	37,697.3	28,523.2	24,237.2

(2)

資料3　世帯における二輪車・自家用車保有台数の割合と所得の関係

（バイク保有台数と所得の関係）

世帯における保有バイク台数の割合[バンコク]

世帯における保有バイク台数の割合[チェンマイ]

世帯における保有バイク台数の割合[コンケン]

（自家用車保有台数と所得の関係）

世帯における保有自家用車台数の割合[バンコク]

世帯における保有自家用車台数の割合[チェンマイ]

世帯における保有自家用車台数の割合[コンケン]

サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

凡例
3台以上
2台
1台

資料4　購入価格

（バイク購入価格）

バイク購入価格（バンコク）

（1000バーツ）

バイク購入価格（チェンマイ）

（1000バーツ）

バイク購入価格（コンケン）

（1000バーツ）

（自家用車購入価格）

自家用車購入価格（バンコク）

（10000バーツ）

自家用車購入価格（チェンマイ）

（10000バーツ）

自家用車購入価格（コンケン）

（10000バーツ）

サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

凡例
- 3台以上
- 2台
- 1台

資料5 使用年数

（バイク使用年数）

バイク使用年数（バンコク）
サンプル数22を100として
の割合

バイク使用年数（チェンマイ）
サンプル数62を100としたとき
の割合

バイク使用年数（コンケン）
サンプル数119を100としたとき
その割合

（自家用車使用年数）

自家用車使用年数（バンコク）
サンプル数

自家用車使用年数（チェンマイ）
サンプル数

自家用車使用年数（コンケン）
サンプル数

サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

凡例
3台以上
2台
1台

(5)

資料6　一台当りの月維持費

（バイク維持費）

バイク当たりの月の維持費（バンコク）
バイク当たりの月の維持費（チェンマイ）
バイク当たりの月の維持費（コンケン）

（自家用車維持費）

自家用車当たりの月の維持費（バンコク）
自家用車当たりの月の維持費（チェンマイ）
自家用車当たりの月の維持費（コンケン）

サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

（バイク購入理由）

バイク購入理由[バンコク]
A 26%　B 12%　C 39%　D 7%　E 14%　H 2%

バイク購入理由[チェンマイ]
A 25%　B 14%　C 33%　D 10%　E 11%　G 2%　H 5%

バイク購入理由[コンケン]
A 25%　B 11%　C 31%　D 10%　E 14%　G 2%　H 7%

（自家用車購入理由）

自家用車購入理由[バンコク]
A 43%　B 9%　C 30%　D 1%　E 5%　F 1%　G 11%

自家用車購入理由[チェンマイ]
A 47%　B 4%　C 27%　D 3%　E 4%　G 15%

自家用車購入理由[コンケン]
A 34%　B 4%　C 31%　D 4%　E 16%　F 3%　G 8%

サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

購入理由）
A：通勤・通学・業務のため
B：低価格で購入可能だったから・知り合いから・使用しなくなったため
C：快適・便利だから
D：維持が楽・友人に進められて
E：近くに公共交通がないい・必要に迫られて
F：お金があったから
G：車が好き・魅力的
H：車を購入することができないから　※二輪車保有者のみに質問

資料8　通勤・通学以外の利用目的

（バイク利用目的）

バンコク
- ツーリング 6%
- 買い物 18%
- 遊びに行く時 21%
- どこへ行くときも 55%

チェンマイ
- ツーリング 8%
- 買い物 27%
- 遊びに行く時 30%
- どこへ行くときも 35%

コンケン
- ツーリング 5%
- 買い物 30%
- 遊びに行く時 32%
- どこへ行くときも 33%

（自家用車利用理由）

通勤通学以外の自家用車利用理由（バンコク）
- ツーリング 4%
- 買い物 31%
- 遊びに行く時 23%
- どこへ行くときも 42%

通勤通学以外の自家用車利用目的（チェンマイ）
- ツーリング 6%
- 買い物 28%
- 遊びに行く時 26%
- どこへ行くときも 40%

通勤通学以外の自家用車利用目的（コンケン）
- ツーリング 2%
- 買い物 32%
- 遊びに行く時 31%
- どこへ行くときも 35%
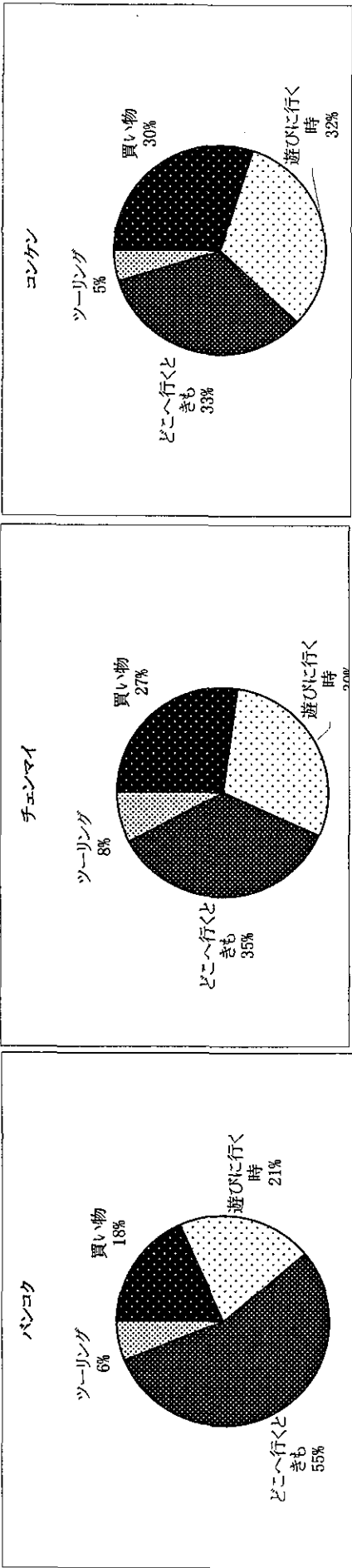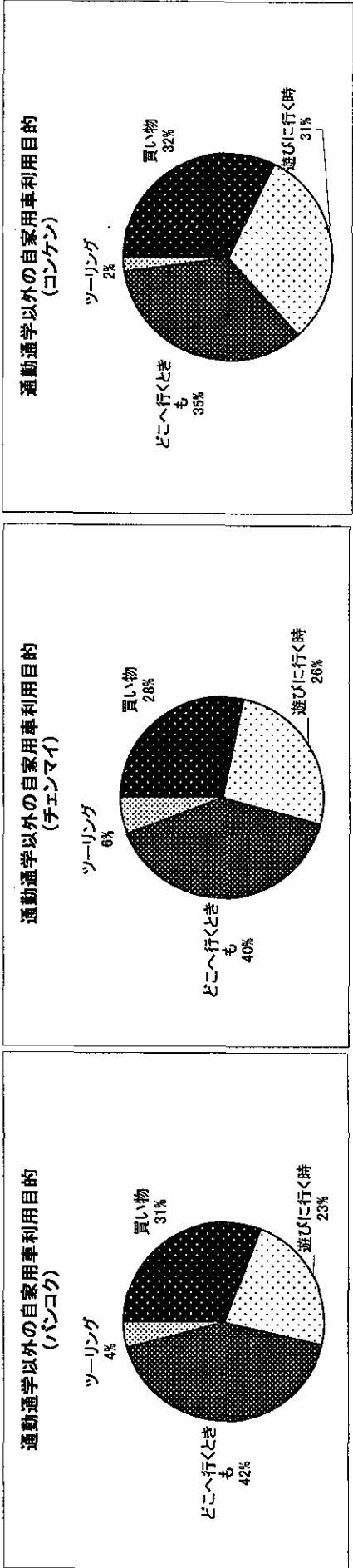
サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

資料9　最大利用距離

（バイク最大利用距離）

バイク最大利用距離（バンコク）

バイク最大利用距離（チェンマイ）

バイク最大利用距離（コンケン）

（自家用車最大利用距離）

自家用車最大利用距離（バンコク）

自家用車最大利用距離（チェンマイ）
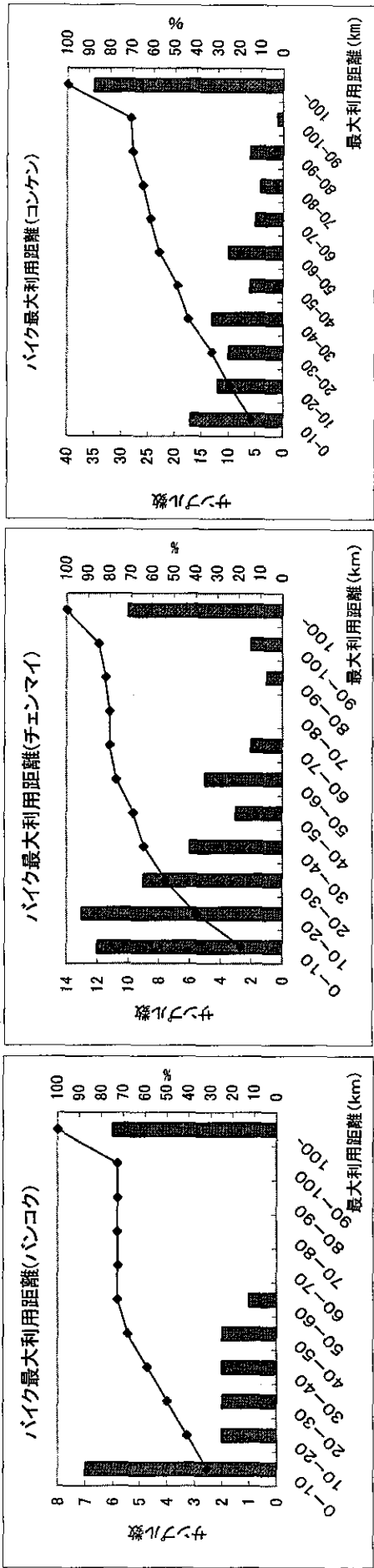
自家用車最大利用距離（コンケン）
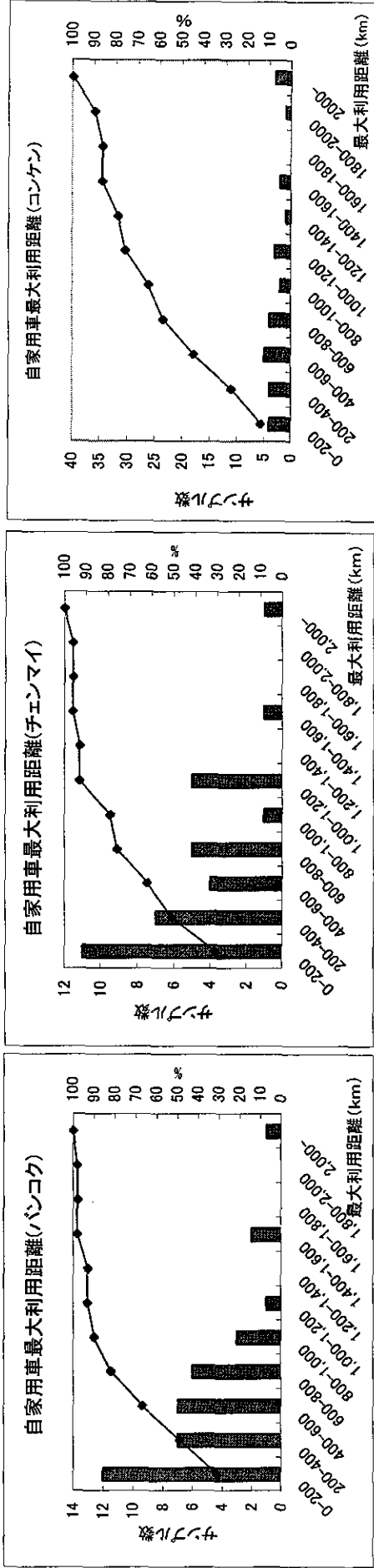
サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

資料10 支払方法/ 将来自家用車を保有したいか

（支払方法）

バイク購入時の支払い方法

	一括	分割
バンコク	一括, 75.6	分割, 24.4
チェンマイ	一括, 68.8	分割, 31.2
コンケン	一括, 96	分割, 4

凡例
一括払い
分割払い

自家用車購入時の支払い方法

	一括	分割
バンコク	一括, 74.7	分割, 25.3
チェンマイ	一括, 70.3	分割, 29.7
コンケン	一括, 61.7	分割, 38.3
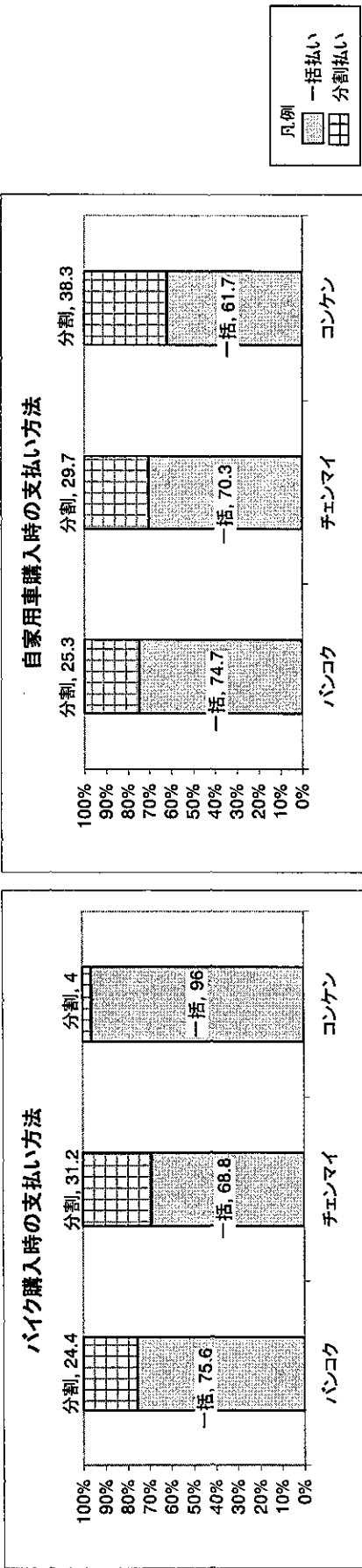
（将来自家用車を保有したいか/ *二輪車保有者のみに質問）

バンコク
yes 78%
no 22%

チェンマイ
yes 87%
no 13%
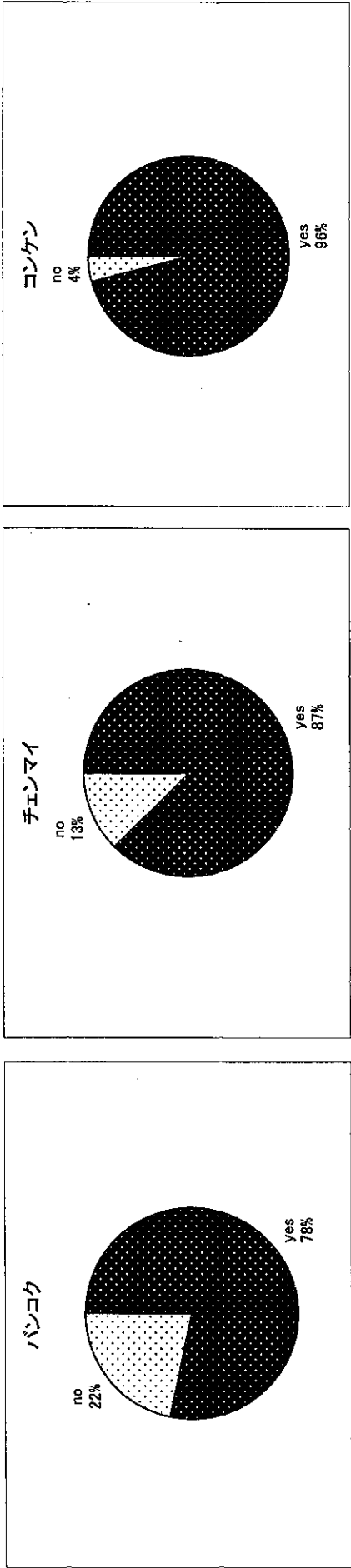
コンケン
yes 96%
no 4%

サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

資料11　免許の有無/　安全教育有無

(免許の有無)

免許の有無（バイク）

	免許あり	免許なし
バンコク	免許あり、42.3	免許なし、57.7
チェンマイ	免許あり、78.1	免許なし、21.9
コンケン	免許あり、54.6	免許なし、45.4

免許の有無（自家用車）

	免許あり	免許なし
バンコク	免許あり、75.8	免許なし、24.2
チェンマイ	免許あり、80.6	免許なし、19.4
コンケン	免許あり、63.3	免許なし、36.7

凡例　有り　無し

(安全教育の有無)

安全教育指導の有無（バイク）

	受けた	受けてない
バンコク	受けた、45.9	受けてない、54.2
チェンマイ	受けた、86.2	受けてない、13.8
コンケン	受けた、49.6	受けてない、50.4

安全教育指導の有無（自家用車）

	受けた	受けてない
バンコク	受けた、66.7	受けてない、33.3
チェンマイ	受けた、80.6	受けてない、19.4
コンケン	受けた、66.7	受けてない、33.3

凡例　受けた　受けてな
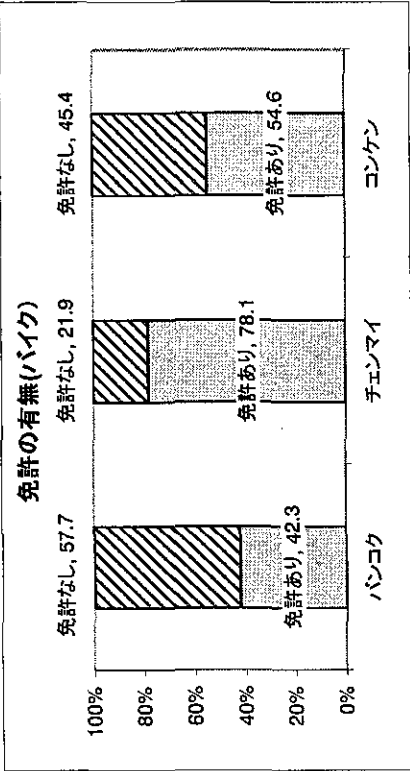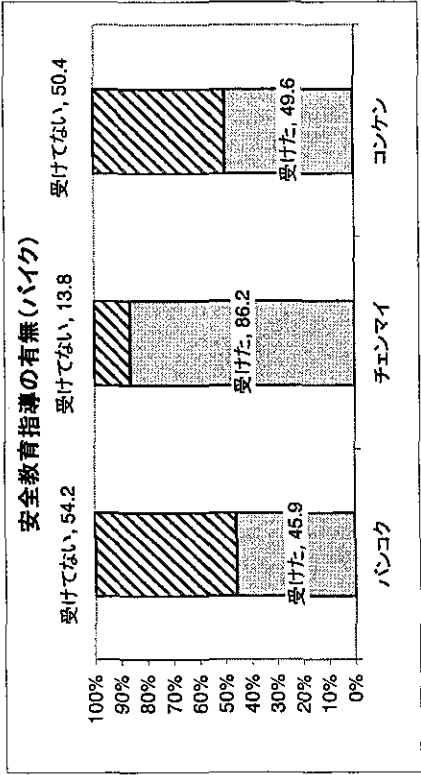
サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

資料12　運転開始年齢

（バイク運転開始年齢）

バイク運転開始年齢（バンコク）

バイク運転開始年齢（チェンマイ）

バイク運転開始年齢（コンケン）

（自家用車運転開始年齢）
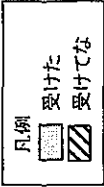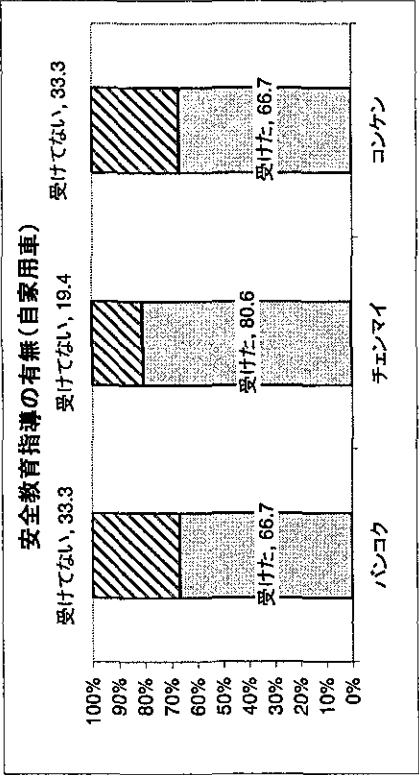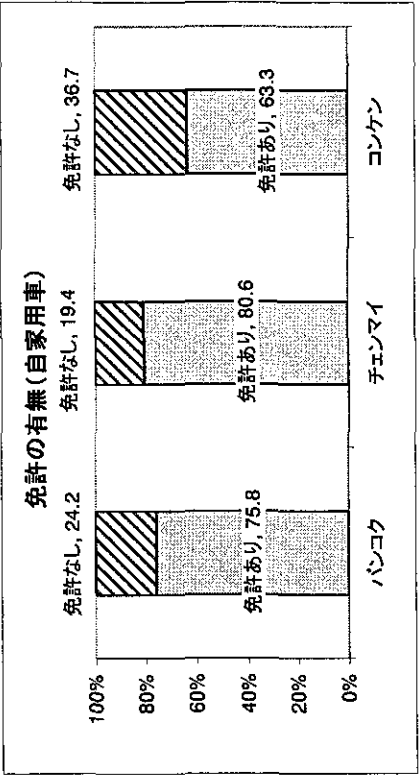
自家用車運転開始年齢（バンコク）

自家用車運転開始年齢（チェンマイ）
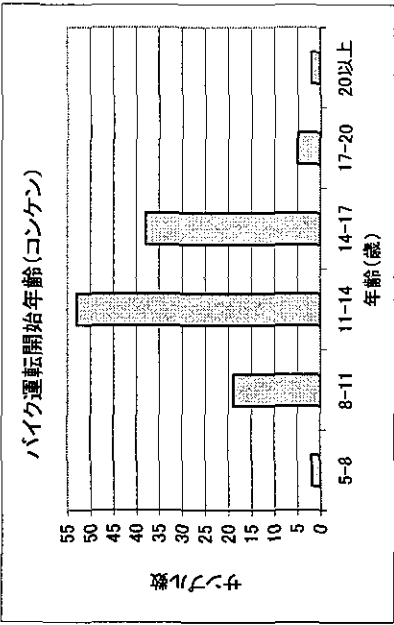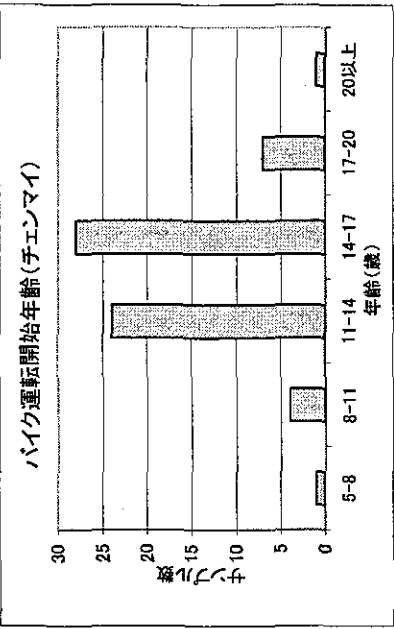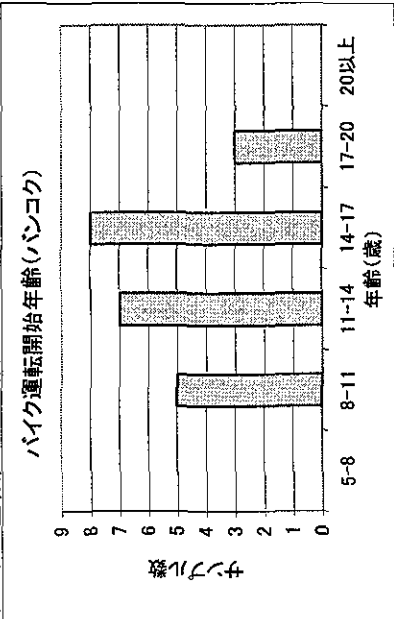
自家用車運転開始年齢（コンケン）
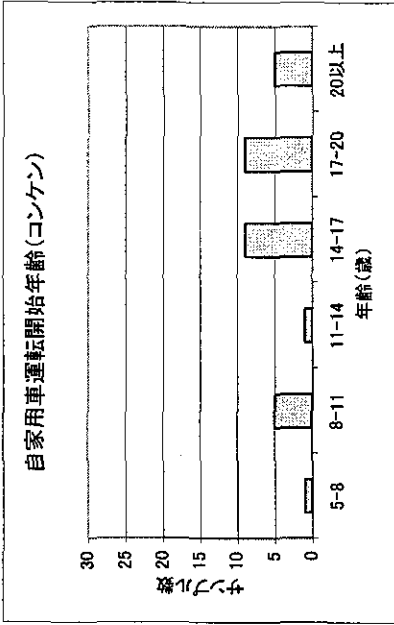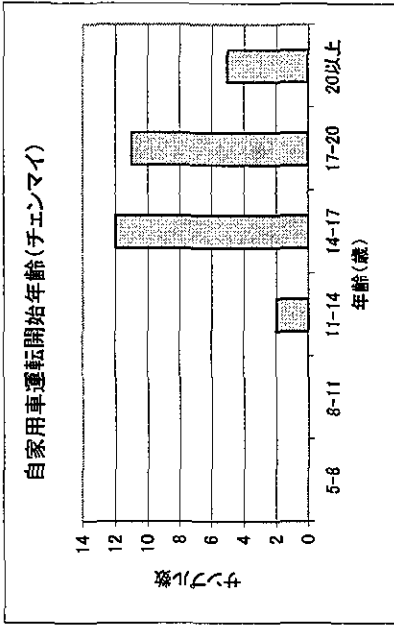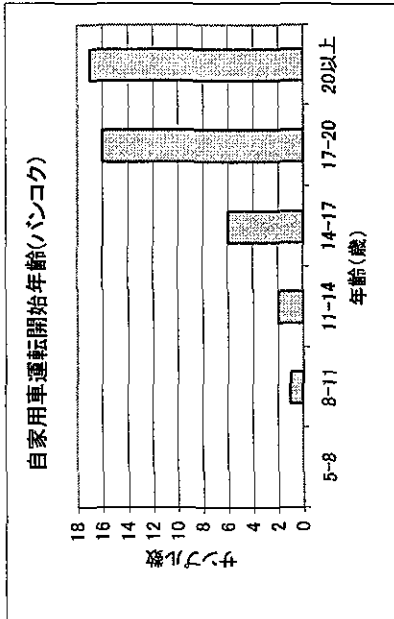
サンプル数	バイク	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

資料13　バイクヘルメット着用率/　取り締まり

（バイクヘルメット着用率）

バイクヘルメット着用率（コンケン）

A 8%
B 55%
C 12%
D 19%
E 6%

凡例
A:必ず着用する
B:時々着用する
C:だいたい着用する
D:ほとんど着用しない
E:いつも着用しない

バイクヘルメット着用率（チェンマイ）

A 12%
B 47%
C 3%
D 29%
E 9%

二輪車ヘルメット着用率（バンコク）

A 45%
B 32%
D 6%
E 17%
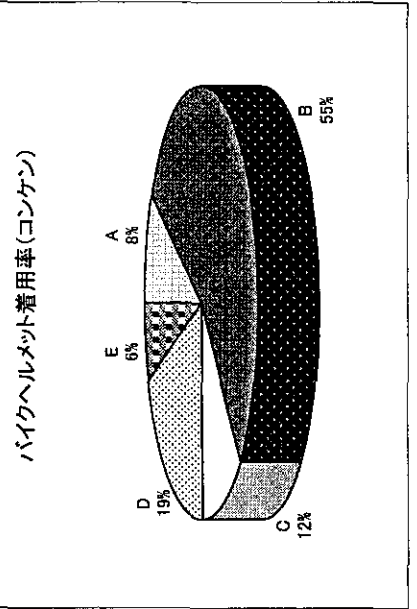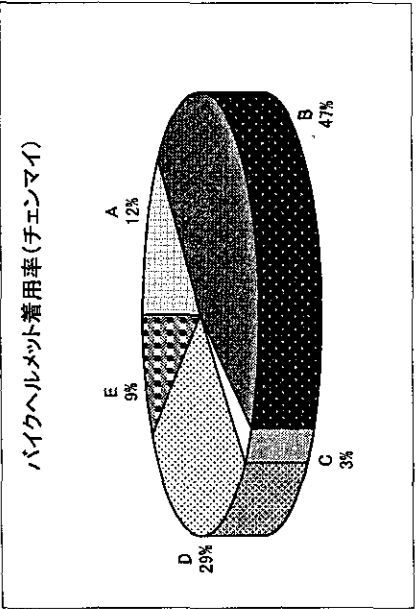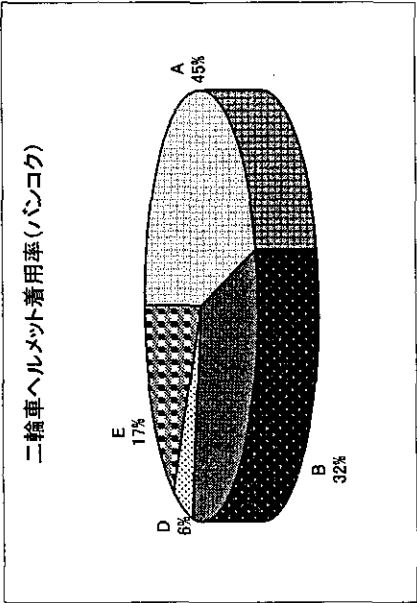
（ヘルメット未使用で警察の取締を受けたことがあるか）

ヘルメット未着用で警察に取締りを受けたことがあるか

凡例
はい
いいえ

	100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%
バンコク	74 / 26.1
チェンマイ	44.6 / 55.4
コンケン	35.3 / 64.7
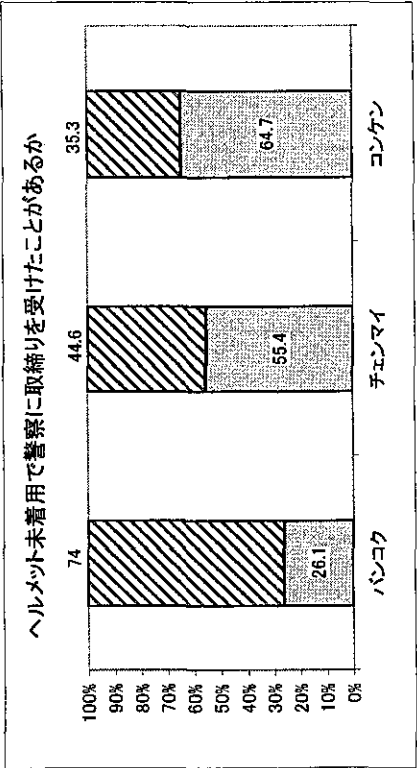
	サンプル数
バンコク	22
チェンマイ	62
コンケン	119

資料14　バイクの規定乗車人数を守っているか/
取り締まり

（バイクの規定乗車人数を守っているか）

バイクの規定乗車人数を守っているか　（パンコ
ク）

A
37%

B
51%

C
3%

D
3%

E
6%

バイクの規定乗車人数を守っているか（チェンマ
イ）

A
34%

B
46%

C
20%

バイクの規定乗車人数を守っているか　（コンケ
ン）

A
28%

B
52%

C
9%

D
8%

E
3%

凡例
A:必ず守る
B:時々守る
C:だいたい守る
D:ほとんど守らない
E:いつも守らない

（バイク定員オーバーで警察の取締りを受けたことがあるか）

バイク定員オーバーで警察に取締りを受けたことがあるか

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

71

29

パンコク

81

19

チェンマイ

85

15

コンケン

凡例
はい
いいえ

サンプル数	バイク
パンコク	22
チェンマイ	62
コンケン	119

(14)

資料15　シートベルト着用率／　シートベルト着用に関する
　　　　　　警察の取り締まり

（シートベルト着用率）
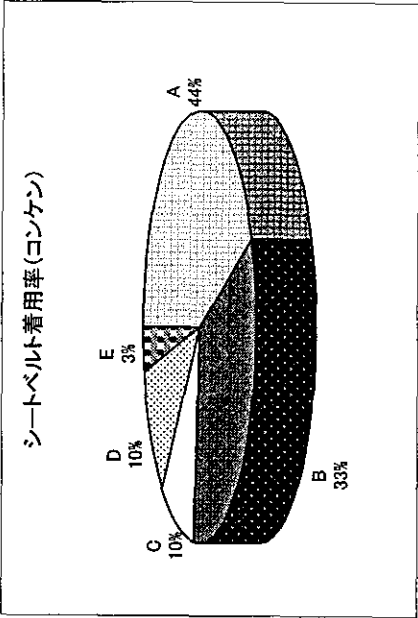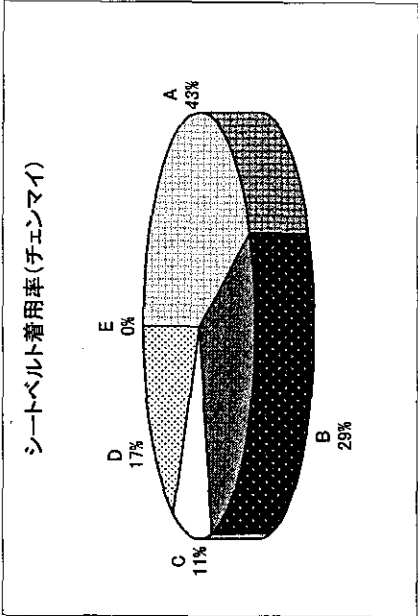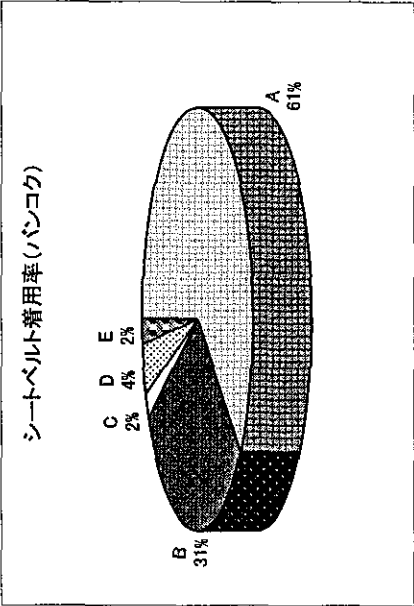
シートベルト着用率（バンコク）

A
61%

B
31%

C　D　E
2%　4%　2%

シートベルト着用率（チェンマイ）

A
43%

B
29%

C
11%

D
17%

E
0%

シートベルト着用率（コンケン）

A
44%

B
33%

C
10%

D
10%

E
3%

凡例
A:必ず着用する
B:時々着用する
C:だいたい着用する
D:ほとんど着用しない
E:いつも着用しない

（シートベルト未着用で警察の取締を受けたことがあるか）

シートベルト未着用で警察の取締を受けたことがあるか

バンコク	チェンマイ	コンケン
82	89	96.7
18	11	3.3

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
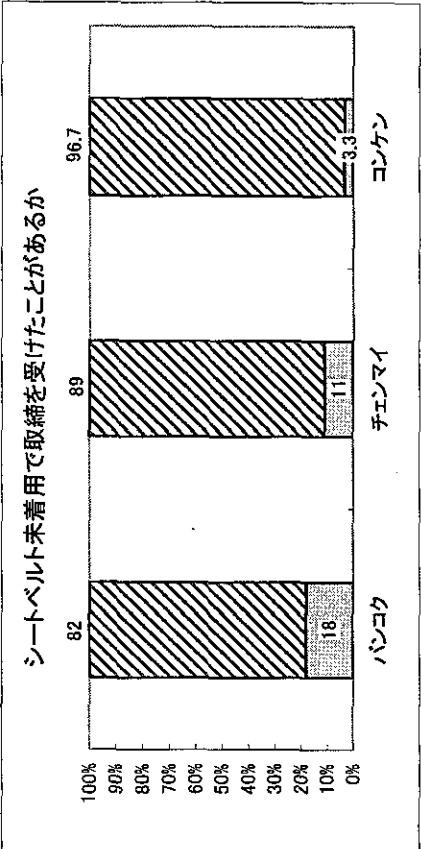
凡例
はい
いいえ

サンプル数	自家用車
バンコク	14
チェンマイ	29
コンケン	30

資料16　自家用車の規定乗車人数を守っているか？
／　定員オーバーによる取締

（自家用車の規定乗車人数を守っているか？）

自家用車の規定乗車人数を守っているか（コンケン）

A 84%
B 10%
C 3%
D 3%

凡例
A：必ず守る
B：時々守る
C：だいたい守る
D：ほとんど守らない
E：いつも守らない

自家用車の規定乗車人数を守っているか（チェンマイ）

A 45%
B 41%
C 8%
D 3%
E 3%

自家用車の規定乗車人数を守っているか（バンコク）

A 51%
B 23%
C 6%
D 0%
E 20%
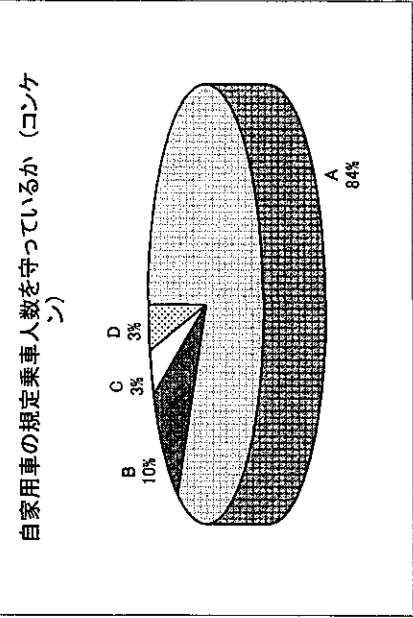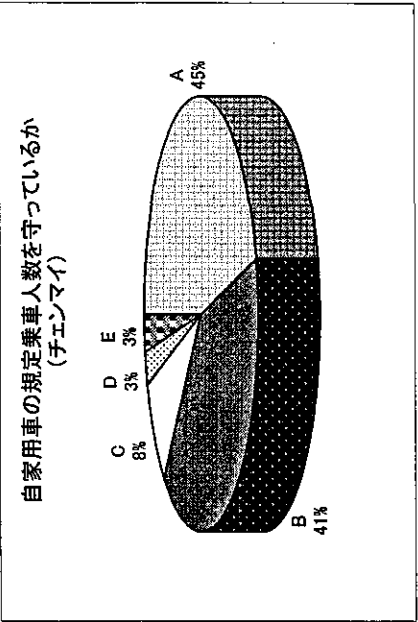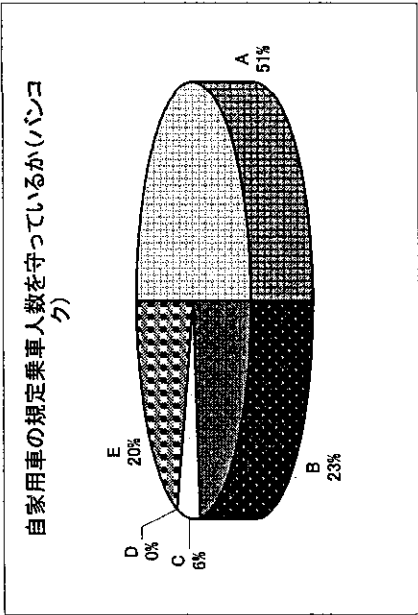
（自家用車定員オーバーで警察の取締を受けたことがあるか）

自家用車定員オーバーで警察に取締りを受けたことがあるか

凡例
はい
いいえ

	バンコク	チェンマイ	コンケン
はい	92	100	100
いいえ	8	0	0

サンプル数	自家用車
バンコク	14
チェンマイ	29
コンケン	30

街頭インタビュー調査，

アラビア数字のみ使用してください

下記の質問に当てはまる答えに丸をするか，当てはまる数字を記入してください。

Q1. あなたの世帯構成と働いている人の収入を例に做って記入してください。

　　　　＊収入のない子供などは性別、年齢、職業を記入し０バーツとしてください。

サンプル

続柄	年	性別	職業	収入 (バーツ)
1	32	男	2	5,000
自分自身				

続柄	年	性別	職業	収入(バーツ)

続柄:

1. 祖父	5. 兄弟	9.おじ	13.その他
2. 祖母	6. 姉妹	10. おば	
3. 父	7. 息子	11. 夫	
4. 母	8. 娘	12.妻	

職業:

1.公務員	5. 専門職	9. その他
2. 会社員	6. 大学生	[　　　]
3. 自営業	7. 大学生以外の学生	
4. 専業主婦	8. 無職	

Q2. 普段通勤・通学に利用する交通手段はなんですか。例のように表にできるだけ詳しく記入してください。

　　　（出勤・登校の場合を記入してください。）

記入例　右の表は家から５分バイクタクシーを利用し１５分バスに乗り，乗り換えてさらに１０分バスに乗りそ
こから３分歩いて会社に出勤する例です。

交通機関	5	2	2	1
時間	5分	15分	10分	3分
運賃	15バーツ	5バーツ	5バーツ	0バーツ

交通機関					
時間	分 □	分 □	分 □	分 □	分 □	分
運賃	バーツ	バーツ	バーツ	バーツ	バーツ	バーツ

凡例

1	徒歩	4	BTS	7	自家用バイク	10	トゥクトゥク
2	バス	5	バイクタクシー	8	自転車	11	ソンテウ
3	電車(BTS除く)	6	自家用車	9	タクシー	12	その他

Q３.自宅から会社・学校までの距離を教えて下さい。

　　　約（　　　　　　）km

自家用バイクに関する質問です。自家用バイクを所有していない方は、**Q19** にすすんでください

Q4.バイクを世帯で何台所有していますか？

_____ 台

Q5バイクはどのような理由で買いましたか？当てはまるものの数字に丸を付けてください。（複数解答可）

1	通勤・通学のため	6	便利だから	11	お金があったから
2	仕事のため	7	維持が簡単だから	12	バイクが好きだから
3	安く購入することができたから	8	近くに公共交通がないから	13	必要に迫られたから
4	知り合いが使わなくなり譲ってもらった	9	車を買うことができないから	14	魅力的だから
5	楽だから	10	友人に進められたから	15	その他

Q6.そのバイクはいつ、いくらでどのような状態で入手しましたか？またどのような支払方法で購入しましたか？

	いつ	価格	どんな方法	分割回数	月々の支払額
1台目	年前	バーツ	1・2	回	バーツ
2台目	年前	バーツ	1・2	回	バーツ
3台目	年前	バーツ	1・2	回	バーツ
4台目	年前	バーツ	1・2	回	バーツ

下記から選び丸を付けてください。

どんな方法	
一括払い	1
分割払い	2

Q7.通勤・通学以外にバイクを利用していますか？

1. はい　もしはいなら下記の理由に丸を付けてください。 / 2. いいえ

1	買い物	2	遊びに行くとき	3	どこへ行くときも	4	ツーリング	5	その他 （　　　　　　　）

Q8.どれくらい離れた距離までならバイクを使用しますか？

約（_____）km

Q9.バイク1台あたりの月の平均維持費はいくらですか？

（ガソリン代・修理費などを含む）

約（_____）バーツ

Q10.バイクの免許を持っていますか？

1. はい　　　　　 /　　　　 2. いいえ

Q11.バイクの免許を取ったとき安全に対する教育を受けましたか？

              1. はい　　　　　/　　　　2. いいえ

Q12.バイクを運転し始めたのは何歳のときですか？正直にお答えください。

約(　　　　　　　)才

Q13.普段ヘルメットをかぶっていますか？

    1.必ず着用する　　2.時々着用する　　3.着用する　　　4.ほとんど着用しない　5.着用したことが無い

Q14.決められた乗車人数を守っていますか？

    1.必ず守る　　　　2.時々守る　　　　3.守る　　　　4.ほとんど守らない 5.守ったことが無い

Q15.バイクに定員オーバーでのっていて警察に捕まったことはありますか？ある方は回数も記入してください。

         1. はい　　約（　　　）回 /　　　　2. いいえ

Q16.バイクにヘルメットをかぶらずに乗っていて警察に捕まったことはありますか？ある方は回数も記入してください。

         1. はい　　約（　　　）回 /　　　　2. いいえ

Q17.中央分離帯のある道路で歩道を逆走したことはありますか？ある方は回数も記入してください。

         1. はい　　約（　　　）回 /　　　　2. いいえ

Q18.将来車を所有したいと思いますか？
    1. はい　　もしはいなら下記の理由に丸を付けてください。　　/　　　　2. いいえ

1	通勤・通学のため	4	便利だから
2	仕事のため	5	魅力的だから
3	楽だから	6	その他 （　　　　　　　　　　　　　　　　）

自家用車に関する質問です。自家用車を所有していない方は、Q32にすすんでください

Q19.車を買う前は、バイクを利用していましたか？

<div style="text-align:center">1．はい　（　　　　　　年間)　／　　　　2.いいえ</div>

Q20.車を世帯で何台所有していますか？

<div style="text-align:center">＿＿＿＿＿台</div>

Q21.車はどのような理由で買いましたか？当てはまるものの数字に丸を付けてください。（複数解答可）

1	通勤・通学のため	6	便利だから	11	車が好きだから
2	仕事のため	7	維持が簡単だから	12	必要に迫られたから
3	安く購入することができたから	8	近くに公共交通がないから	13	魅力的だから
4	知り合いが使わなくなり譲ってもらった	9	友人に進められたから	14	その他
5	楽だから	10	お金があったから		

Q22.その車はいつ、いくらでどのような状態で入手しましたか？またどのような支払方法で購入しましたか？

	いつ	価格	どんな方法	分割回数	月々の支払額
1台目	年前	バーツ	1 ・ 2	回	バーツ
2台目	年前	バーツ	1 ・ 2	回	バーツ
3台目	年前	バーツ	1 ・ 2	回	バーツ
4台目	年前	バーツ	1 ・ 2	回	バーツ

下記から選び丸を付けてください。

どんな方法	
一括払い	1
分割払い	2

Q23.通勤・通学以外に車を利用していますか？

1. はい　もしはいなら下記の理由に丸を付けてください。/ 2. いいえ

								その他
1	買い物	2	遊びに行くとき	3	どこへ行くときも	4	ドライブ	5 ( )

Q24.どれくらい離れた距離へいくなら車を使用しますか？

<div style="text-align:center">約(＿＿＿＿＿) km</div>

Q25.車1台あたりの月の平均維持費はいくらですか？
（ガソリン代・修理費などを含む）

<div style="text-align:center">約(＿＿＿＿＿) バーツ</div>

Q26.車の免許を持っていますか？

<div style="text-align:center">1. はい　/　　　2. いいえ</div>

Q27.車の免許を取ったとき安全に対する教育を受けましたか？

              1. はい　/　　　　　2. いいえ

Q28.車を運転し始めたのは何歳のときですか？正直にお答えください。

    約(＿＿＿＿＿＿＿＿＿)才

Q29.普段シートベルトを着用していますか？

    1.必ず着用する　　2.時々着用する　　3.着用する　　　　4.ほとんど着用しない　5.着用したことが無い

Q30.決められた乗車人数を守っていますか？

    1.必ず守る　　　　2.時々守る　　　　3.守る　　　　　　4.ほとんど守らない　5.守ったことが無い

Q31.車に定員オーバーでのっていて警察に捕まったことはありますか？ある方は回数も記入してください。

         1. いいえ /　　　　2. はい　　約（＿＿＿＿＿）回

Q32.車にシートベルトを着用せずに乗っていて警察に捕まったことはありますか？ある方は回数も記入してください。

         1. いいえ /　　　　2. はい　　約（＿＿＿＿＿）回

これから先はバイクタクシーに関する質問です。

Q33.バイクタクシーを利用するときにヘルメットはかぶりますか？

    1.必ず着用する　　2.時々着用する　　3.着用する　　　　4.ほとんど着用しない　5.着用したことが無い

Q34.どれくらいの距離を移動するのにバイクタクシーを利用しますか？

    約(＿＿＿＿＿＿＿) km

終わり:あなたのご協力に感謝いたします。

PASSENGER INTERVIEW SURVEY

Please use only English number.

Would you please answer the following questions and circle the answers or write some figures?

Q1. Please fill in relationship, age, sex, an occupation and income about you and your family members.

SAMPLE

Relationship	Age	Sex	Occupation	Income (Baht)
1. Yourself	32	Male	2	5,000

Relationship	Age	Sex	Occupation	Income (Baht)

Relationship:

1. Grandfather	5. Brother	9. Uncle	13. Other (specify)
2. Grandmother	6. Sister	10. Aunt	
3. Father	7. Son	11.hasband	
4. Mother	8. Daughter	12.wife	

Occupation:

1.Government official worker	5. Professional	9. Other (specify)
2. Private company worker	6. Univ. student	
3. Business owner	7. Student (except no. 6)	
4. Housewife	8. Unemployed	

Q2. How do you commute to work or school? Please fill in the following table like an example as in detail as possible. (Please fill in the case of commute to work or school.)

The example of entry; The following table shows an example of commute pattern. An answerer use 5 minutes by motorcycle taxi from his/her house to bus stop(15baht), and rides on a bus for 15 minutes(5baht), and transit to other bus and rides on it for 10 minutes(5baht). After getting off the second bus, walks for 3 minutes to his/her office (or school).

SAMPLE

MODE	5		2		2		1
TRAVELTIME	5minutes	⇒	15minutes	⇒	10minutes	⇒	3 minutes
COST	15 Baht	(5)	5 Baht	(3)	5 Baht	(0)	0 Baht

Please fill in transit time.

Mode:

1.	Walk	4.	BTS	7.	Private motorcycle	10.	Sam Lor (Tuk-Tuk)	13.	Other (specify)
2.	Bus	5.	Motorcycle taxi	8.	Bicycle	11.	Songthew		
3.	Train (except BTS)	6.	Private car	9.	Taxi	12.	Ban pooling		

Q3. How long does it take from your house to company or school?

About (　　　)km

Now, if you do not have any private motorcycle, please move on to Q19.

Q4. How many motorcycles are owned by your family?

_____ bikes

Q5. Could you select the reason of having motorcycle from followings? Please circle following numbers.

(Multiple answers)

1	commutation or attending school	6	Convenience	11	Had many money
2	for working purpose	7	easy to maintenance	12	Attractive to get
3	it purchased at a low price	8	no public transport near by	13	necessity to buy
4	An acquaintance gave it to you	9	cannot afford a car	14	Its figure is attractive
5	easy to use	10	recommended from acquaintance	15	The others

Q6. When did you buy the motorcycle, how was the state and how much did you pay for it by which payment method?

	When did you purchase	Price	How was the state	How to buy	The number of times of division	A monthly payment frame
The first	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht
The second	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht
The third	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht
The fourth	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht

1	New	3	Get from someone
2	Second hand	4	The Others

Please select the way of payment method from following;

1   Payment in a lamp sum

2   Payment in installments

Q7. Do you use your motorcycle for the other purpose except community and attending school?

1. Yes   /   If you choose "Yes", please attach a circle to the following reason.   /   2. No

1	Go shopping	2	Hung out with friends	3	Wherever I want to go	4	The others ( )

Q8. What is the maximum distance which you ride on your motorcycle?

About (_____) km

Q9. How much do you pay for average monthly maintenance cost per one motorcycle?

(Gasoline cost, repair expense, etc. are included.)

About(_____) Baht

Q10. Do you have motorcycle driving license?

<div align="center">

1. Yes   /   2. No

</div>

Q11.Did you take any safety educations for riding on a motorcycle ?

<div align="center">

1. Yes   /   2. No

</div>

Q12. Honestly speaking, how old were you when you begin to operate a motorcycle by yourself?

About(_____)years old

Q13. Do you wear helmet while riding on a motorcycle?

1 all the time wears.   2 sometimes wear.   3. moderate   4 hardly wear.   5. not at all

Q14. Do you keep the regulated number of passengers while you ride on a motorcycle?

1 all the time follows.   2 sometimes follow.   3. moderate   4 hardly follow.   5. not at all

Q15. Have you ever been caught by police as result of carry more than regulated passengers? If yes, please specify the number of times.

<div align="center">

1. . Yes   about (____) times   /   2. No

</div>

Q16. Have you ever been caught by police because of not wearing helmet? If yes, please specify the number of times.

<div align="center">

1. . Yes   about (____) times   /   2. No

</div>

Q17. Have you ever illegally ridden motorcycle on opposite sidewalk or street shoulder??

<div align="center">

1. . Yes   about (____) times   /   2. No

</div>

Q18.Do you want to have your own car in the future ?
     1. Yes   /   if you choose "Yes", please attach a circle to the following reason.   /   2. No

1	For commuting or going to school	4	Convenience
2	For working	5	Attractive
3	For social symbolic status	6	The others( )

The question is concerned with private car. Those who do not own the private car need to move on to Q32.

Q19. Had you ridden on the motorbike before you bought a car?

        1.Yes   if you say "yes" ,write used period ╱   2 . No

Q20. How many cars does your family have? (How many cars per household)?

                         _____ cars

Q21. Will you please give your reasons for buying car? Please circle following numbers. (multiple answers)

1	commutation or attending school	6	Convenience	11	Attractive to get
2	for working purpose	7	easy to maintenance	12	necessity to buy
3	it purchased at a low price	8	no public transport near by	13	Its figure is attractive
4	An acquaintance gave it to you	9	recommended from acquaintance	14	The others
5	easy to use	10	Had many money		

Q22. When did you buy the car, how was the state and how much did you pay for it by which payment method?

	When	Price	How was the state	How to buy	The number of times of division	A monthly payment frame
The first	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht
The second	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht
The third	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht
The fourth	Years Ago	Baht	1 · 2 · 3 · 4	1 · 2	times	Baht

1	New	3	Get from someone
2	Second hand	4	The Others

Please select the way of payment method from following;

1   Payment in a lamp sum

2   Payment in installments

Q23.Do you use your car for the other purpose except comity and attending school?

    1. Yes   / If you choose "Yes", please attach a circle to the following reason. /   2. No

1	Go shopping	2	Hung out with friends	3	Wherever I want to go	4	The others ( )

Q24. What is the maximum distance which you drive your car?

      About ( ) km

Q25. How much do you pay for average monthly maintenance cost per car?
  (Gasoline cost, repair expense, etc. are included.)

      About( ) Baht

Q26. Do you have driving license?

                                 1. Yes   /   2. No

Q27. Did you take any safety educations for driving a car?

                                   1. Yes   /   2. No

Q28. Honestly speaking, how old were you when you begin to drive a car by yourself?

                             About(_____)Years old

Q29. Normally do you use safety belt?

        1. Always   2. sometimes   3. moderate   4. less significant   5. Non use

Q30. Do you keep the regulated number of passengers while you drive a car?

        1.All the time.   2. sometimes follow.   3. moderate.   4. hardly follow.   5.Not at all

Q31. Have you ever been caught by police cause of over the regulated number of passengers? If yes, please specify the number of times.

                        1. No   /   2. Yes   about (   ) times

Q32. Have you ever been caught by police because you did not use safety belt? If yes, please specify the number of times.

                1. No   /   2. Yes   about (   ) times

Please answer the following questions, if you use the motorcycle taxi.

Q33. Do you use helmet while riding on motorcycle taxi?

        1.All the time   2. sometimes wears   3. moderate   4. hardly wear   5. Not at all

Q34. What is the maximum distance do you take motorcycle taxi?

        About (   ) km

Thank you very much for your cooperation.

แบบสำรวจแบบสอบถามผู้ใช้ยานพาหนะ

กรุณาตอบคำถาม ด้านล่าง โดยการ ใส่หมายเลข วงกลม หรือ เขียนคำอธิบาย

กรุณาใส่หมายเลข (1,2,3,..) ที่ระบุตำแหน่งสมาชิกครอบครัวของท่านในช่องสมาชิกครอบครัวและกรอก ข้อมูลเกี่ยวกับ อายุ เพศ อาชีพ และ รายได้ ของท่าน และ สามชิกใน ครอบครัวของท่านในช่องว่างที่กำหนดให้. โปรดดูตัวอย่างข้างล่าง.

Q1. กรุณากรอก ข้อมูล ของ อายุ เพศ อาชีพ และ รายได้ ของท่าน และ สามชิกใน ครอบครัวของท่านในช่องว่างที่กำหนดให้.

(ตัวอย่างเช่น)

สมาชิกครอบครัว	อายุ	เพศ	อาชีพ	รายได้ต่อเดือน (บาท)
ตัวท่านเอง	32	ชาย	2	5,000
ตัวท่านเอง				

สมาชิกครอบครัว	อายุ	เพศ	อาชีพ	รายได้ (บาท)

สมาชิกครอบครัว:

1. ปู่ หรือ ตา	5. พี่ หรือ น้อง ชาย	9. ลุง
2. ย่า หรือ ยาย	6. พี่ หรือ น้อง สาว	10. ป้า
3. บิดา	7. บุตร ชาย	11. อื่น ๆ (กรุณาระบุ)
4. มารดา	8. บุตร สาว	

อาชีพ:

1.หน่วยงาน ราชการ	5. นักวิชาชีพ	9. อื่น ๆ
2. พนักงาน บริษัท เอกชน	6.นิสิต นักศึกษา มหาวิทยาลัย	
3. เจ้าของกิจการ	7.นักเรียนหรือผู้ ที่กำลังศึกษา นอกเหนือจากข้อ 6	
4. แม่บ้าน	8. ว่างงาน	

Q2. ท่านเดินทางไปทำงานหรือไปโรงเรียนของท่านอย่างไร? กรุณากรอกข้อมูลลงตารางข้างล่างที่กำหนดให้เท่าที่ท่านสามารถกรอกได้ ดังเช่นตัวอย่างด้านล่าง.

ตัวอย่างการกรอกข้อมูล;ตัวอย่างตามตารางต่อไปนี้เป็นรูปแบบของการเดินทาง.ผู้กรอกแบบสอบถามเดินทาง5นาที

โดยมอเตอร์ไซค์รับจ้างจากบ้านถึงป้ายรถประจำทาง(15บาท) ขึ้นรถประจำทางอีก 15 นาที(5บาท) และขึ้นรถประจำทางต่อที่สองอีก 10นาที (5บาท) หลังจากนั้นเดินเท้าอีก 3นาที ไปยังที่ทำงาน (หรือโรงเรียน)

หมายเลขพาหนะ:

1.	เดิน	4.	รถไฟฟ้าBTS	7.	รถจักรยานยนต์ส่วน ตัว	10	สามล้อ (ตุ๊กตุ๊ก)	13.	อื่นๆ (กรุณาระบุ)
2.	รถประจำทาง	5.	มอเตอร์ไซค์รับ จ้าง	8.	จักรยาน	11.	รถสองแถว		
3.	รถไฟ (การรถไฟ)	6.	รถยนต์ส่วนตัว	9.	แท็กซี่	12.	รถตู้		

พาหนะ	5		2		2		1
เวลาเดินทาง	5นาที	⇨	15นาที		10นาที		3นาที
ค่าใช้จ่าย	15บาท	(5)	5บาท	(3)	5บาท	(0)	0บาท

หมายเลขพาหนะ

ช่องกรอกเวลาในการรอพาหนะ

พาหนะ						
เวลาเดิน ทาง (นาที)	⇨	⇨	⇨	⇨	⇨	⇨
ค่าใช้จ่าย (บาท) ( )	( )	( )	( )	( )	( )	

รถยนต์ส่วนตัว ใส่ค่าใช้จ่าย เท่ากับ 0 บาท

ช่องกรอกเวลาในการรอพาหนะ
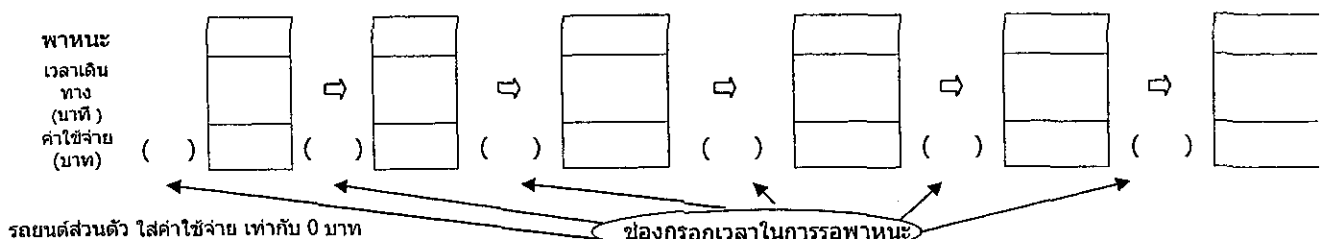
Q3. ท่านใช้เวลาในการเดินทางไปที่ทำงานหรือไปโรงเรียนเท่าไหร่?

ประมาณ ( ) ชั่วโมง ( ) นาที

ถ้าท่านไม่มีรถจักรยานยนต์ส่วนตัว, กรุณาข้ามไปทำที่ข้อ Q19.

Q4. ครอบครัวของท่านมีรถจักรยานยนต์กี่คัน?

_____ คัน

Q5. กรุณาเลือกสาเหตุที่ท่านเลือกใช้รถจักรยานยนต์? กรุณาวงกลมตามหมายเลขที่ระบุในช่อง สามารถเลือกได้มากกว่าหนึ่งข้อ)

1	ใช้ในการเดินทาง หรือ ไปโรงเรียน	6	เพื่อความสะดวกสบาย	11	มีสตางค์มาก
2	ใช้ทำงาน	7	ดูแลรักษาง่าย	12	น่าลองใช้
3	สามารถซื้อได้ในราคาถูก	8	ไม่มีรถบริการสาธารณะใกล้บ้าน	13	จำเป็นต้องใช้
4	มีผู้ซื้อให้	9	ไม่สามารถซื้อรถยนต์ได้	14	ชอบรูปลักษณ์
5	ใช้ง่าย	10	มีคนแนะนำ	15	อื่นๆ

Q6. ท่านได้รถจักรยานยนต์ของท่านเมื่อไหร่, ขณะนั้นสถานะของรถ ราคา และวิธีการชำระค่ารถจักรยานยนต์เป็นอย่างไร?

	ซื้อมาเมื่อ	ราคา	สถานะ	วิธีการชำระ	จำนวนงวดที่ชำระ	จำนวนเงินต่องวด
ลำดับที่หนึ่ง	_____ปีที่แล้ว	_____บาท	1 , 2 , 3 , 4	1 , 2	_____ครั้ง	_____บาท
ลำดับที่สอง	_____ปีที่แล้ว	_____บาท	1 , 2 , 3 , 4	1 , 2	_____ครั้ง	_____บาท
ลำดับที่สาม	_____ปีที่แล้ว	_____บาท	1 , 2 , 3 , 4	1 , 2	_____ครั้ง	_____บาท
ลำดับที่สี่	_____ปีที่แล้ว	_____บาท	1 , 2 , 3 , 4	1 , 2	_____ครั้ง	_____บาท

สถานะภาพของรถจักรยานยนต์ของท่าน

1	มือหนึ่ง	3	มีคนให้
2	มือสอง	4	อื่นๆ

กรุณาเลือกวิธีการชำระเงิน ดังต่อไปนี้

1	เหมาจ่ายงวดเดียว
2	จ่ายเป็นเงินผ่อน

Q7. ท่านได้ใช้รถจักรยานยนต์ของท่านในกิจกรรมอื่น นอกจากเดินทางไปทำงาน หรือเดินทางไปโรงเรียนหรือไม่?(เลือกได้มากกว่า 1 ข้อ)

    1. ใช้   /   ถ้าตอบ "ใช้", กรุณาวงกลมที่เหตุผลด้านล่าง.   /   2. ไม่

1	ไป ช้อปปิ้ง	2	ไปกับเพื่อนๆ	3	ไปที่ๆอยากไป	4	(อื่นๆ)

Q8. ท่านใช้รถจักรยานยนต์ของท่านเดินทางเป็นระยะทางสูงสุดเท่าไร?

    ประมาณ (_____) กิโลเมตร

Q9. ท่านมีค่าใช้จ่ายในการบำรุงรักษารถจักรยานยนต์1 คัน ต่อเดือนเท่าไหร่?
    (รวมค่าน้ำมันค่าซ่อมแซม และอื่นๆ.)
    ประมาณ (_____) บาทต่อเดือน/คัน

Q10. ท่านมีใบขับขี่รถจักรยานยนต์หรือไม่?

    1. มี   2. ไม่มี

Q11. ท่านเคยได้รับการศึกษาวิธีขี่รถจักรยานยนต์อย่างปลอดภัยหรือไม่?

         1. เคย   2. ไม่เคย

Q12. ท่านเริ่มขับรถจักรยานยนต์ครั้งแรกเมื่ออายุเท่าไร?

     <u>ประมาณ (</u>   <u>) ปี</u>

Q13. ท่านสวมหมวกนิรภัยขณะท่านขับขี่รถจักรยานยนต์หรือไม่?

     1 สวมทุกครั้ง.   2 สวมบางครั้ง.   3. พอประมาณ   4 น้อยครั้ง.   5. ไม่เลย

Q14. ขณะที่ท่านขับรถจักรยานยนต์ ท่านปฏิบัติตามกฎโดยบรรทุกผู้โดยสารตามที่กฎหมายกำหนดหรือไม่?

     1 ตามที่กฎหมายกำหนดทุกครั้ง.   2 บางครั้ง.   3. พอประมาณ   4 น้อยครั้ง.   5. ไม่เลย

Q15. ท่านเคยถูกตำรวจจับหรือไม่ในกรณีที่มีผู้โดยสารซ้อนเกินที่กฎหมายกำหนด? ถ้าเคยกรุณาระบุจำนวนครั้ง.

         1. เคย   <u>ประมาณ (</u>   <u>) ครั้ง</u>   /   2.ไม่เคย

Q16. ท่านเคยถูกตำรวจจับหรือไม่ในกรณีที่ไม่สวมหมวกนิรภัย? ถ้าเคยกรุณาระบุจำนวนครั้ง.

         1. เคย   <u>ประมาณ (</u>   <u>) ครั้ง</u>   /   2.ไม่เคย

Q17. ท่านเคยขับรถจักรยานยนต์สวนทางการเดินจราจร หรือ ขับบนทางเท้าหรือไม่?

         1. เคย   <u>ประมาณ (</u>   <u>) ครั้ง</u>   /   2. ไม่เคย

Q18. ในอนาคตท่านต้องการมีรถยนต์ส่วนตัวหรือไม่? (เลือกได้มากกว่า 1 ข้อ)
     1. ต้องการ / ถ้าตอบ "ต้องการ", กรุณาวงกลมเหตุผลด้านล่างนี้. / 2. ไม่ต้องการ

1	ใช้ในการเดินทางหรือไปโรงเรียน	4	ความสะดวกสบาย
2	สำหรับทำงาน	5	น่าสนใจ
3	เพื่อสถานภาพทางสังคม	6	อื่นๆ ( )

คำถามต่อไปเกี่ยวข้องกับรถยนต์ส่วนตัว. ท่านที่ไม่มีรถยนต์ส่วนตัวกรุณาข้ามไปทำข้อ Q32

Q19. ครอบครัวของท่านมีรถยนต์กี่คัน? (จำนวนรถยนต์ต่อครอบครัว)

_____ คันต่อครอบครัว

Q20. กรุณาให้เหตุผลที่ท่านเลือกใช้รถยนต์? กรุณาวงกลมตามตารางข้างล่าง. (สามารถตอบได้มากกว่าหนึ่งข้อ)

1	ใช้ในการเดินทาง หรือ ไปโรงเรียน	6	เพื่อความสะดวกสบาย	11	นำลองใช้
2	ใช้ทำงาน	7	ดูแลรักษาง่าย	12	จำเป็นต้องใช้
3	สามารถซื้อได้ในราคาถก	8	ไม่มีรถสาธารณะบริการใกล้บ้าน	13	ชอบรูปลักษณ์
4	มีผู้ซื้อให้	9	มีคนแนะนำ	14	อื่นๆ
5	ใช้ง่าย	10	มีสตางค์มาก		

Q21. ท่านได้ซื้อรถยนต์ของท่านเมื่อไหร่, ขณะนั้นสถานะของรถ ราคา และวิธีการชำระค่ารถยนต์ เป็นอย่างไร?

	ซื้อมาเมื่อ	ราคา	สถานะ	วิธีการชำระ	จำนวนงวดที่ชำระ	จำนวนเงินต่องวด
ลำดับที่หนึ่ง	_____ปีที่แล้ว	_____บาท	1, 2, 3, 4	1 , 2	_____ครั้ง	_____บาท
ลำดับที่สอง	_____ปีที่แล้ว	_____บาท	1, 2, 3, 4	1 , 2	_____ครั้ง	_____บาท
ลำดับที่สาม	_____ปีที่แล้ว	_____บาท	1, 2, 3, 4	1 , 2	_____ครั้ง	_____บาท
ลำดับที่สี่	_____ปีที่แล้ว	_____บาท	1, 2, 3, 4	1 , 2	_____ครั้ง	_____บาท

<u>สถานะภาพของรถยนต์ของท่าน</u>

1	มือหนึ่ง	3	มีคนให้
2	มือสอง	4	อื่นๆ

<u>กรุณาเลือกวิธีการชำระเงิน ดังต่อไปนี้</u>

1	เหมาจ่ายงวดเดียว
2	จ่ายเป็นเงินผ่อน

Q22. ท่านได้ใช้รถยนต์ของท่านในกิจกรรมอื่น นอกจากการเดินทางไปทำงาน หรือ เดินทางไปโรงเรียนหรือไม่? (เลือกได้มากกว่า 1 ข้อ)

1. ใช้ / ถ้าตอบ "ใช้", กรุณาวงกลมที่เหตุผลด้านล่าง. / 2. ไม่

1	ไป ช้อปปิ้ง	2	ไปกับเพื่อนๆ	3	ไปที่ๆ อยากไป	4	(อื่นๆ)

Q23. ท่านใช้รถยนต์ของท่านเดินทางเป็นระยะทางสูงสุดเท่าไร?

<u>ประมาณ (_____) กิโลเมตร</u>

Q24. ท่านมีค่าใช้จ่ายในการบำรุงรักษารถยนต์ 1 คันต่อเดือนเท่าไหร่?
(รวมค่าน้ำมันค่าซ่อมแซม และอื่นๆ.)

<u>ประมาณ (_____) บาทต่อเดือน/คัน</u>

Q25. ท่านมีใบขับขี่รถยนต์หรือไม่?

1. มี   /   2. ไม่มี

Q26. ท่านเคยได้รับการศึกษาวิธีขับรถยนต์อย่างปรอดภัยหรือไม่?

1. เคย   /   2. ไม่เคย

Q27. ท่านเริ่มขับรถยนต์ครั้งแรกเมื่ออายุเท่าไร?

ประมาณ (_____) ปี

Q28. ท่านคาดเข็มขัดนิรภัยขณะท่านขับขี่รถยนต์หรือไม่?

1 คาดทุกครั้ง.   2 คาดบางครั้ง.   3. คาดพอประมาณ   4 น้อยครั้ง.   5. ไม่เคยเลย

Q29. ขณะที่ท่านขับรถยนต์ ท่านได้ปฏิบัติตามกฎโดยบรรทุกผู้โดยสารตามที่กฎหมายกำหนดหรือไม่?

1 ตามที่กฎหมายกำหนดทุกครั้ง.   2 บางครั้ง. 3. พอประมาณ   4 น้อยครั้ง.   5. ไม่เคยปฏิบัติตามเลย

Q30. ท่านเคยถูกตำรวจจับหรือไม่ในกรณีที่บรรทุกผู้โดยสารเกินกำหนด? ถ้าเคยกรุณาระบุจำนวนครั้ง

1. ไม่เคย   /   2. เคย   ประมาณ (_____) ครั้ง

Q31. ท่านเคยถูกตำรวจจับหรือไม่ในกรณีที่ไม่คาดเข็มขัดนิรภัย? ถ้าเคยกรุณาระบุจำนวนครั้ง.

1. ไม่เคย   /   2. เคย   ประมาณ (_____)ครั้ง

กรุณาตอบคำถามต่อไปนี้ในกรณีที่ท่านใช้บริการมอเตอร์ไซค์รับจ้าง.

Q32. ท่านสวมหมวกนิรภัยขณะท่านใช้บริการมอเตอร์ไซค์รับจ้างหรือไม่?

1. สวมทุกครั้ง.   2 สวมบางครั้ง.   3. พอประมาณ   4 น้อยครั้ง.   5. ไม่เคยสวมเลย

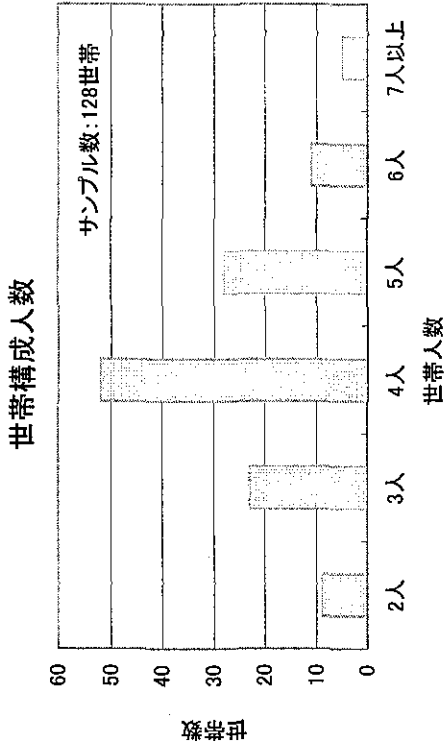**Q33.** ท่านใช้บริการมอเตอร์ไซค์รับจ้างในการเดินทางเป็นระยะทางสูงสุดเท่าไร?

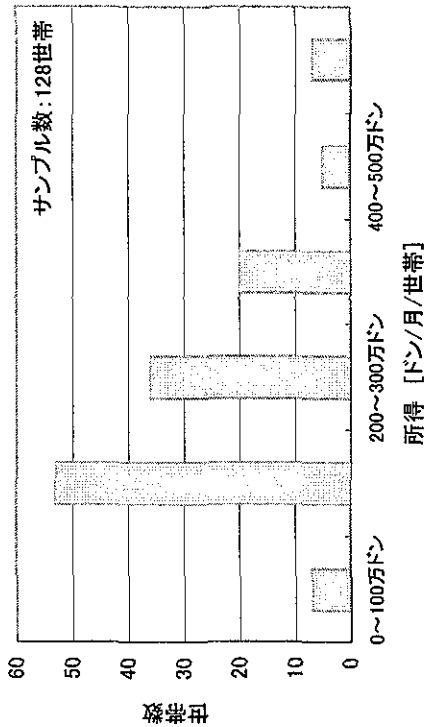ประมาณ (_____) กิโลเมตร

ขอขอบคุณ ที่กรุณาให้ความร่วมมือ.

II-3　ベトナム調査資料

資料20 アンケート回収率と世帯情報

世帯構成人数

サンプル数:128世帯

世帯人数: 2人, 3人, 4人, 5人, 6人, 7人以上

世帯一人当たりに換算した収入

サンプル数:128世帯

世帯一人当たりに換算した収入 [ドン/月/世帯一人当たり]: 0～20万ドン, 40～60万ドン, 80～100万ドン, 120万ドン～

	配布			回収		
	Q-A	Q-B	Q-C	Q-A	Q-B	Q-C
現地調査員1	11	13	14	11	13	14
現地調査員2	17	22	22	17	17	22
現地調査員3	10	15	8	10	11	8
現地調査員4	9	4	9	9	4	9
現地調査員5	10	10	9	10	9	9
現地調査員6	12	16	11	12	16	11
現地調査員7	16	22	13	15	23	13
現地調査員8	13	17	11	13	16	11
現地調査員9	17	14	18	17	14	18
現地調査員10	18	24	24	18	24	23
合計	133	157	139	132	147	138
回収率（％）				99.25	93.63	99.28

世帯当りの所得

サンプル数:128世帯

所得 [ドン/月/世帯]: 0～100万ドン, 200～300万ドン, 400～500万ドン
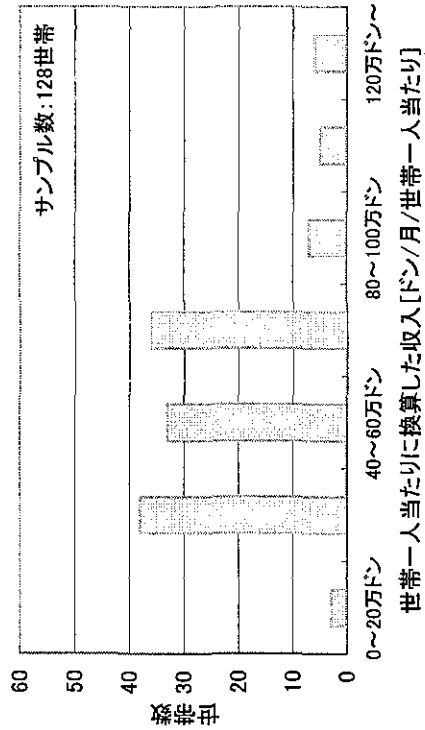
資料21 バイクの保有率と保有台数

バイク保有率

バイクを1台も保有していない世帯の割合
3%

バイクを少なくとも1台は保有している世帯の割合
97%

サンプル数:130世帯

一人当りの二輪車保有台数

サンプル数:130世帯

[世帯]
50
40
30
20
10
0

0台 0.1台 0.2台 0.3台 0.4台 0.5台 0.6台 0.7台 0.8台 0.9台 1台
[台/人]

バイク保有台数

サンプル数:130世帯

[世帯数]
70
60
50
40
30
20
10
0

0台 1台 2台 3台 4台
バイク保有台数[台]

資料22　バイク免許保有率　／　保有バイク駐車場の有無

バイク免許保有率

- (0%以上20%未満) 14%
- 2 (0%以上40%未満) 18%
- (40%以上60%未満) 28%
- (60%以上80%未満) 19%
- (80%以上100%未満) 2%
- (100%) 19%
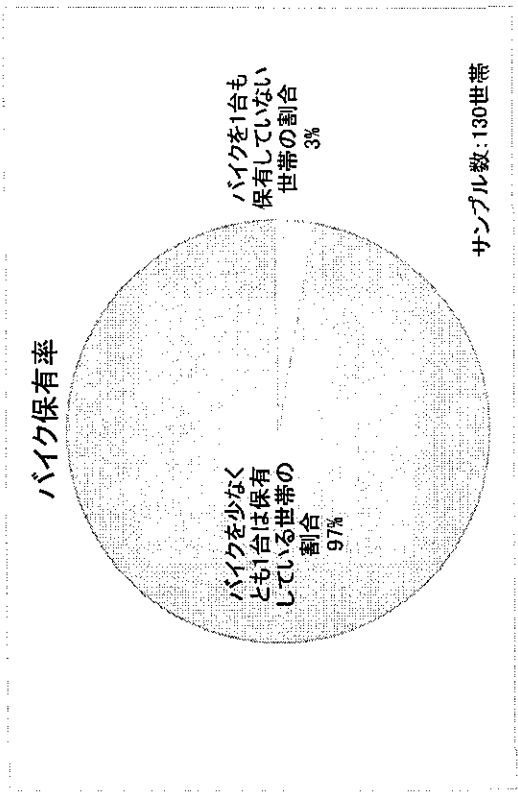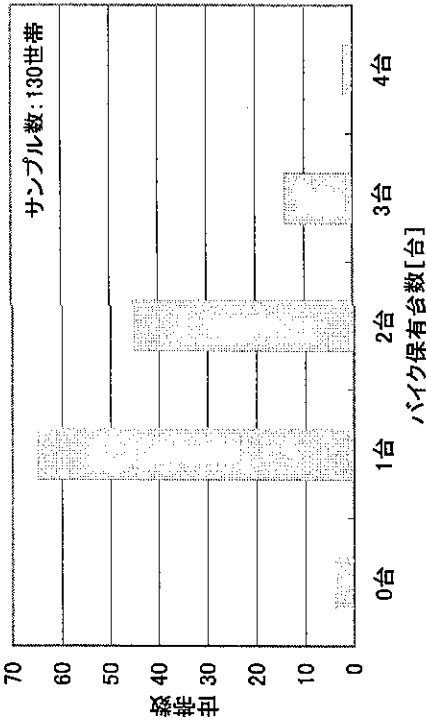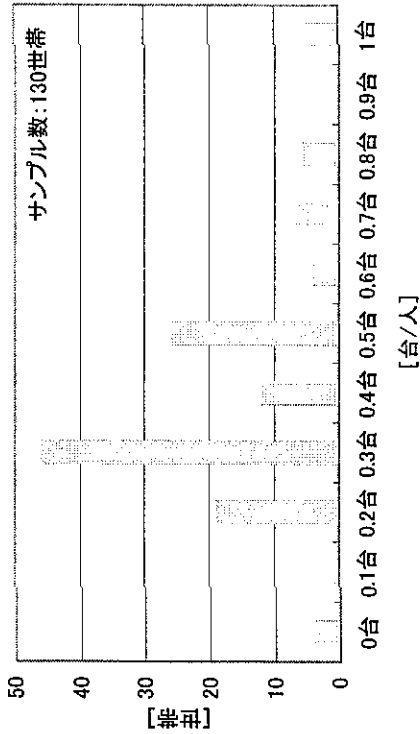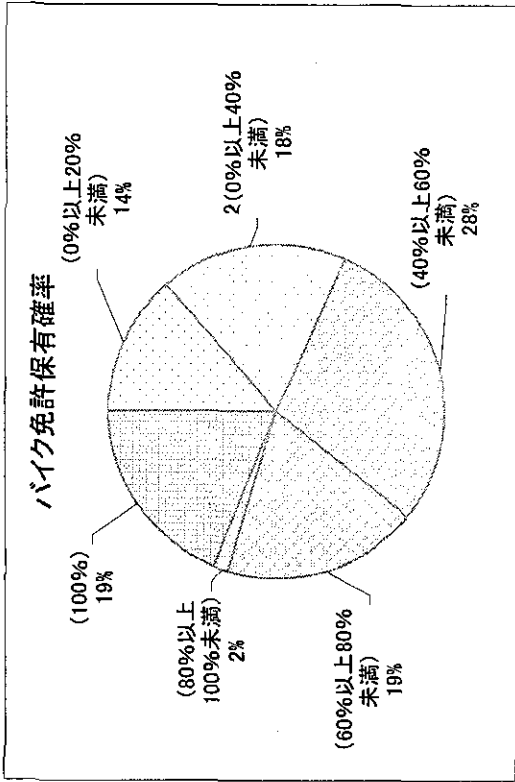
*世帯で18歳以上（免許保有が可能）の人がバイクの免許を保有している割合。

保有しているバイクの駐車場の有無（%）

- 有 95%
- 無 5%

資料23　バイク購入費及び管理費

月当たりバイク1台当りの維持管理費

サンプル数：198世帯

縦軸：サンプル数（0〜80）
横軸：管理費［ドン/1台/月］
0〜5万ドン、10万〜15万ドン、20万〜25万ドン、30万〜35万ドン

バイク購入費

サンプル数：198世帯

縦軸：サンプル数（0〜80）
横軸：購入費
0〜500万ドン、1500万ドン〜2000万ドン、3000万〜3500万ドン

所得に占めるバイク管理費の割合

サンプル数：117世帯

縦軸：総世帯数（0〜50）
横軸：％
0〜5、5〜10、10〜15、15〜20、20〜25、25〜30、30〜

資料24 バイクの利用実態と利用目的（第一利用者）

第一利用者の年齢

サンプル数：203人

第一利用者の年齢

（縦軸：利用者（人）0〜40、横軸：年齢 18歳未満、20〜25歳、30〜35歳、40〜45歳、50〜55歳、60歳以上）

バイクの利用実態

43%

17%

40%

- □ 1台のバイクの利用者が1人
- □ 1台のバイクの利用者が2人
- □ 1台のバイクの利用者が3人

サンプル数：203台

第一利用者のバイク利用目的

通勤
54%

リラックスの為
10%

通院
7%

デート
3%

習い事
1%

ドライブ
1%

買物
4%

通学
14%

その他
6%

サンプル数：203人

資料25 バイクの利用目的（第一利用者以外_1）

第一利用者以外のバイク利用目的

通勤 18%
通学 10%
買物 15%
習い事 8%
デート 7%
送り迎え 4%
通院 1%
運動 1%
リラックスの為 28%
その他 5%

サンプル数：116人

第二利用者の利用目的

通勤 20%
通学 7%
買物 15%
習い事 6%
デート 6%
送り迎え 5%
通院 6%
運動 1%
リラックスの為 28%
その他 6%

サンプル数：81人

第三利用者の利用目的

通勤 14%
通学 17%
買物 14%
習い事 11%
デート 9%
送り迎え 3%
リラックスの為 29%
その他 3%

サンプル数：35人

資料26 バイクの利用目的（第一利用者以外_2）

男性の第二・三利用者の利用目的

サンプル数:57人

- 通勤 28%
- 通学 12%
- 買物 4%
- 習い事 7%
- デート 2%
- 通院 4%
- 運動 2%
- リラックスの為 32%
- その他 9%

女性の第二・三利用者の利用目的

サンプル数:57人

- 買物 26%
- 習い事 7%
- デート 12%
- 送り迎え 9%
- 通院 5%
- リラックスの為 21%
- その他 2%
- 通勤 9%
- 通学 9%

バイク第一利用者以外の年齢

- 女性
- 男性

（縦軸）人数 0 5 10 15 20 25 30 35

（横軸）年齢 18歳未満 20〜25歳 30〜35歳 40〜45歳 50〜55歳 60歳以上

資料27　世帯人数とバイク保有台数　　／　　世帯所得と
バイク保有台数

所得とバイク保有台数の関係

世帯人数とバイク保有の関係

所得とバイク保有台数の関係
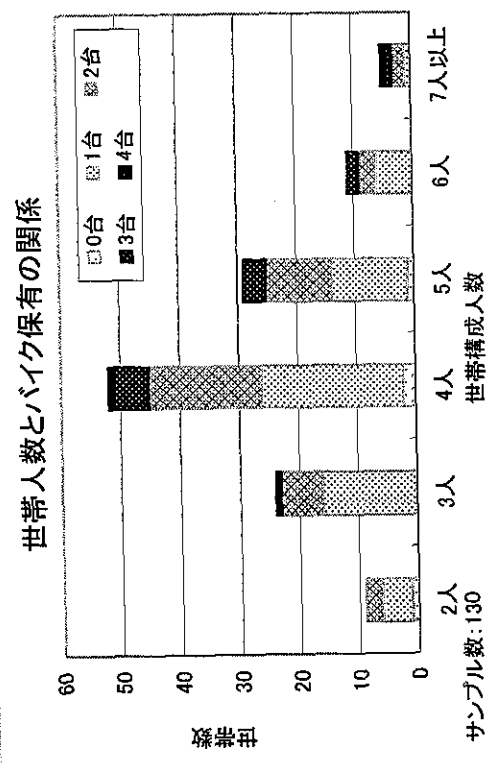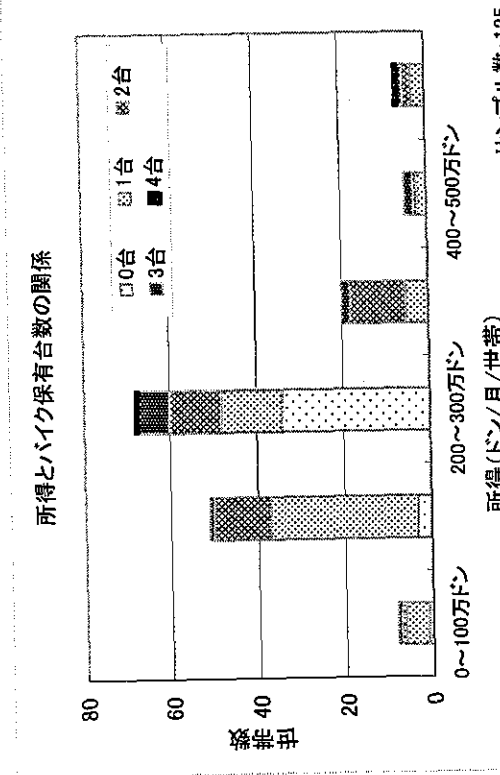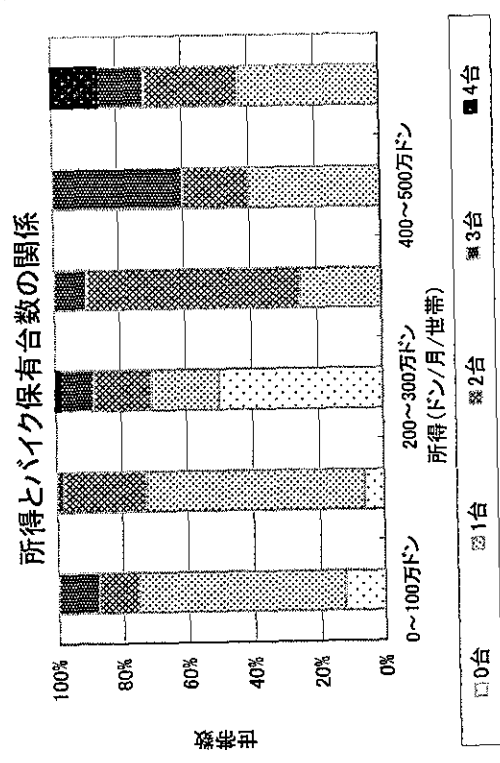
資料28　世帯一人当たりに換算した所得とバイクの保有台数および保有率

世帯一人当たりに換算した収入と世帯のバイク保有台数

一人当たりに換算した収入［ドン/月/人］

凡例：0台　1台　2台　3台　4台

20万ドン未満　40〜50万ドン　70〜80万ドン　100万ドン以上

世帯一人当たりに換算した所得と世帯一人当たりのバイク保有率

一人当たりに換算した所得と世帯一人当たり

20万ドン未満　40〜50万ドン　70〜80万ドン　100万ドン以上

凡例：0台　0より上0.25台未満　0.25以上5台未満　5以上0.75台未満　0.75以上1台未満　1台

世帯一人当たりに換算した収入とバイク保有台数

一人当たりに換算した収入［ドン/月/人］

凡例：0台　1台　2台　3台　4台

20万ドン未満　30〜40万ドン　50〜60万ドン　70〜80万ドン　90〜100万ドン

サンプル数：125世帯

世帯一人当たりに換算した所得と世帯一人当たりのバイク保有率

収入［ドン/月/世帯一人当たり］

サンプル数：125世帯

20万ドン未満　30〜40万ドン　50〜60万ドン　70〜80万ドン　90〜100万ドン

凡例：0台　0より上0.25台未満　0.25以上5台未満　5以上0.75台未満　0.75以上1台未満　1台

資料29　自転車保有台数及び保有率

世帯当りの自転車保有率

サンプル数:129

世帯一人当りの自転車保有率　[台/人/世帯]

世帯収入と自転車保有台数

自転車0台　自転車1台
自転車2台　自転車3台
自転車4台

世帯収入

自転車保有台数

サンプル数:129

保有台数

世帯人数と自転車保有台数

サンプル数:122

世帯構成人数

自転車0台　自転車1台　自転車2台　自転車3台　自転車4台

資料30 自転車購入費及び管理費

自転車購入費用

サンプル数：140世帯

自転車購入費[ドン]

横軸：25万ドン未満 / 50〜75万ドン / 100〜125万ドン / 150〜175万ドン

縦軸：世帯数 0〜70

自転車管理費の所得に対する割合

サンプル数：87世帯

管理費/所得 [%]

横軸：0.5%未満 / 1〜1.5% / 2〜3% / 4%以上

縦軸：世帯数 0〜35

自転車管理費

サンプル数：87世帯

自転車管理費[ドン]

横軸：5千ドン以下 / 1万〜1.5万ドン / 2万〜2.5万ドン / 3万〜3.5万ドン

縦軸：世帯数 0〜25

資料31　自転車利用目的（第一利用者）

自転車第一利用者性別

男性
39%

女性
61%

サンプル数:136

第一利用者の自転車利用目的

通学
40%

通勤
13%

その他
3%

リラックス
7%

デート
6%

習い事
5%

送り迎え
1%

買物
25%

サンプル数:133

自転車第一利用者年齢

女性
男性

10歳未満　15～20歳　25～30歳　35～40歳　45～50歳　55～60歳　65歳以上

年齢

総人数　0　5　10　15　20　25　30　35

資料32　自転車利用目的(第一利用者以外)

自転車第一利用者以外の性別

男性
53%

女性
47%

サンプル数:69

第一利用者以外の自転車利用目的

買物
30%

通学
14%

通勤
5%

その他
1%

リラックス
33%

デート
8%

習い事
9%

自転車第一利用者以外の年齢

サンプル数:69人

年齢

10歳未満　15〜20歳　25〜30歳　35〜40歳　45〜50歳　55〜60歳　65歳以上

16　12　8　4　0

人数

資料33 通勤時間1

タクシー利用時の通勤時間

	サンプル数
バス	55
タクシー	24
車	33

バスを利用時の通勤時間

車利用時の通勤時間

(14)

資料34　通勤時間2

バイク利用時の通勤時間

サンプル数	
バイクタクシー	60
バイク	134
自転車	43

バイクタクシー利用時の通勤時間

自転車利用時の通勤時間

ハノイでは、バスは一律2500ドンと決まっています。
ハノイの乗り物でセ・ラムという乗り物があり、乗り合いバスとなっていてこちらは一律1000ドンでした。
こちらをバスと考えて答えている人がいました。
また5000ドンと答えている人は、バスを1回乗り換えて乗っていることに、なります。

タクシー利用時の運賃

バイクタクシー利用時の運賃
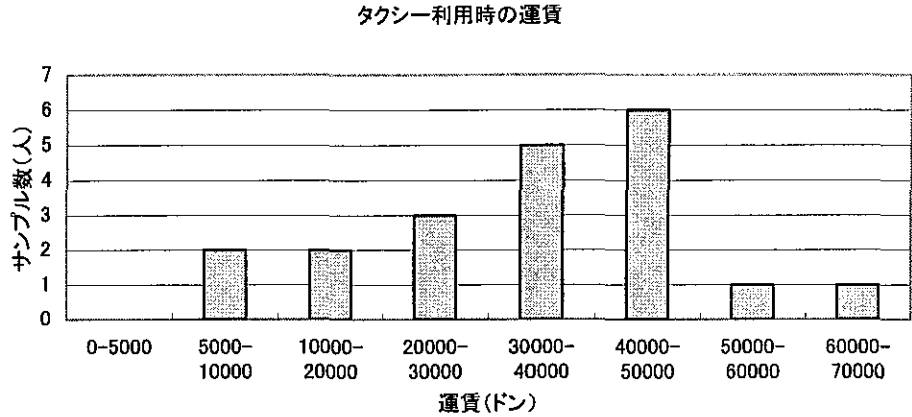
	サンプル数
タクシー	20
バイクタクシー	43

資料35 運賃

資料36　利用形態

車の利用形態

縦軸: サンプル数（人）, 0, 5, 10, 15, 20, 25, 30
横軸: 利用形態番号 A, B, C, D, E

自転車の利用形態

縦軸: サンプル数（人）, 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
横軸: 利用形態番号 A, B, C, D

バイクの利用形態

縦軸: サンプル数（人）, 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130
横軸: 利用形態番号 A, B, C, D
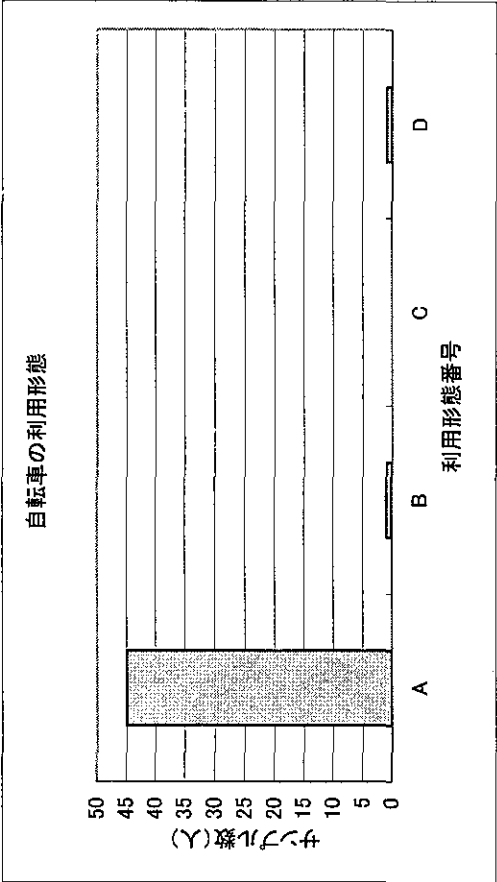
凡例
A:自分で運転
B:家族が運転
C:専属ドライバーが運転
D:知人の相乗り
E:その他

	サンプル数
車	35
バイク	131
自転車	58

資料37　利用可能者数と不可能者数

バイクタクシー利用可能者数と不可能者数

可能者
49%

非可能者
51%

サンプル数	126
可能者	62
非可能者	64

バス利用可能者数と不可能者数

可能者
34%
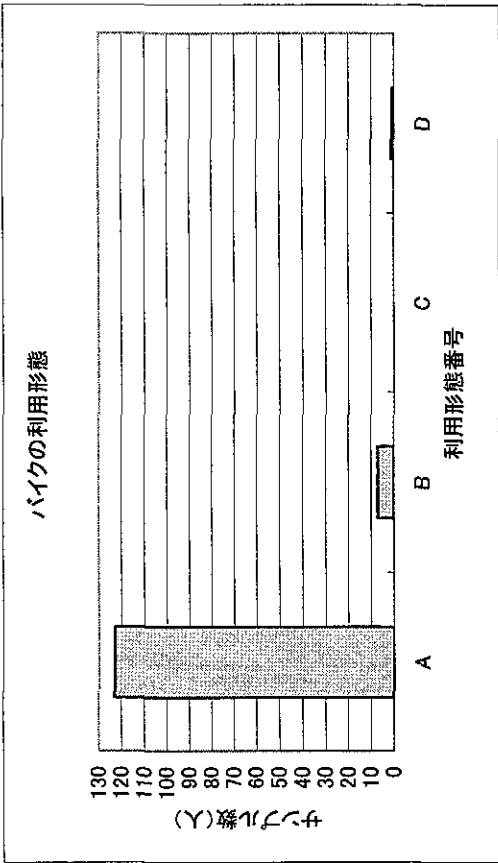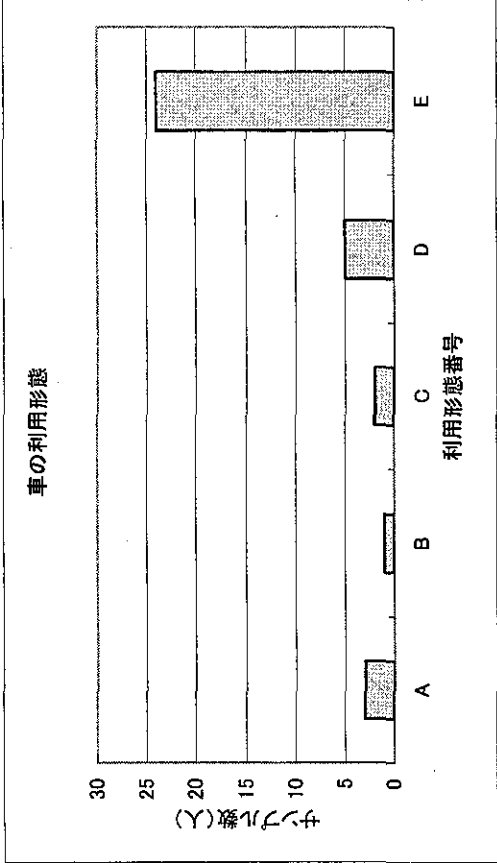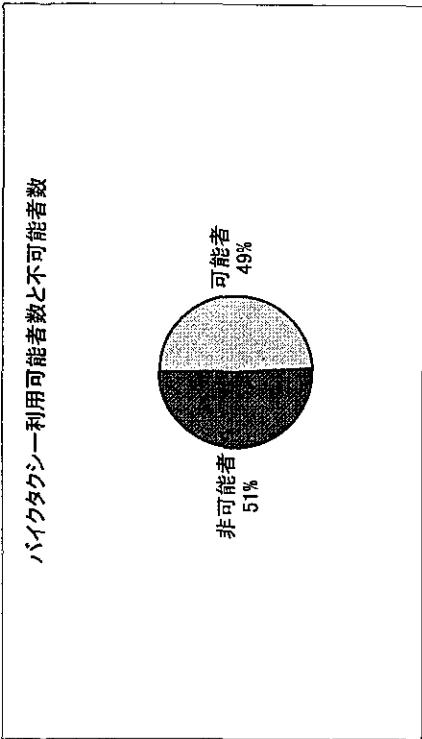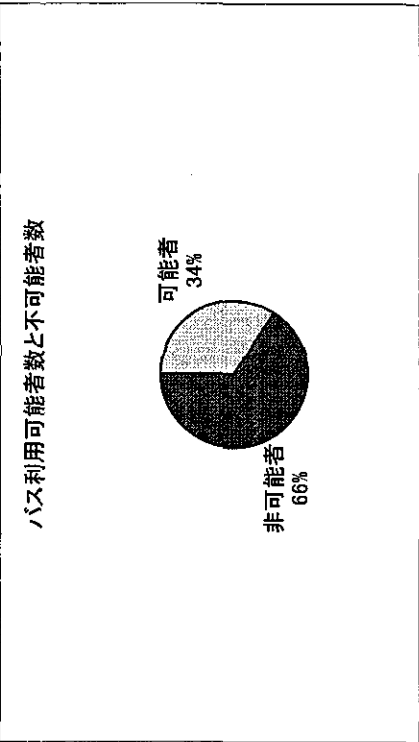
非可能者
66%

サンプル数	181
可能者	62
非可能者	119

資料38 バスに関する結果

家からバス停までかかる時間

サンプル数：61

（グラフ：横軸 時間(分) 0-5, 5-10, 10-15, 15-20, 20-25／縦軸 サンプル数(人) 0〜30）

バスを降りて会社までかかる時間

サンプル数：56

（グラフ：横軸 時間(分) 0-5, 5-10, 10-15, 15-20, 20-25／縦軸 サンプル数(人) 0〜35）

バス停での待ち時間

サンプル数：61

（グラフ：横軸 時間(分) 0-5, 5-10, 10-15, 15-20／縦軸 サンプル数(人) 0〜30）

資料39　利用不可能な理由

バス利用不可能な理由

サンプル数（人）／利用不可能な理由番号

凡例
1 自宅から目的地に着くまでに適切なバス路線がない
2 自宅からバス停が遠い
3 降りたバス停から会社が遠い
4 料金が高い
5 利用したい時にバスが来ない
6 乗車環境が悪い（バスが混んでいる、振動がひどい
7 安全面で問題がある（車両の整備不良、交通事故
8 その他

サンプル数：103

バイクタクシー非利用者の代替交通手段

サンプル数（人）／その他の交通手段番号

凡例
1 自家用車による送迎
2 自家用バイクによる送迎
3 シクロー
4 知人の車の相乗り
5 知人のバイクの相乗り
6 バス
7 その他

サンプル数：65

資料40　バイクタクシーに関する結果

バイクタクシーを降りてから会社までにかかる時間

サンプル数：51

家からバイクタクシーを利用するまでにかかる時間

サンプル数：49

バイクタクシー平均乗車時間

サンプル数：61

資料41　通学時間1

バスを利用時の通学時間

タクシー利用時の通学時間

車利用時の通学時間
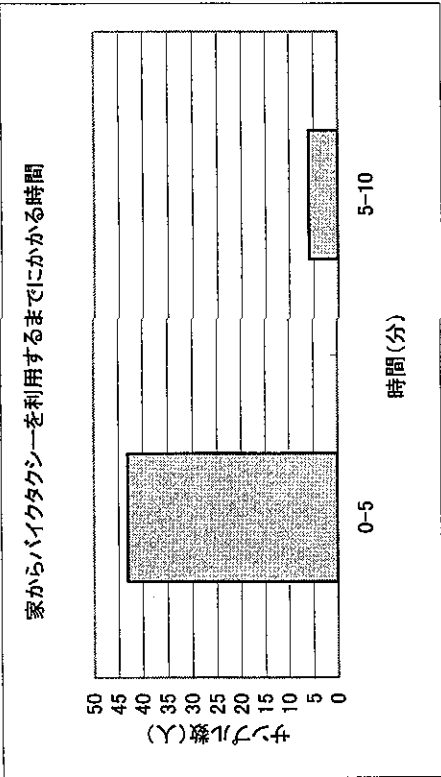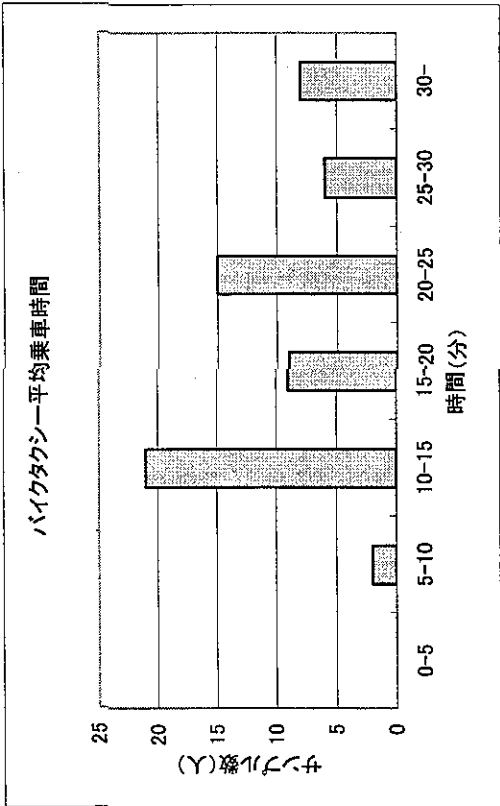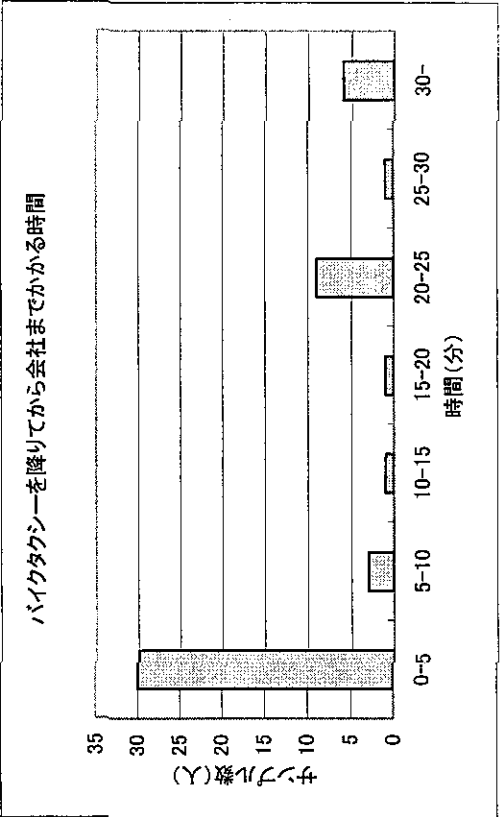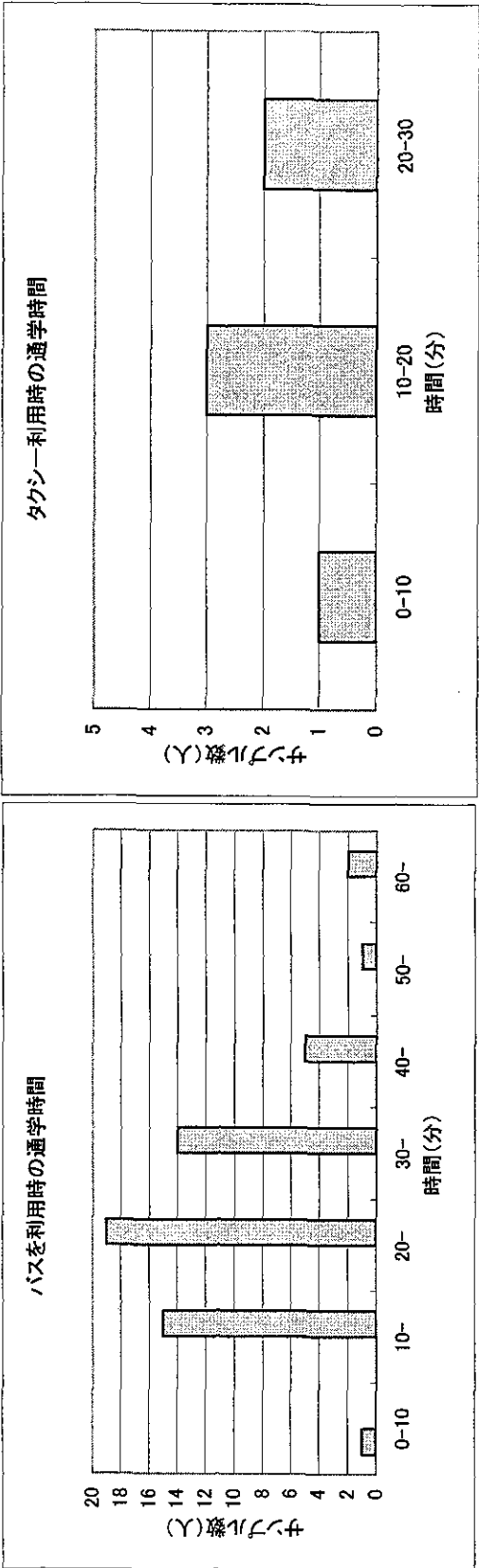
	サンプル数
バス	56
タクシー	6
車	15

資料42　通学時間2

バイク利用時の通学時間

サンプル数（人）

35 30 25 20 15 10 5 0

0-10　10-20　20-30　30-40　40-50

時間（分）
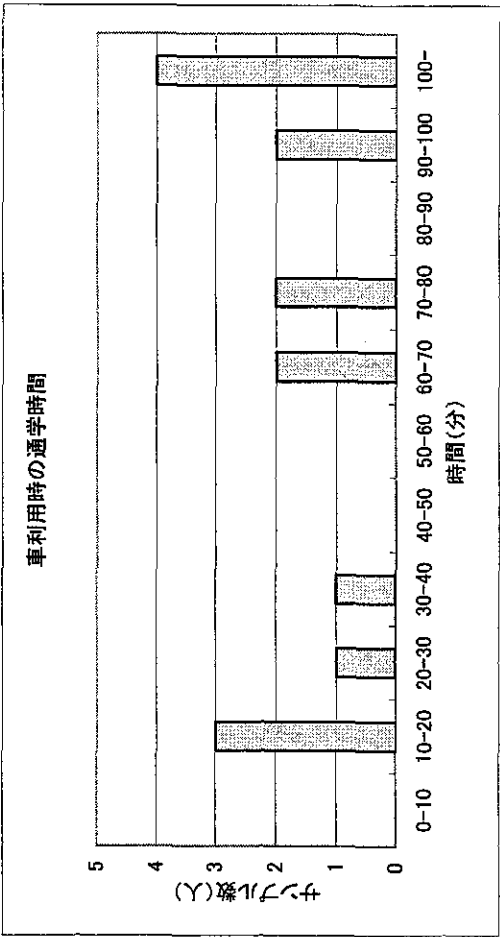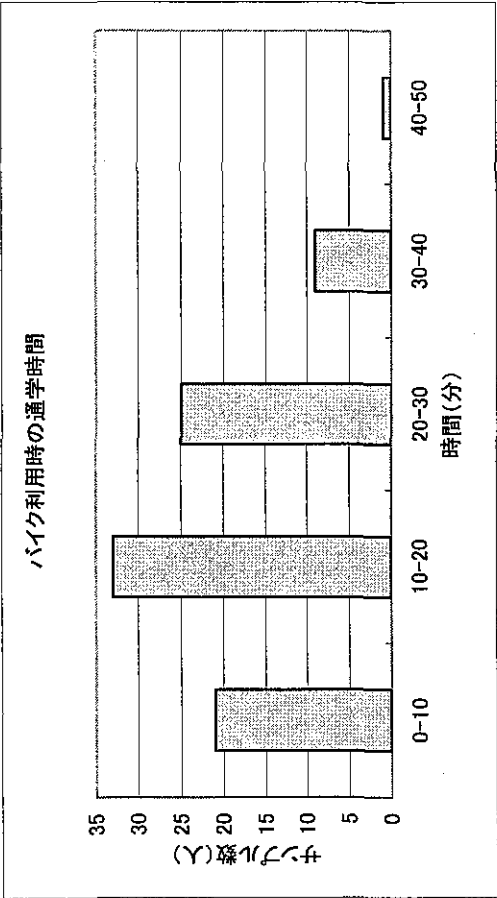
	サンプル数
バイクタクシー	27
バイク	89
自転車	102

バイクタクシー利用時の通学時間

サンプル数（人）

18 16 14 12 10 8 6 4 2 0

0-10　10-20　20-30　30-40　40-50　50-60　60-70　70-80

時間（分）

自転車利用時の通学時間

サンプル数（人）

60 50 40 30 20 10 0

0-10　10-20　20-30　30-40　40-50　50-60　60-70

時間（分）
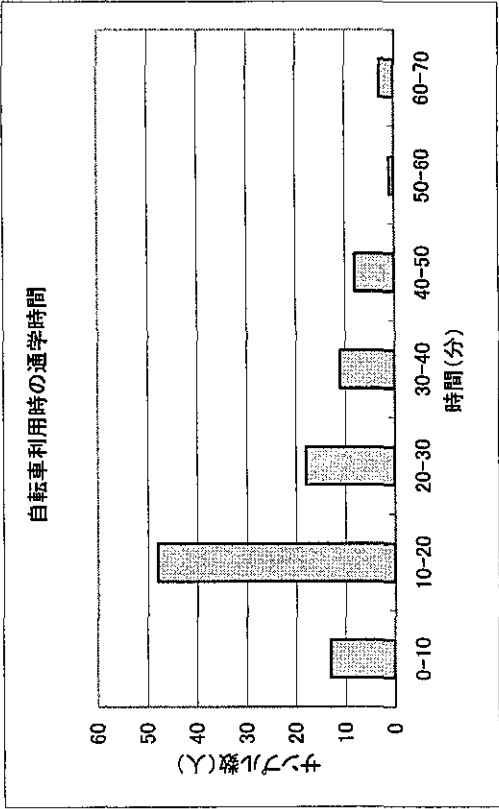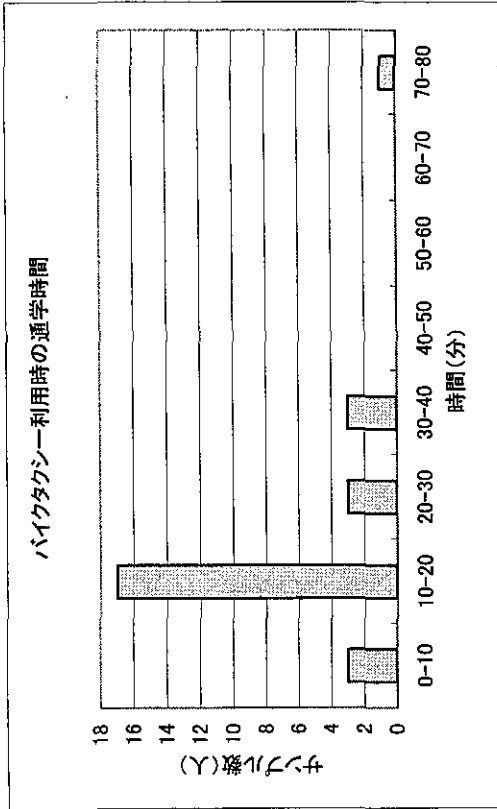
資料43　運賃

ハノイでは、バスは一律2500ドンと決まっています。
ハノイの乗り物でセ・ラムという乗り合いバスがあり、乗り合いバスでこちらは1000ドンでした。
こちらをバスと考えている人もいる人もいました。
また5000ドンと答えている人は、バスを1回乗り換えて乗っていることに、なります。

	サンプル数
タクシー	4
バイクタクシー	23

タクシー利用時の運賃

運賃（ドン）

バイクタクシー利用時の運賃

運賃（ドン）

資料44　利用形態

自転車の利用形態

サンプル数(人)：100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0

利用形態番号：A　B　C　D

車の利用形態

サンプル数(人)：12, 10, 8, 6, 4, 2, 0

利用形態番号：A　B　C　D　E

バイクの利用形態

サンプル数(人)：50, 45, 40, 35, 30, 25, 20, 15, 10, 5, 0

利用形態番号：A　B　C　D
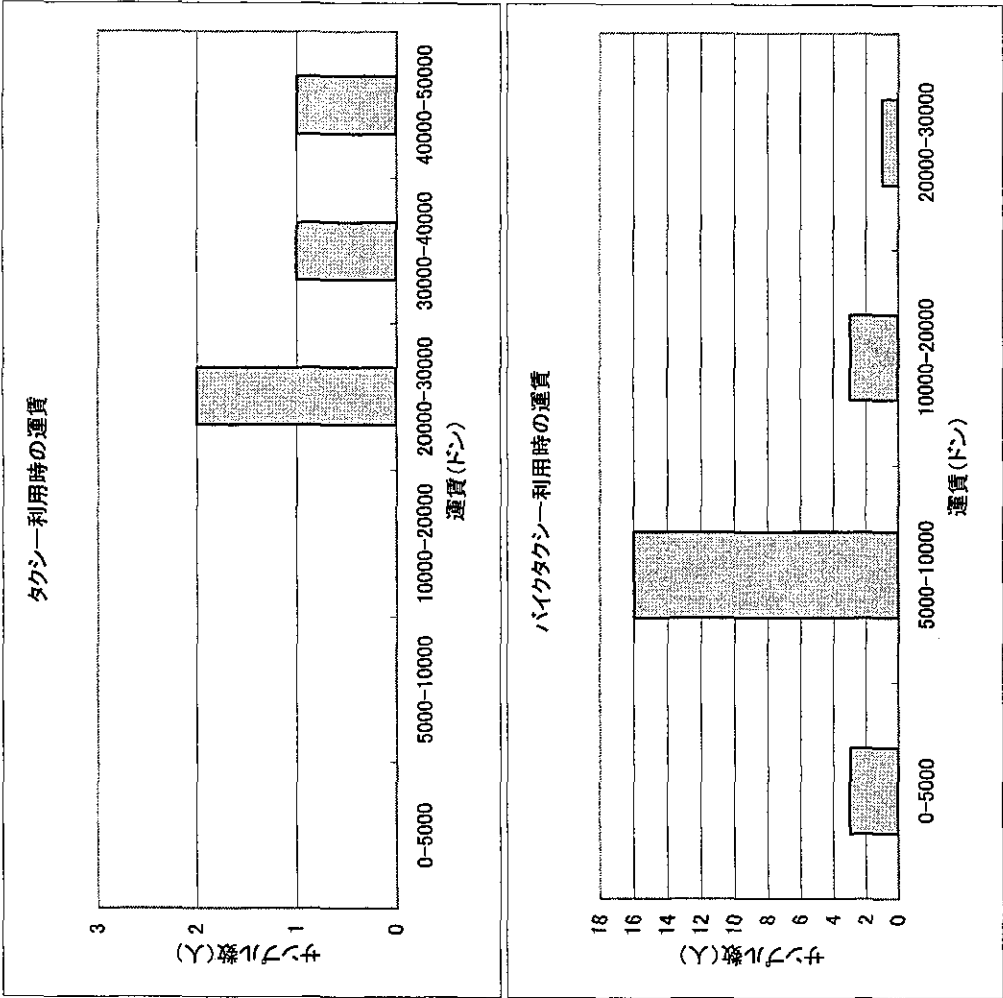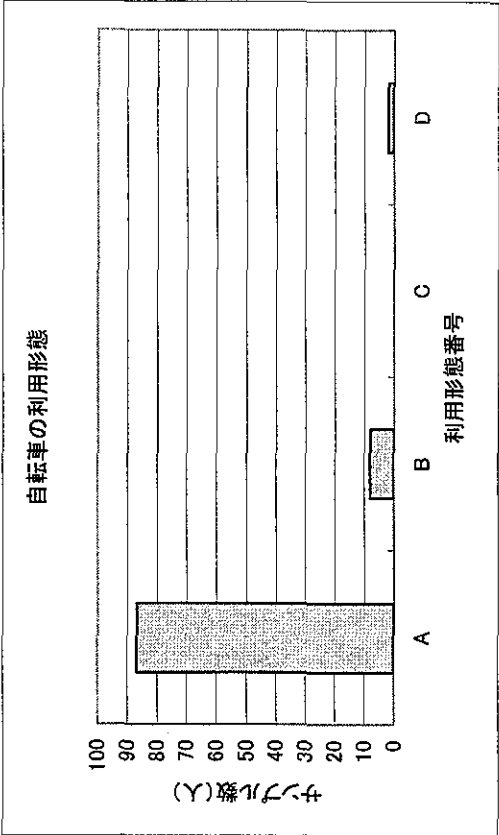
凡例
A：自分で運転
B：家族が運転
C：専属ドライバーが運転
D：知人の相乗り
E：その他

	サンプル数
車	15
バイク	89
自転車	97
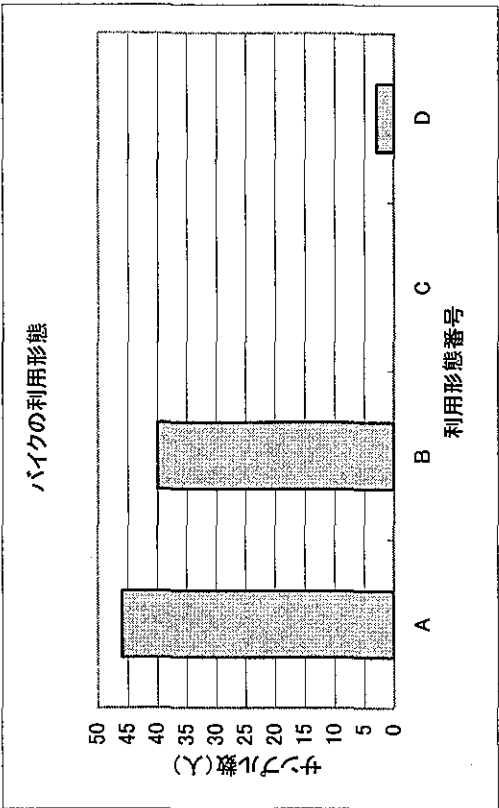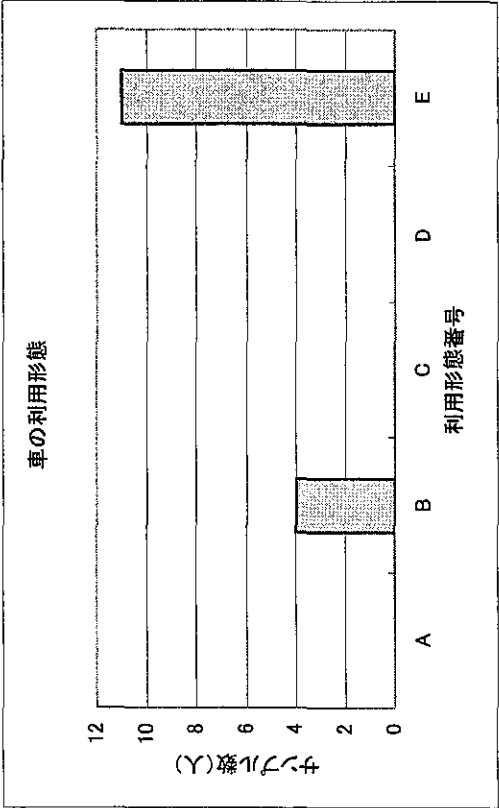
資料45　利用可能者数と不可能者数

バス利用可能者数と不可能者数

可能
33%

不可能
67%

サンプル数	182
可能者	60
非可能者	122

バイクタクシー利用可能者数と不可能者数

可能
67%

不可能
33%

サンプル数	159
可能者	106
非可能者	53

資料46　バスに関する結果

バスを降りて学校までかかる時間

サンプル数：58

家からバス停までかかる時間

サンプル数：59

バス停での待ち時間

サンプル数：60

資料47　利用可能な理由

バス利用不可能な理由

サンプル数：81

バイク・タクシー非利用者の代替交通手段

サンプル数：53

(28)

資料48　バイクタクシーに関する結果

バイクタクシー平均乗車時間

サンプル数：50

家からバイクタクシーを利用するまでにかかる時間

サンプル数：39

バイクタクシーを降りてから学校までにかかる時間

サンプル数：44

A 世帯に関する質問をします。

質問 A-1.

回答者の家族構成（番号を選択）、性別、年齢、職業、それぞれの月収、バイクの免許の有無、車の免許の有無をお答え下さい。なお、回答者 ID は以降の質問の対象番号となります。

回答者ID	世帯構成（番号指定）	性別	年齢	職業	月収（ドン）	バイクの免許	車の免許
A	①	男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
B		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
C		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
D		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
E		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
F		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
G		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
H		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無
I		男 ・ 女	才		ドン	有 ・ 無	有 ・ 無

① ご自身 ② 夫 ③ 妻 ④ 父 ⑤ 母
⑥ 祖父 ⑦ 祖母 ⑧ 兄 ⑨ 姉 ⑩ 弟
⑪ 妹 ⑫ 息子 ⑬ 娘 ⑭ おじ
⑮ おば ⑯ 甥 ⑰ 姪 ⑱ その他（　　）

①公務員 ②会社員 ③自営業 ④教員 ⑤パート
⑥専業主婦 ⑦大学生 ⑧専門学校生 ⑨高校生
⑩中学生以下 ⑪ その他（　　）

質問 A-2.

世帯でモーターバイクを保有していますか？ 〇を付けて下さい。

（ はい ・ いいえ ）

「はい」と答えた方に質問します。現在のモーターバイクの種類とその購入費、および１ヶ月の管理費（ガソリンや修理費）、駐車場の有無、またそれぞれのバイクの**主な**利用者（質問 1-2 の回答 ID を記入してください／同じバイク一人のみが利用の場合は一人のみを記入しますが、もしも利用者が複数の場合は、利用回数の多い順に明記してください。）とその利用者の**主な**利用目的（番号を指定／回答がない場合はどのように利用しているか明記してください）

バイクの種類	購入費（ドン）	管理費（ドン）	駐車場の有無	利用者（回答者ID）	利用目的（番号指定）
			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	
			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	
			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	

			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	

① 通勤 ② 通学 ③ 買物 ④ ドライブ ⑤ 習い事 ⑥ デート ⑦ 送り迎え ⑧ 通院
⑨ 外出 ⑩ 運動 ⑪ リラックスの為 ⑫ その他 （それぞれ明記してください）

質問 A-3.

世帯で自動車を保有していますか？ ○を付けて下さい。

（ はい ・ いいえ ）

「はい」と答えた方に質問します。現在の自家用車の種類とその購入費、および1ヶ月の管理費（ガソリンや修理費）、駐車場の有無、またそれぞれの自家用車の**主な**利用者（質問1-2の回答 ID を記入してください/同じバイク一人のみが利用の場合は一人のみを記入しますが、もしも利用者が複数の場合は、利用回数の多い順に明記してください。）とその利用者の**主な**利用目的（番号を指定/回答がない場合はどのように利用しているか明記してください）。

自家用車の種類	購入費（ドン）	管理費（ドン）	駐車場の有無	利用者（回答者ID）	利用目的（番号指定）
			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	
			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	
			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	
			有 ・ 無	1.	
				2.	
	ドン	ドン		3.	

① 通勤 ② 通学 ③ 買物 ④ ドライブ ⑤ 習い事 ⑥ デート ⑦ 送り迎え ⑧ 通院
⑨ 外出 ⑩ 運動 ⑪ リラックスの為 ⑫ その他 （それぞれ明記してください）

質問 A-4.

世帯で自転車を保有していますか？　〇を付けて下さい。

（　はい　　・　　いいえ　）

「はい」と答えた方に質問します。それぞれの自転車の購入費、1ヶ月当りの維持費、自転車の**主な**利用者（質問 1-2 の回答 ID を記入してください/同じバイク一人のみが利用の場合は一人のみを記入しますが、もしも利用者が複数の場合は、利用回数の多い順に明記してください。）とその利用者の**主な**利用目的（番号を指定／回答がない場合は明記してください）。

自転車	購入費 （ドン）	管理費 （ドン）	利用者 （回答者 ID）	利用目的 （番号指定）
自転車 no.1	ドン	ドン	1	
			2	
			3	
自転車 no.2	ドン	ドン	1	
			2	
			3	
自転車 no.3	ドン	ドン	1	
			2	
			3	
自転車 no.4	ドン	ドン	1	
			2	
			3	

① 通勤　② 通学　③ 買物　④ ドライブ　⑤ 習い事　⑥ デート　⑦ 送り迎え　⑧ 通院
⑨ 外出　⑩ 運動　⑪ リラックスの為　⑫ その他　（それぞれ明記してください）

B 通勤をしている方に質問をします。

世帯の中で**通勤をしている方一人づつ**お答え下さい。回答者の回答者 ID（質問 A-2 で使用した番号）をそれぞれ明記してからお答え下さい（いない場合は問題 C に進んでください）

回答者 ID＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

質問 B-1 会社の住所を明記してください

＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

質問 B-2. 以下の交通機関に関して、通勤に（少しでも）利用可能なものには〇を、利用不可能なものには×を付けて下さい。利用可能な場合は、その交通機関を利用した時にかかる通勤時間及び利用形態または運賃を記入してください。また、現在実際に利用している手段を利用頻度の高いものを３つえらび、その順番を振ってください。

乗り物	利用可能か否か	通勤時間（分）	利用形態	運賃　（ドン）	利用頻度の高い順番
①バス		分		ドン	
②タクシー		分		ドン	
③モーターバイクタクシー		分		ドン	
④車					
⑤モーターバイク					
⑥自転車					

（A）自分で運転　　（B）家族が運転　　（C）専属ドライバーが運転　　（D）知人の相乗り　　（E）その他

質問 B-3. バスで通勤することが**可能な方**、回答してください。

質問 B-3-1 自宅からバス停までの移動手段を選んでください。（〇を付けて下さい）

①徒歩　②自家用車による送迎　③自家用バイクによる送迎　④バイクタクシー（＿＿＿ドン）
⑤シクロー（＿＿＿＿＿ドン）　⑥知人の車の相乗り　⑦知人のバイクの相乗り
⑧その他（＿＿＿＿＿＿＿＿）

その場合、自宅からバス停まで何分かかりますか？

＿＿＿＿＿＿＿＿＿分

質問 B-3-2 バスの待ち時間は平均何分ですか？　　　　＿＿＿＿＿＿＿＿＿分

質問 B-3-3 平均乗車時間は何分ですか？　　　　＿＿＿＿＿＿＿＿＿分

質問 B-3-4 下車したバス停から会社までの移動手段　（１つだけ選択）

①徒歩　②自家用車による送迎　③自家用バイクによる送迎　④バイクタクシー（＿＿＿ドン）
⑤　シクロー（＿＿＿＿＿ドン）　⑥知人の車の相乗り　⑦知人のバイクの相乗り
⑧その他（＿＿＿＿＿＿＿＿）

その場合、下車したバス停から会社まで何分かかりますか？

＿＿＿＿＿＿＿＿＿分

質問 B-4. バスで**通勤不可能**な主な理由は何ですか？（1つだけ選択）

①自宅から目的地に着くまでに適切なバス路線がない　②自宅からバス停が遠い　③降りたバス停から会社が遠い　④料金が高い　⑤利用したい時にバスが来ない　⑥乗車環境が悪い（バス内が混んでいる、振動がひどい等）　⑦安全面で問題がある（車両の整備不慮、交通事故等）
⑧　その他（明記：_____）

質問 B-5. バイクタクシーで通勤することが**可能な方**、回答してください。

質問 B-5-1　バイクタクシーのみで会社に行くことは可能ですか？　（　はい　・　いいえ　）

「いいえ」と答えた方にお聞きします。そのほかに使う交通手段はなんですか？（1つだけ選択）
①自家用車による送迎　　②自家用バイクによる送迎　　③シクロー（_____ドン）
④知人の車の相乗り　　　⑤知人のバイクの相乗り　　　⑥バス　（_____ドン）
⑦その他（_____）

質問 B-5-2　バイクタクシーをつかまえるのにかかる時間は自宅を出てから平均何分ですか？

_____分

質問 B-5-3　平均乗車時間は何分ですか？

_____分

質問 B-5-4　バイクタクシーを降りてから会社まで何分ぐらいかかりますか？

_____分

ありがとうございました。

C 通学をしている方に質問をします。

世帯の中で**通学をしている方一人づつ**お答え下さい。回答者の回答者 ID（質問 A-2 で使用した番号）をそれぞれ明記してからお答え下さい。

回答者 ID＿＿＿＿＿＿＿＿＿＿＿＿

質問 C-1 学校の名前と住所を明記してください

＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

質問 B-2. 以下の交通機関に関して、通学に（少しでも）利用可能なものには○を、利用不可能なものには×を付けて下さい。利用可能な場合は、その交通機関を利用した時にかかる通勤時間及び利用形態または運賃を記入してください。また、現在実際に利用している手段を利用頻度の高いものを3つえらび、その順番を振ってください。

乗り物	利用可能か否か	通勤時間（分）	利用形態	運賃（ドン）	利用頻度の高い順番
①バス		分		ドン	
②タクシー		分		ドン	
③モーターバイクタクシー		分		ドン	
④車		分			
⑤モーターバイク		分			
⑥自転車		分			

（A）自分で運転　　（B）家族が運転　　（C）専属ドライバーが運転　　（D）知人の相乗り

質問 C-3. バスで通学することが可能な方、回答してください。

質問 C-3-1 自宅からバス停までの移動手段を選んでください。（○を付けて下さい）

①徒歩　②自家用車による送迎　③自家用バイクによる送迎　④バイクタクシー（＿＿＿ドン）
⑤シクロー（＿＿＿＿ドン）　⑥知人の車の相乗り　⑦知人のバイクの相乗り
⑧その他（＿＿＿＿＿＿＿）

その場合、自宅からバス停まで何分かかりますか？

＿＿＿＿＿＿＿分

質問 C-3-2 バスの待ち時間は平均何分ですか？　　　　＿＿＿＿＿＿＿分

質問 C-3-3 平均乗車時間は何分ですか？　　　　＿＿＿＿＿＿＿分

質問 C-3-4 下車したバス停から会社までの移動手段

① 徒歩　② 自家用車による送迎　③ 自家用バイクによる送迎　④ バイクタクシー（＿＿＿ドン）
⑤ パラトランジット（＿＿＿＿ドン）　⑥ 知人による車の相乗り　⑦ 知人によるバイクの相乗り
⑧ その他（＿＿＿＿＿＿＿）

その場合、下車したバス停から学校まで何分かかりますか？

＿＿＿＿＿＿＿分

質問 C-4. バスで通学不可能な主な理由は何ですか？（1つだけ選択）

① 自宅から目的地に着くまでに適切なバス路線がない ② 自宅からバス停が遠い ③ 降りたバス停から会社が遠い ④ 料金が高い ⑤ 利用したい時にバスが来ない ⑥ 乗車環境が悪い（バス内が混んでいる、振動がひどい等） ⑦ 安全面で問題がある（車両の整備不慮、交通事故等）
⑧ その他（明記：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿）

質問 C-5. バイクタクシーで通勤することが可能な方、回答してください。

質問 C-5-1 バイクタクシーのみで学校に行くことは可能ですか？ （ はい ・ いいえ ）

「いいえ」と答えた方にお聞きします。そのほかに使う交通手段はなんですか？（1つだけ選択）
①自家用車による送迎 ②自家用バイクによる送迎 ③シクロー（＿＿＿＿＿ドン）
④知人の車の相乗り ⑤知人のバイクの相乗り ⑥バス （＿＿＿＿＿ドン）
⑦その他（＿＿＿＿＿＿＿＿）

質問 C-5-2 バイクタクシーをつかまえるのにかかる時間は自宅を出てから平均何分ですか？
＿＿＿＿＿＿＿＿分

質問 C-5-3 平均乗車時間は何分ですか？ ＿＿＿＿＿＿＿＿分

質問 C-5-4 バイクタクシーを降りてから学校まで何分ぐらいかかりますか？

＿＿＿＿＿＿＿＿分

御協力ありがとうございました。

This questioner is the survey organized by IATSS (International Association of Traffic and Safety Sciences) and Nihon University for exploring the current situation of motorbike and car ownership in Vietnam. The survey will be very important for developing the successful future transportation planning in Vietnam. Your answer will be used only for research purpose, and we will confidentially deal with your individual information. Thank you for your cooperation!!!

The questions are composed by 3 sections. Section "A" is asking about your family information regarding to your family member, household motorbike, household car and household bicycle ownerships. Section "B" is the questions for asking transportation mode for commuting. Section "C" is questions of transportation mode for going to school.

A. HOUSEHOLD information

Question A-1.

Please specify your family member (please chose from undermentioned number) and their gander, age, occupation (choose the number from undermentioned box), monthly salary (Dong), hold a motorbike driver's license or not (yes or no), and hold a car driver's license or not (yes or no).

Answer ID (the left end of the table) is the object number for whole of the questioner

Answer ID	Family member (choose the number)	Gender	Age	Occupation	Monthly Income (Dong)	Do you have motorbike driver's license?	Do you have car driver's license
A	① (yourself)	Male / Female			Dong	Yes / No	Yes / No
B		Male / Female			Dong	Yes / No	Yes / No
C		Male / Female			Dong	Yes / No	·Yes / No
D		Male / Female			Dong	Yes / No	Yes / No
E		Male / Female			Dong	Yes / No	Yes / No
F		Male / Female			Dong	Yes / No	Yes / No
G		Male / Female			Dong	Yes / No	Yes / No
H		Male / Female			Dong	Yes / No	Yes / No
I		Male / Female			Dong	Yes / No	Yes / No

①Yourself ②Husband ③Wife ④Father
⑤Mother ⑥Grandfather ⑦Grandmother
⑧Elder Brother ⑨Elder Sister
⑩Younger Brother ⑪Younger Sister
⑫Son ⑬Daughter ⑭Uncle ⑮Aunt
⑯Nephew ⑰Niece ⑱Others (pls. specify)

①Government officer ②Private officer
③Self-supporting company ④Teacher
⑤Part-time worker ⑥Full-time housewife
⑦University student ⑧Vocational school student
⑨High school student ⑩Junior school or younger than junior high school student
⑪Others (pls. specify)

Question A-2.

Do your family have own motorbike? Please encircle (o) at the answer.　　　(　YES　/　NO　)

If you answer "YES", please write the type of motorbike (such as HONDA 250cc, etc.), and each purchase price, monthly maintenance cost (such as gasoline fare, repair cost), there is parking lots or not, user (please specify by Answer ID from question A-1/ if there is only one user for one motorbike, please specify only one user's information. But if two or more persons use one motorbike, please specify these users' information), **main** purpose of motorbike usage of the user (pls. choose from undermentioned number).

Type of Motorbike	Purchase Cost (Dong)	Maintenance Cost (Dong/month)	Parking lots (yes there is, no there is)	User (Answer ID)	Trip Purpose (Choose the number)
				1.	
			Yes / No	2.	
	Dong	Dong		3.	
				1.	
			Yes / No	2.	
	Dong	Dong		3.	
				1.	
			Yes / No	2.	
	Dong	Dong		3.	
				1.	
			Yes / No	2.	
	Dong	Dong		3.	

① Commute　② Go to school　③ Go shopping　④ Have a drive　⑤ Go to lesson
⑥ Go on a date　⑦ Send and pick up　⑧ Business　⑨ Go to hospital　⑩ Exercising
⑪ Others (pls. specify)

Question A-3.

Do your family have own car? Please encircle (o) at the answer.　　　(　YES　/　NO　)

If you answer "YES", please write the type of car (sedan/ pick up type/ van / other), and each purchase price, monthly maintenance cost (such as gasoline fare, repair cost), there is parking lots or not, user (please specify by Answer ID from question A-1/ if there is only one user for one car, please specify only one user's information. But if two or more persons use one car, please specify these users' information), **main** purpose of motorbike usage of the user (pls. choose from undermentioned number).

Type of Car	Purchase Cost (Dong)	Maintenance Cost (Dong/month)	Parking lots (yes there is, no there is)	User (Answer ID)	Trip Purpose (Choose the number)
				1.	
			Yes / No	2.	
	Dong	Dong		3.	
				1.	
			Yes / No	2.	
	Dong	Dong		3.	

				1.	
			Yes / No	2.	
	Dong	Dong		3.	
				1.	
			Yes / No	2.	
	Dong	Dong		3.	

① Commute	② Go to school	③ Go shopping	④ Have a drive ⑤ Go to lesson
⑥ Go on a date	⑦ Send and pick up	⑧ Business	⑨Go to hospital ⑩ Others (pls. specify)

Question A -4.

Do your family have own bicycle? Please encircle (○) at the answer. (YES   /   NO   )

If you answer "YES", please each purchase price, monthly maintenance cost (such as repair cost), user (please specify by Answer ID from question A-1), **main** purpose of bicycle usage of the user (pls. choose from undermentioned number).

Bicycle	Purchase Cost (Dong)	Maintenance Cost (Dong/month)	User (Answer ID)	Trip Purpose (Choose the number)
Bicycle no.1			1.	
			2.	
	Dong	Dong	3.	
Bicycle no.2			1.	
			2.	
	Dong	Dong	3.	
Bicycle no.3			1.	
			2.	
	Dong	Dong	3.	
Bicycle no.4			1.	
			2.	
	Dong	Dong	3.	

① Commute	② Go to school	③ Go shopping	④ Have a drive ⑤ Go to lesson
⑥ Go on a date	⑦ Send and pick up	⑧ Business	⑨Go to hospital ⑩ Others (pls. specify)

B. Commute trip

We would like to ask only your family members who go to office. Please use each questioner paper for each person to answer the questions. Firstly please start by identifying your Answer ID which is defined by Question A-1.

Please specify the Answer ID: _____

Question B-1.

Please enter your company address:_____

_____

Question B-2.

If it is impossible to use following transportation modes (①~⑥) for commuting, please put cross (×) on the box. However, if you can use following transportation modes to go to office, please check circle (o) and please indicate the total time spent in commuting and the way of usage or its fare. (*Even if you don't use these transportation modes usually, but if it is possible to use these transportation modes, please put (o) and continue the question.).
Which transportation mode do you use the most? Please give the order from 1st to 3rd on the higher frequency in use of transportation mode. (If currently you use only one transportation mode, you can put only one mode as "1st")

Transportation mode	Available (o) or not (x).	Time spent in commuting	The way of usage	Fare	Order of higher frequency
① Bus		Minutes		Dong	
② Taxi		Minutes		Dong	
③ Motorbike Taxi		Minutes		Dong	
④ Car		Minutes			
⑤ Motorbike		Minutes			
⑥ Bicycle		Minutes			

(A) Drive it by yourself	(B) Family send you by this transportation mode
(C) Employed driver drives it	(D) Ride on acquaintance's transportation mode
(E) Other	

Question B-3.
(Even though, currently you do not use bus for commuting) Please answer following questions, if there are bus operations that you can use for commuting:
(*if you cannot use bus for commuting, you can omit following questions.)

Question B-3-1:
How do you approach to the nearest bus stop from your house?

① By walk　　　　　　　② Send by family car　　　　　③ Send by family motorbike
④ Bike taxi (_____Dong)　⑤ Cyclo (_____Dong)　　⑥ Ride in acquaintance's car
⑦ Ride pillion on acquaintance's motorbike　⑧ Others (pls. specify:_____)

Answer _____

In this case, how long does it take to approach to the nearest bus stop?

_____Minutes

Question B-3-2:
What is the averaged waiting time?

_____Minutes

Question B-3-3:
What is the averaged riding time?

_____Minutes

Question B-3-4:
How do you approach to your office from the bus stop where you get off? (Specify only one answer)

① By walk   ② Send by family car   ③ Send by family motorbike
④ Bike taxi (_____Dong)   ⑤ Cyclo (_____Dong)   ⑥ Ride in acquaintance's car
⑦ Ride pillion on acquaintance's motorbike   ⑧ Others (pls. specify:_____)

Answer _____

In this case, how long does it take to go
           to your office after getting off the bus?   _____Minutes

Question B-4.
If it is **impossible** to use bus for commuting, what is the reason behind?
Please choose **one** reason from followings: (Specify only one answer)

① There are no bus operations to go to your office.   ② Bus stop is far from your house
③ Bus stop is far from your office   ④ Fare is expensive
⑤ Bus doesn't come when you want to use.
⑥ Riding condition is bad (e.g. inside is very crowded, vibration of the bus is terrible, etc.)
⑦ Traffic safety is bad (e.g. traffic accident etc.)   ⑧ Others (pls. specify:_____)

Answer _____

Question B-5.
(Even though, currently you do not use motorbike taxi for commuting) Please answer following questions, if there are available motorbike taxi operation that you can use for commuting:
(*if you can not use motorbike taxi for commuting, you can omit following questions.)

Question B-5-1:
Is it possible to go to your office only by motorbike taxi?
                             (YES / NO)

If you answer "NO", what is the additional transportation mode you need to you for commuting?
(Specify only one answer)
   ① Send and pick up by your family car   ② Send and pick up by your family motorbike

   ③ Cyclo (_____ Dong)   ④ Ride on acquaintance's car

   ⑤ Ride on acquaintance's motorbike taxi   ⑥ Bus (_____ Dong)

   ⑦ Other (pls. Specify _____)

Answer: _____

Question B-5-2:
How long does it take to catch motorbike since you left your home?

_____Minutes

Question B-5-3:
What is the averaged riding time?

_____Minutes

Question B-5-4:
How long does it take to your office after getting off the motorbike taxi?

_____Minutes

Thank you for your cooperation !!!

C. Attending School

We would like ask only your family member who go to school. Please use each paper for each person to answer the questions. Firstly please start by indicating your Answer ID which is defined by Question A-1.

specify the Answer ID: _____

Question C-1.

Please enter your school address:_____

_____

Question C-2.

If it is impossible to use following transportation modes (①~⑥) for going to school, please put cross (×) on the box. However, if you can use following transportation modes to go to school, please check circle (○) and indicate the total time spent in attending school and the way of usage or its fare. (*Even if you don't use these transportation modes usually, but if it is possible to use these transportation modes, please put (○) and continue the question.).
Which transportation mode do you use the most? Please give the order from 1st to 3rd on the higher frequency in use of transportation mode. (If currently you use only one transportation mode, you can put only one mode as "1st")

Transportation mode	Available (○) or not (×).	Time spent in commuting	The way of usage	Fare	Order of higher frequency
① Bus		Minutes		Dong	
② Taxi		Minutes		Dong	
③ Motorbike Taxi		Minutes		Dong	
④ Car		Minutes			
⑤ Motorbike		Minutes			
⑥ Bicycle		Minutes			

(A) Drive it by yourself	(B) Family send you by this mode
(C) Employed driver drive it	(D) Ride on acquaintance

Question C-3.
(Even though, currently you do not use bus for going to school) Please answer following questions, if there are bus operations that you can use for attending school: (*if you cannot use bus for going to school, you can omit following questions.)

Question C-3-1:
How do you approach to the nearest bus stop from your house?

① By walk   ② Send by family car   ③ Send by family motorbike
④ Bike taxi (_____Dong)   ⑤ Cyclo (_____Dong)   ⑥ Ride in acquaintance's car
⑦ Ride pillion on acquaintance's motorbike   ⑧ Others (pls. specify:_____)

Answer _____

In this case, how long does it take to approach to the nearest bus stop?

_____Minutes

(42)

Question C-3-2:
What is the averaged waiting time?

_____Minutes

Question C-3-3:
What is the averaged riding time?

_____Minutes

Question C-3-4:
How do you approach to your school from the bus stop where you get off? (Specify only one answer)

① By walk   ② Send by family car   ③ Send by family motorbike
④ Bike taxi (_____Dong)   ⑤ Cyclo (_____Dong)   ⑥ Ride in acquaintance's car
⑦ Ride pillion on acquaintance's motorbike   ⑧ Others (pls. specify:_____)

        Answer _____

In this case, how long does it take to go
           to your school after getting off the bus?   _____Minutes

Question C-4.
If it is **impossible** to use bus for going to school, what is the reason behind? (Specify only one answer)
Please choose **one** reason from followings:

① There are no bus operations to go to your school.   ② Bus stop is far from your house
③ Bus stop is far from your school   ④ Fare is expensive
⑤ Bus doesn't come when I want to use.
⑥ Riding condition is bad (e.g. inside is very crowded, vibration of the bus is terrible, etc.)
⑦ Traffic safety is bad (e.g. traffic accident etc.)   ⑧ Others (pls. specify:_____)

        Answer _____

Question C-5.
(Even though, currently you do not use motorbike taxi for going to school) Please answer following questions, if there are available motorbike taxi operation that you can use for going to school: (*if you can not use motorbike taxi for going to school, you can omit following questions.)

Question C-5-1:
Is it possible to go to your office only by motorbike taxi?

                                (YES / NO)

If you answer "NO", what is the additional transportation mode you need to you for going to school?
① Send and pick up by your family car   ② Send and pick up by your family motorbike
③ Cyclo (_____ Dong)   ④ Ride on acquaintance's car
⑤ Ride on acquaintance's motorbike taxi   ⑥ Bus (_____ Dong)
⑦ Other (pls. Specify _____)

            Answer: _____

Question B-5-2:
How long does it take to catch motorbike since you left your home?

_____Minutes

Question B-5-5:
What is the averaged riding time?

_____Minutes

Question B-5-6:
How long does it take to your school after getting off the motorbike taxi?

_____Minutes

Thank you very much for your cooperation.

II-4　関連論文

タイにおける二輪車保有実態のミクロ分析 *

１．はじめに

　東南アジアの地方都市や後発国では，二輪車保有の割合が高く，今後経済発展に伴なって，その保有が四輪車に転換した場合，多くの問題が懸念される。

　そこで本研究では，タイにおける二輪車および四輪車保有実態を解析する。

２．アンケート調査による保有実態分析

（１）アンケート調査概要

　タイの地方都市であるチェンマイ，コンケンを対象とし，世帯における二輪車（モーターバイク）および四輪車(セダン，ピックアップ，バン)の保有実態を，首都であるバンコクのそれと比較，分析を行うために，それぞれの都市でアンケート調査を行った。

　期間は 2002 年８月１日から９月５日で，質問は世帯収入，車両保有台数，車両購入価格などに関して選択回答方式で行った。

（２）アンケート結果

　世帯における二輪車および四輪車の保有台数と所得の関係を図－１に示す。どの対象地域においても四輪車保有の割合は，所得が上がるほど高く，複数保有の割合も上がっており，四輪車保有と所得には相関関係が認められた。しかし，二輪車保有にはその傾向がみられず，所得との相関性も認められなく，全般的に所得の低い地方都市においても二輪車保有の割合は高かった。

　表－１のアンケート集計結果より平均購入価格をみると，地域ごとに大差はなく，二輪車平均購入価格は 33，715 バーツで，四輪車平均購入価格はその 14.4 倍の 483，747 バーツにあたり，これは地方都市の平均所得の 16.6 ヶ月分に相当する。

　月あたりの維持費に関しては,四輪車および二輪車ともにバンコクの方が地方都市に比べて高くなっている。また，全ての対象地域において四輪車の維持費は月収の９％分にあたり，二輪車維持費の約 4.5 倍に相当する。
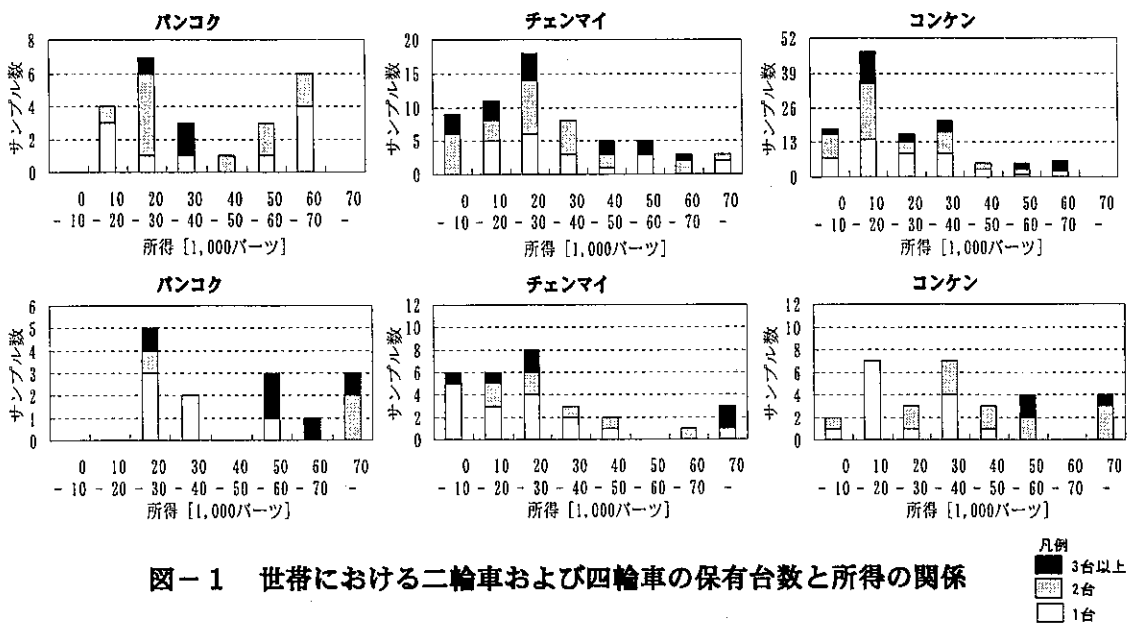
図－１　世帯における二輪車および四輪車の保有台数と所得の関係

　＊ 岡田 祐香・福田 敦：タイにおける二輪車保有実態のミクロ分析，平成14
　　年度日本大学理工学部交通土木工学科卒業論文概要集, pp.69-70, 2003.

二輪車保有率はバンコクでは 27%であるのに対し，チェンマイでは 77%，コンケンにおいては 100%と，全アンケート解答者の世帯で少なくとも1台は保有している結果となった。

図ー2は，二輪車のみ保有している世帯を対象に四輪車購入希望を質問した結果である。このようにどの対象地域においても四輪車購入希望が高くなっており，特に地方都市でその傾向が強く表れた。

表ー1　アンケート集計結果

	バンコク	チェンマイ	コンケン	平均
二輪車　　　[サンプル数]	24	62	119	―
四輪車　　　[サンプル数]	14	29	30	―
二輪車購入価格　[バーツ]	32,191	32,311	36,643	33,715
四輪車購入価格　[バーツ]	479,829	482,174	495,238	485,747
世帯所得　　　　[バーツ]	43,538	30,005	28,523	34,022
二輪車保有率　　　[%]	27	77	100	―
月の二輪車維持費 [バーツ]	634	352	485	490
月の四輪車維持費 [バーツ]	3,598	2,672	2,331	2,867
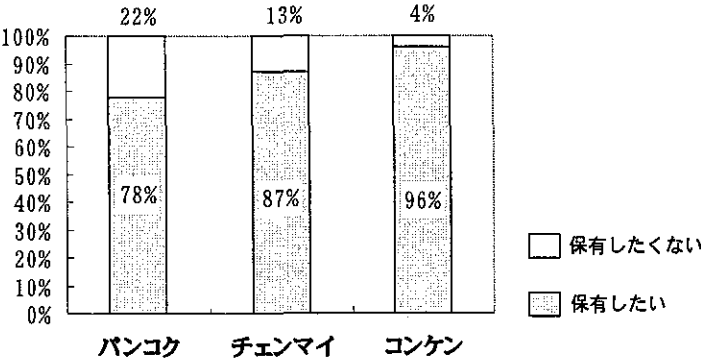
図ー2　四輪車購入希望率

３．保有に関する要因の分析

（1）分析概要

　次に二輪車および四輪車保有に関係する要因が，保有にどのように影響するかを分析する。 1995 年に OCMRT (Office of the Commission for the Management of Road Traffic) が OD 調査の一環として，バンコクで行った家庭訪問調査によって集められたデータを使用し，固有ベクトルを用い主成分分析を行った。主成分の数は5つとし，行列の種類は目的変数の単位が異なっていることから相関行列を使用した。目的変数には月の世帯収入，世帯人数，就業者人数，四輪車保有台数，二輪車保有台数を用いた。

（2）モデル推定・結果

　表ー2に5主成分の固有値を示す。第3～5主成分の固有値は1未満であり，また第2主成分までの累積寄与率は 60%以上であるので，第1，2主成分でこの目的変数を十分説明できる。表ー3に各主成分の固有ベクトルを示す。第1主成分においては就業者人数および世帯の収入合

計の固有ベクトルが高い値を示しているので，第1主成分を月の世帯収入の程度とし，第2主成分においては，正の値は二輪車保有台数，負の値は四輪車保有台数の固有ベクトルが高いので，正の値が大きいほど二輪車保有の傾向が高くなり，負の値が大きいほど四輪車保有の傾向が高くなることを示している。ここで，第1主成分，第2主成分の主成分得点を図－3に示す。

　図－3より，二輪車および四輪車保有構造は，A）収入が低レベルで二輪車および四輪車を保有していない世帯，B）収入が低～中レベルで二輪車1台を保有している世帯，C）収入が中レベルで四輪車を1台保有している世帯，D）収入が中～高レベルで二輪車を複数保有している世帯，E）収入が高レベルで四輪車を複数保有している世帯，F）収入が中～高レベルで二輪車と四輪車を複数保有している世帯の6つのグループに大分することができた。

表－2　固有値

主成分No	固有値	寄与率(%)	累積寄与率(%)
1	2.05	41.10	41.10
2	1.16	23.23	64.32
3	0.80	15.93	80.25
4	0.60	11.94	92.19
5	0.39	7.81	100.00

表－3　固有ベクトル

		主成分1	主成分2
月の世帯収入	(X_1)	0.5005	－ 0.3384
世帯人数	(X_2)	0.4805	0.3275
就業人数	(X_3)	0.5060	0.2134
四輪車保有台数	(X_4)	0.4688	－ 0.5083
二輪車保有台数	(X_5)	0.2067	0.6887
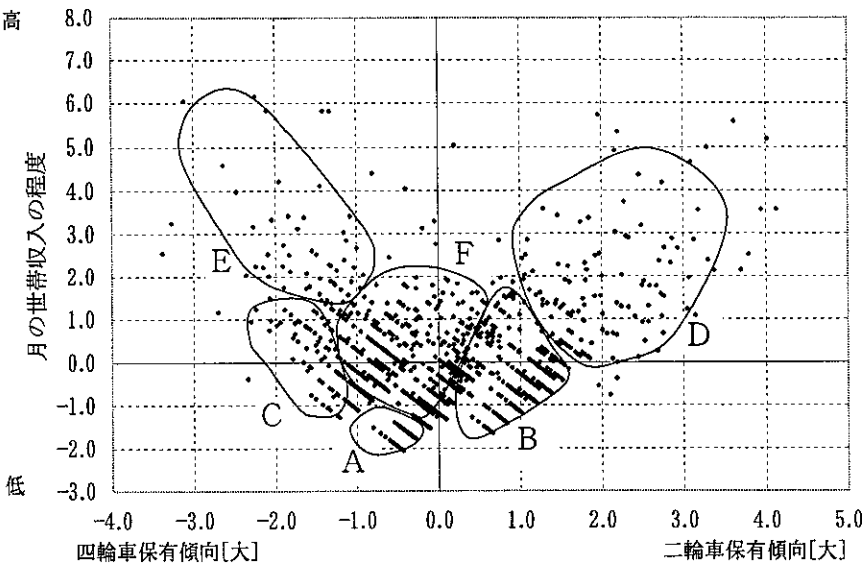
図－3　主成分得点

4．おわりに

　アンケート結果から，二輪車保有はその価格が収入と比較して相対的に安いため，地方都市においても必要に応じて購入，利用が可能な状態であることがわかった。一方，四輪車保有は価格が相対的に高いため収入に依存しており，収入が低い水準にある地方都市では購入および利用がすすんでいない状態であることがわかった。

　主成分分析結果からは，二輪車保有世帯に比べ四輪車保有世帯の方が，月の収入が高い傾向がみられ，車両の複数保有世帯も同様な結果となった。また，バンコクでは収入が低レベルで，両車両を保有していない世帯の割合が低くなった。

　両分析結果より，世帯所得の低い地域においても維持費が安く，低価格な二輪車保有の割合は高い。これは，タイ国の所得水準が，二輪車購入可能なレベルまで達していると考えられ，今後，経済発展に伴なう所得の上昇により，二輪車保有から四輪車保有へ転換する可能性が高いことが示唆される。

タイにおける二輪車保有実態のマクロ分析 *

Macroscopic Analysis on Current Situation of Two-wheeled Vehicle Ownership in Thailand

1. はじめに

　近年，後発の東南アジア諸国では二輪車の保有が急速に増加している。このような国で，一度モビリティーを獲得した二輪車保有者は，経済発展に伴ない所得が上昇すると四輪車保有へ急速に転換すると予想され，その結果交通問題が深刻化すると懸念されている。

　そこで本研究ではタイを対象とし，地方地域における二輪車と四輪車の保有動向を首都圏のそれと比較し，分析する。

2. 研究対象地域

研究対象地域は，図－1に示すとおり，6地方から各々の主要都市を含む各1県と首都圏のバンコク県の全7県を選定した。

3. 保有率の変化

統計データによる，対象地域の1978年から1998年の一人当たりのGPP（県内総生産）の経年変化を図－2に示す。

　バンコク県と他県のGPPは大きく乖離している。1997年におけるスラタニー県のGPPは59,821バーツであり，バンコク県のGPP231,383バーツと比べると約1/4となり，これはバンコク県における1985年の水準に相当する。また，ロップリー県のGPP47,396バーツはバンコク県と比べると約1/5となっており，バンコク県の1981年の水準に相当する。

　同時期の対象地域における県民千人当たりの二輪車及び四輪車の登録台数の推移を図－3に示す。二輪車保有率は全ての対象地域において急増しているが，四輪車保有率は地方都市とバンコク県では大きな隔たりがある。スラタニー県とバンコク県の二輪車保有率
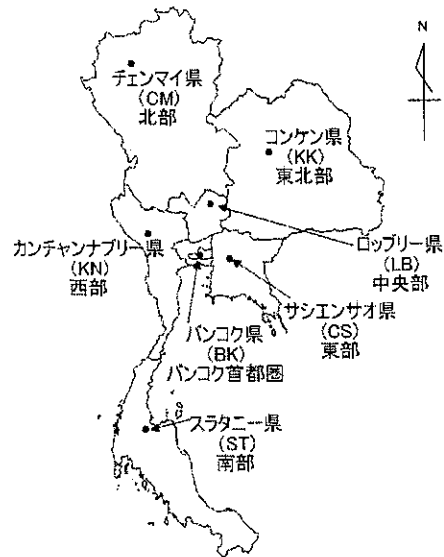
図－1　研究対象地域
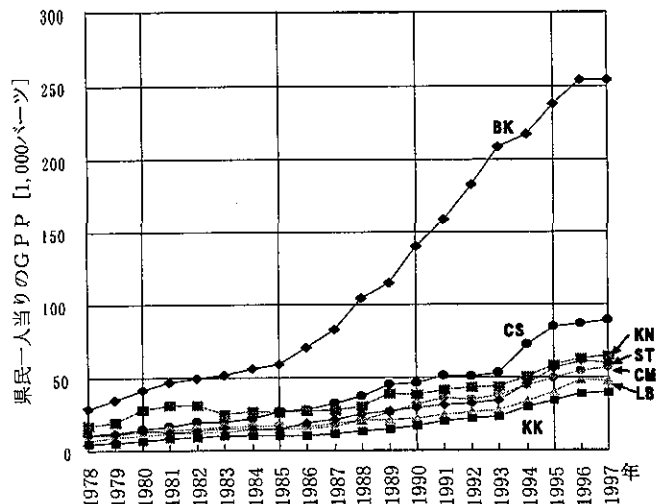
図－2　県内総生産の経年変化

は, 1979 年はそれぞれ 23.5 台/千人, 29.3 台/千人とほぼ同じ保有率であり, 1997 年は 307.3 台/千人, 288.4 台/千人と同水準で増えている。しかし四輪車保有率は大きく乖離しており, スラタニー県の 1997 年の四輪車保有率 (82.0 台/千人) は, バンコク県の 1982 年の保有率 (86.7 台/千人) と同水準となっており, その関係はGPPの水準の関係と酷似している。四輪車保有率は, GPPなどの経済的要因に大きく依存していると考えられる。

ロップリー県に関しては, 経済水準はスラタニー県と同程度に伸びている。また, ロップリー県とスラタニー県の自動車保有率は, 1978 年はそれぞれ 15.6 台/千人, 7.1 台/千人, 1994 年は 46.6 台/千人, 42.4 台/千人とほぼ同じ割合で増加しているが, 二輪車保有率においては 1978 年はそれぞれ 13.6 台/千人, 21.2 台/千人, 1994 年は 121.2 台/千人, 233.0 台/千人と約 100 台/千人の差となった。
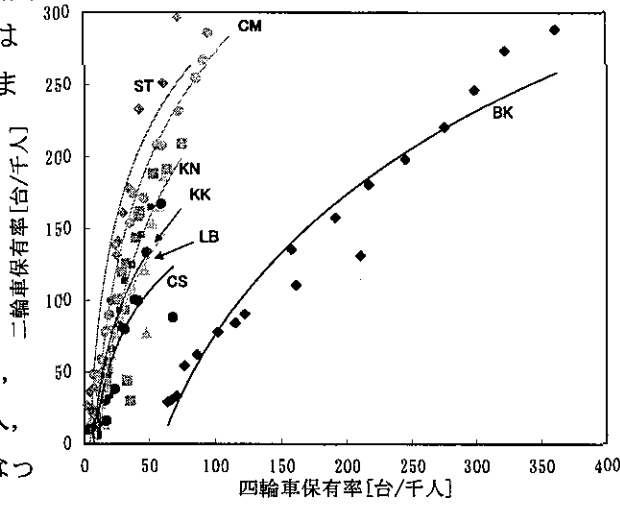
図－3　二輪車及び四輪車登録台数の推移

4. 二輪車保有推計モデル

1978 年から 1997 年の統計データを基に重回帰式を用いて二輪車保有推計モデル[1], [2] を求める。

目的変数 (y) は二輪車保有台数 (台) とし, 説明変数 (x_1, x_2, x_3) は, 所得水準を表す指標として県民一人当たりのGPP (バーツ), 人口の集積を表す指標として県の昼間人口 (人), 公共交通の整備水準を表す指標としてバスの登録台数 (台) を用いた。なおバスの登録台数は, 地方都市におけるバスの役割を担うソンテウなどのパラトランジットの登録台数を含んでいる。

モデルの推計結果を表－1に示す。相関係数は高いがサンプル数が少ないためt値は必ずしも高くなっていない。

ここで, 二輪車保有推計モデル式を

表－1　重回帰分析結果

		係数	t 値	P 値	定数	重相関係数
バンコク	GPP (x_1)	7.748	5.881	0.000	-1129423	0.976
	人口 (x_2)	0.329	1.888	0.088		
	バス登録台数 (x_3)	-46.892	-1.726	0.115		
ロップリー	GPP (x_1)	2.754	6.953	0.000	-71972.3	0.978
	人口 (x_2)	0.082	1.202	0.257		
	バス登録台数 (x_3)	8.299	0.565	0.585		
サシエンサオ	GPP (x_1)	0.473	0.698	0.501	-20820.1	0.846
	人口 (x_2)	0.003	0.015	0.988		
	バス登録台数 (x_3)	55.223	1.312	0.219		
カンチャナブリー	GPP (x_1)	2.784	2.334	0.042	-117545	0.940
	人口 (x_2)	0.164	1.000	0.341		
	バス登録台数 (x_3)	-23.260	-0.285	0.781		
チェンマイ	GPP (x_1)	5.773	5.995	0.000	-443211	0.988
	人口 (x_2)	0.385	4.034	0.002		
	バス登録台数 (x_3)	-19.777	-1.172	0.268		
コンケン	GPP (x_1)	7.542	9.120	0.000	-33739.2	0.977
	人口 (x_2)	-0.004	-0.043	0.967		
	バス登録台数 (x_3)	0.477	0.019	0.985		
スラタニー	GPP (x_1)	4.146	8.842	0.000	-144437	0.988
	人口 (x_2)	0.184	1.825	0.098		
	バス登録台数 (x_3)	-18.140	-0.500	0.628		

表－2に示す。ＧＰＰの係数は0.473〜7.748と正の値をとっており，ＧＰＰが増加すると二輪車保有台数が増加することがわかった。

次に人口の係数は，コンケン県で-0.004と負の値であるが，その他の県は0.003〜0.385と正の値であり，コンケン県を除く全ての県において，人口が増加すると共に二輪車保有台数は増加することがわかった。

表－2　二輪車保有推計モデル式

バンコク	$y=7.748x_1+0.329x_2-46.892x_3-1129423$
ロップリー	$y=2.754x_1+0.082x_2+8.299x_3-71972.3$
サシエンサオ	$y=0.473x_1+0.003x_2+55.223x_3-20820.1$
カンチャナブリー	$y=2.784x_1+0.164x_2-23.260x_3-117545$
チェンマイ	$y=5.773x_1+0.385x_2-19.777x_3-443211$
コンケン	$y=7.542x_1-0.004x_2+0.477x_3-33739.2$
スラタニー	$y=4.146x_1+0.184x_2-18.140x_3-144437$

バス登録台数はバンコク県，カンチャナブリー県，チェンマイ県，スラタニー県において，係数は-46.892〜-18.140と負の値をとっており，バスの台数が増加すると二輪車台数登録台数が減少するという結果となり，これは図－3で示した二輪車保有率が200台/千人以上に当たる県と一致した。しかしロップリー県，サシエンサオ県，コンケン県においては係数が0.477〜55.223と正の値をとっており，バス登録台数が増加すると共に二輪車保有台数も上昇する傾向を示し，これら3県は図－3で示した二輪車保有率が200台/千人未満の県となった。

5.　おわりに

以上の結果から，四輪車保有はバンコク県に比べ地方都市においては非常に低くなっているが，二輪車保有はどの対象地域においても高くなっていることがわかった。四輪車は価格が高いため所得水準が保有に大きく影響するが，二輪車はその価格が安いため，所得水準による影響が少なく購入が可能である。よって今後経済が発展するに従って二輪車保有から四輪車保有への転換する可能性は大きいことがわかった。

コンケン県，ロップリー県，サシエンサオ県のように，二輪車保有率が高い水準まで達していない県では，公共交通の普及水準が上昇しても個人のモビリティーの確保がさらに進むことがわかった。

しかしバンコク県，カンチャナブリー県，チェンマイ県，スラタニー県のように二輪車保有率が高い県では，今後公共交通の普及水準の上昇に伴い，二輪車保有から公共交通利用へ転換することが示唆される。

参考文献
1)　G.S.マダラ著：計量経済分析の方法，マグロウヒル出版，pp.66-116,1992.
2)　遠藤　謙一郎・鹿島　茂：乗用車の走行燃費モデルと保有率モデルの構築，土木学会年次学術講演会後援概要集,第4部，Vol53巻，pp.258-259，1998.

関連資料 1
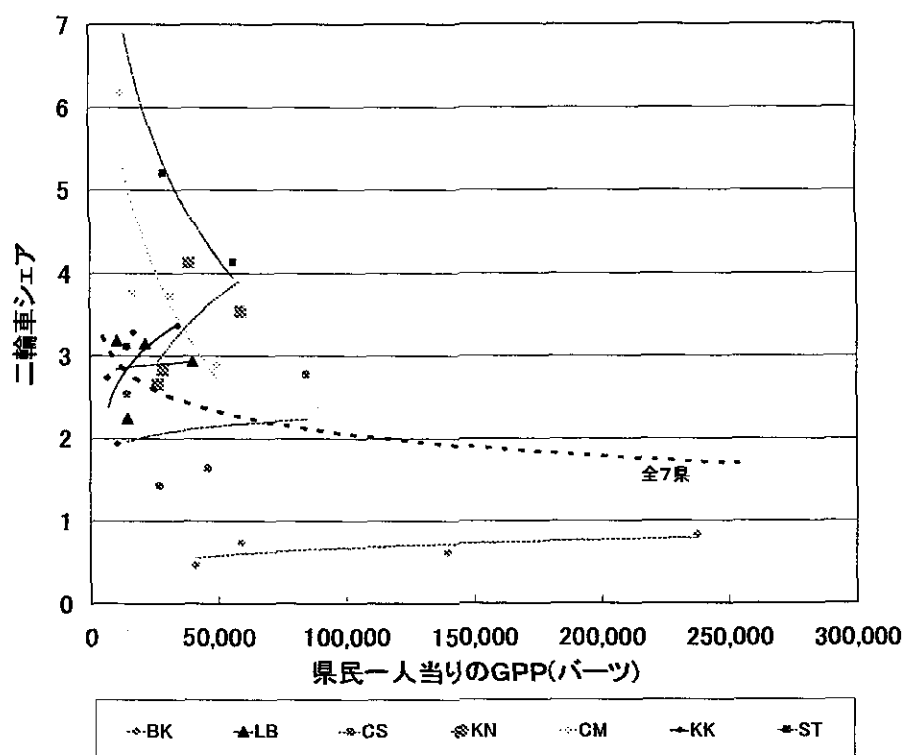
二輪車シェアと GPP の関係
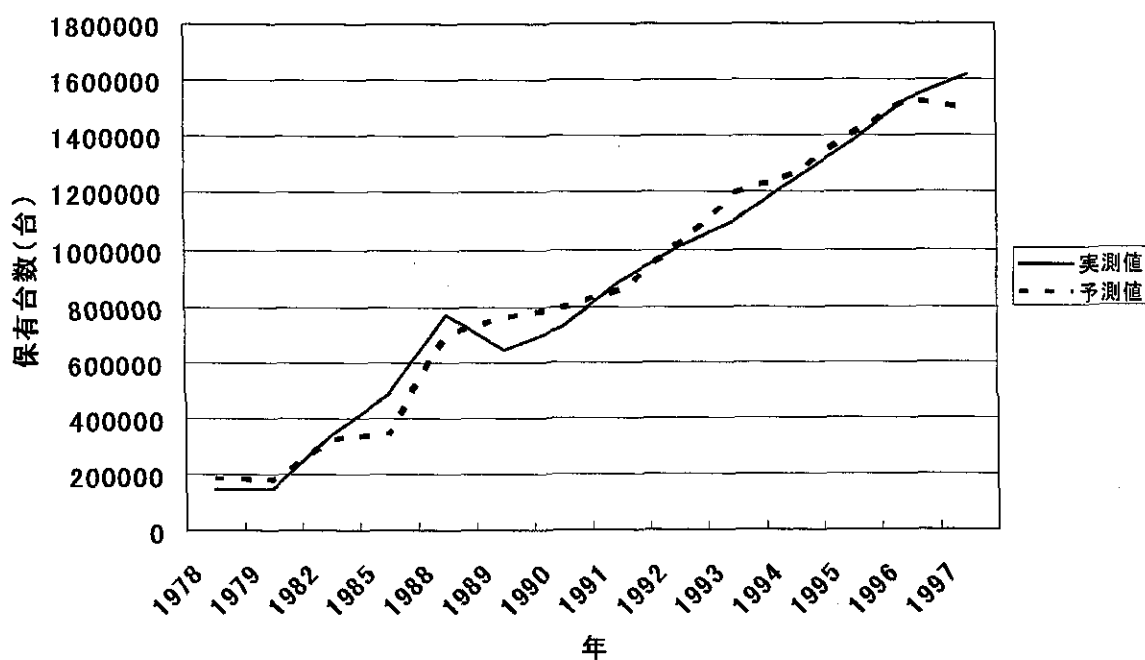
バンコク県の二輪車保有台数の実測値と予測値

関連資料 2
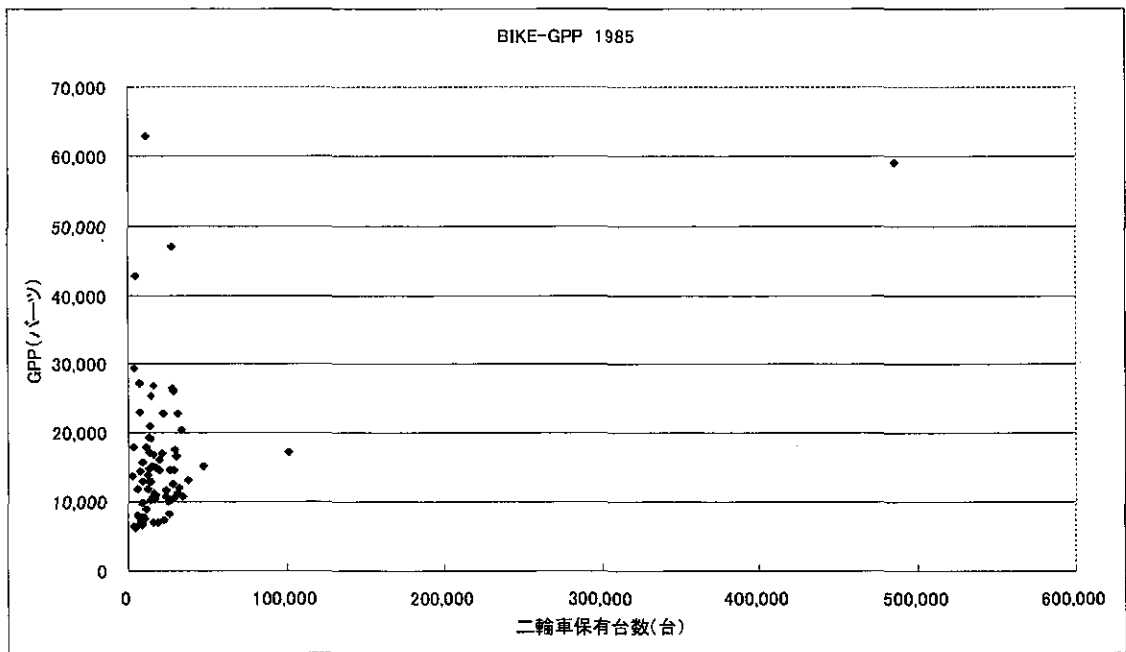
各県ごとの二輪車登録台数とGPPの関係　1985年
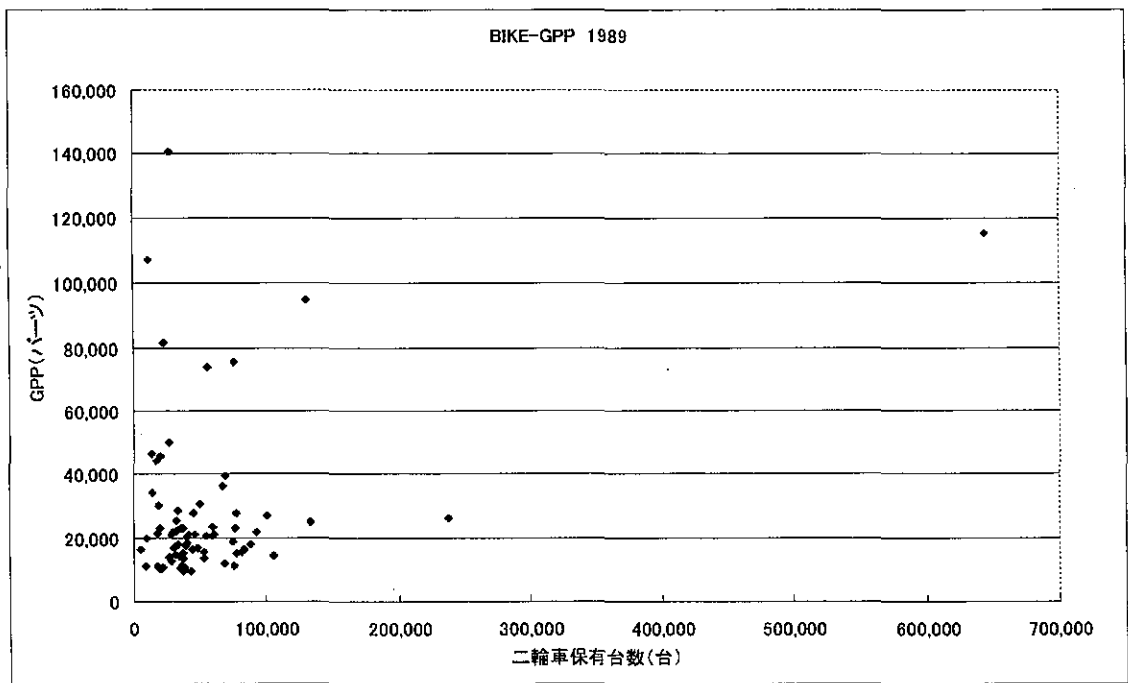
各県ごとの二輪車登録台数とGPPの関係　1989年

関連資料 3
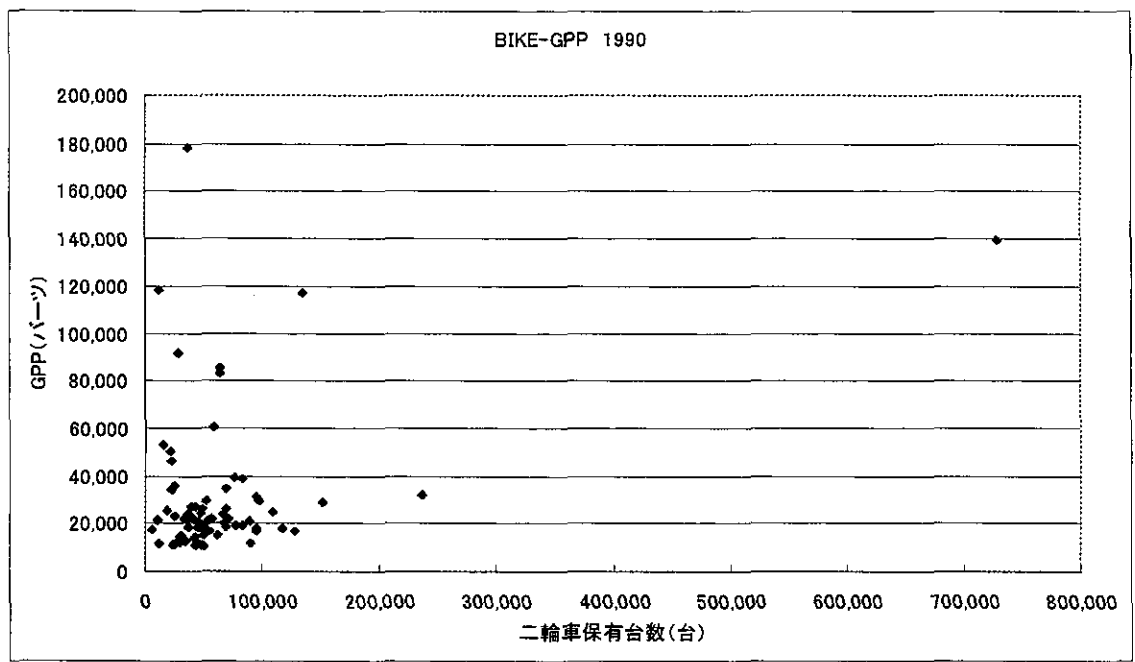
各県ごとの二輪車登録台数とＧＰＰの関係　１９９０年
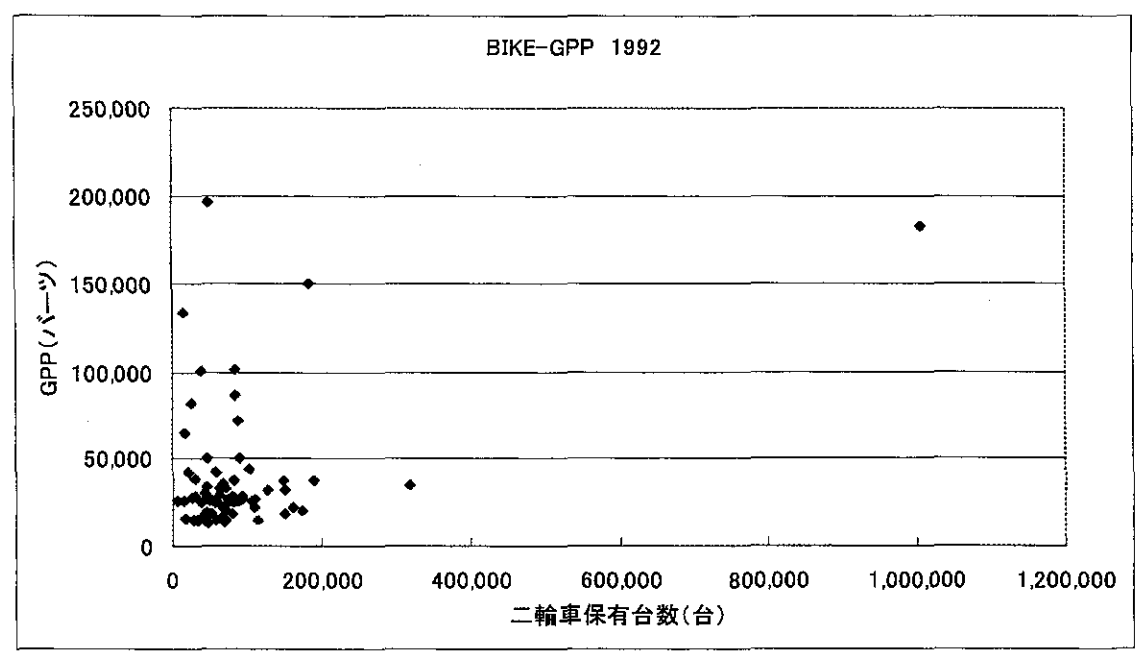
各県ごとの二輪車登録台数とＧＰＰの関係　１９９２年

関連資料 4

BIKE-GPP 1996
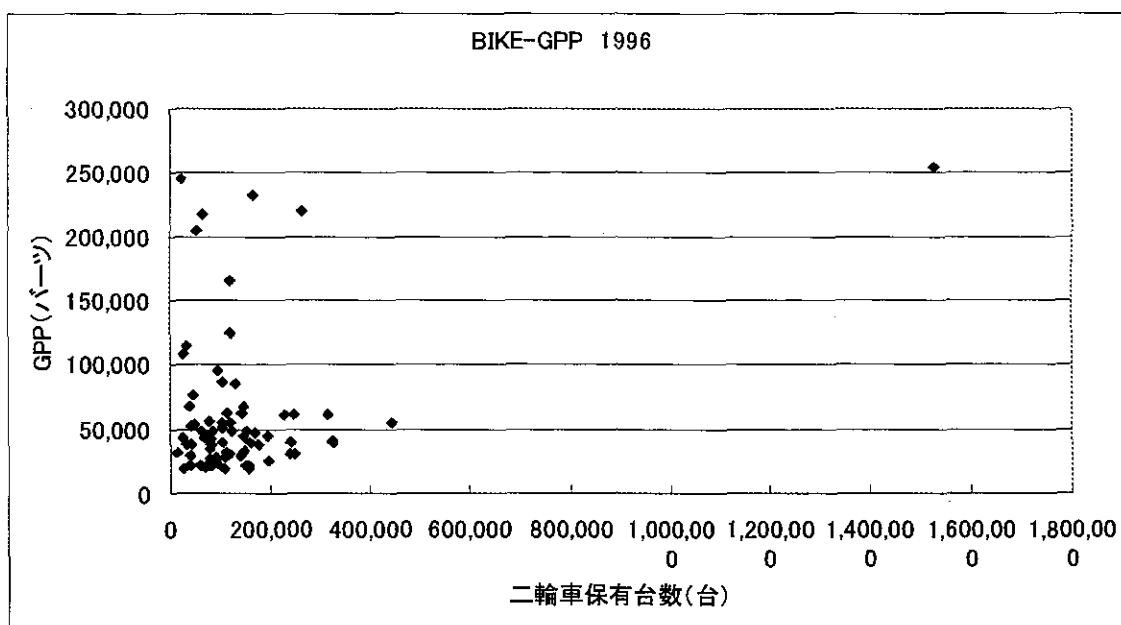
各県ごとの二輪車登録台数とGPPの関係　１９８６年

BIKE-GPP 1997
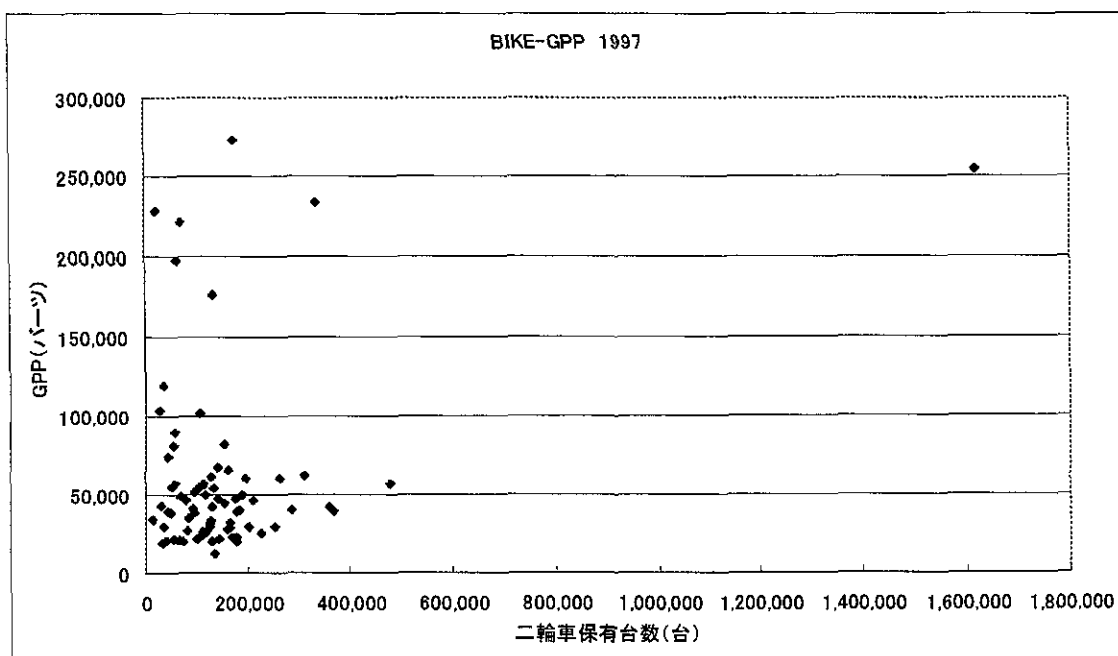
各県ごとの二輪車登録台数とGPPの関係　１９９７年

TWO-WHEELED VEHICLE OWNERSHIP TRENDS AND ISSUES IN THE ASIAN REGION *

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Abstract: In recent years, the number of registered two-wheeled vehicles has been increasing remarkably in the Asian region. This phenomenon is contributing to the worsening transportation problems such as traffic accidents, traffic congestion, and air pollution. Since a two-wheeled vehicle owner tends to shift to a four-wheeled vehicle when economic conditions would permit, these various transportation problems might become worst. However, few researches on two-wheeled vehicle ownership in the Asian region have been done. This paper focuses on the analysis of the characteristics of two-wheeled vehicle ownership as well as that of four-wheeled vehicle ownership in the Asia region, especially in the case of Thailand for both the macroscopic and microscopic points of view. Results show that two-wheeled and four-wheeled vehicle ownerships are highly dependent on income levels. Also, two-wheeled vehicle ownership tends to be suppressed by the presence of public transport in the urban area but it tends to increase accordingly with respect to the economic condition of the local area even though alternative public transportation is introduced.

Key Words: two-wheeled vehicle ownership, four-wheeled vehicle ownership, microscopic analysis, macroscopic analysis, estimated two-wheeled vehicle ownership model

1. INTRODUCTION

The number of registered two-wheeled vehicles has been increasing remarkably in the Asian region particularly in developing countries while the number of registered four-wheeled vehicles has been increasing in more advanced countries. Once a person has gained mobility, it is considered that he/she tries to increase further his/her mobility. Thus, it is easy to understand why many two-wheeled vehicle holders shift to four-wheeled vehicles. If this conjecture is true, the number of four-wheeled vehicle ownership will increase explosively. It is no doubt that more serious transportation problems might occur in the near future in developing countries.

The increase in the number of two-wheeled vehicles in developing countries is much more accelerated compared with those of four wheeled vehicles. In a span of ten years, the ratios of two-wheeled vehicle and four-wheeled vehicle ownership in Thailand were from 74 and 18 vehicles per 1,000 persons in 1989 to 215 and 43 vehicles per 1,000 persons in 1999, respectively. From the point of view of transportation planning, town planning needs to take into consideration this relationship between the two-wheeled vehicle and four-wheeled vehicle ownerships. The importance of this issue is quite obvious in the current situation and its future effects if not addressed is overwhelming. However, most research focused only on four-wheeled vehicle ownership.

Thus, this paper would like to tackle these problems. Firstly, the current situations of two-

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wheeled vehicle and four-wheeled vehicle ownership in Asian region are analyzed using statistical and socio-economic data.

The trends of two-wheeled vehicle and four-wheeled vehicle ownership in the case of Thailand especially between rural region and urban areas were analyzed simultaneously with the economic situation using the macroscopic point of view. In order to elucidate the characteristics of two-wheeled vehicle ownership, questionnaire surveys were conducted in Bangkok, Chiang Mai and Khon Kaen. From the results of the survey, the purchase price and maintenance costs were analyzed in comparison to household income levels. Based on these analysis, the estimation models for two-wheeled vehicle ownership were developed by using multi-regression analysis in which the factors affecting the two-wheeled vehicle ownership was easily obtained and the trends of two-wheeled vehicle ownership was further analyzed. Shifts in the future vehicle ownership patterns were also estimated.

In this paper, only the motorcycle was included in the two-wheeled vehicle category. Sedan type cars, pick up cars, and vans were defined in the four-wheeled vehicle category.

2. RESEARCH REVIEW AND POSITION OF OUR STUDY

Vehicle ownerships are mostly used as an indicator of degree of motorization by several researchers such as by Hook and Replogle (1996), and Schafer (1998). And there are some researches that focus on a particular phenomena influencing vehicle ownership. Cullinane (2002) reports that good public transport can deter vehicle ownership in the case of Hong Kong. Andou, et al. (1997) indicate house locations and conditions can be effected by four-wheeled vehicle ownership condition. While Ashizawa (1986) mentions that the level of car ownership in cities affects the volume of car traffic.

Recently, there are several types of research dealing with four-wheeled vehicle ownership models. Bates, et al. (1981) report that forecasting the four-wheeled vehicle ownership and its usage is a crucial element in planning highway provision. In terms of the vehicle ownership model, Katoh and Hayashi (1997) report that most of researches on four-wheeled vehicle ownership model can be classified into two types, aggregate model and disaggregate model. In their research, the aggregate model is defined as the model for expressing the averaged vehicle ownership condition of certain targeted area. On the other hand, the disaggregate model is described as the model representing vehicle ownership model of the identified target using individual data collected from the household, individuals or other sources. Kitamura (1992) reports that most of household four-wheeled vehicle ownership models using the disaggregate point of view are classified as either "cross-sectional", using data obtained at one point in time, or "pseudo-dynamic", using repeated cross-sectional data or aggregate time series observations obtained from various sources. Nakamura, et al. (1991) develop a four-wheeled vehicle ownership model for analyzing effects of light rail transit facility in Metro Manila by car ownership level using disaggregate model with cross-sectional data. Roorda, et al. (2000) use their four-wheeled vehicle ownership model which can simulate the vehicle transaction process, including decisions to purchase, replace, and dispose of a vehicle and the do-nothing decision, as well as vehicle choice decisions. And Lam and Tam (2002) develop the aggregate car ownership model and examine the reliability of the territory-wide car ownership in Hong Kong.

Regarding factors that directly affect four-wheeled vehicle ownership are reported by Katoh and Hayashi (1997): "income level" for representing the economic situation, "number of driver's license holders" for expressing the number of car drivers, "road service level" for the factor in improvement of vehicle usage, "service level of public transportation mode" for illustrating convenience level of alternative transportation modes, and "factor of urban structure" such as size or density of city. In addition, Hook and Replogle (1996) indicate that growth in four-wheeled vehicle ownership and use is often seen as an inevitable outcome of increasing gross domestic product (GDP) and incomes.

In terms of vehicle ownership and economic index, Dargay, et al. (2001 and 2002) indicate that income is a primary impetus to four-wheeled vehicle ownership. Moreover, increasing real income during the second half of the 20th century has allowed four-wheeled vehicle ownership to flourish in all industrialized countries, and more recently in many parts of the developing world. Furthermore, Dargay and Gately (1999) analyze the relationship between

four-wheeled vehicle ownership and income of several countries as a time series, and they evaluate income elasticity regarding four-wheeled vehicle ownership using their own model. So it is clear that four-wheeled vehicle ownerships are greatly affected by economic status. Dargay and Gately (1997) indicate that the potential for further increase of four-wheeled vehicle ownership will be substantial as estimated by their car ownership model. Moreover, it is with certainty that growth in four-wheeled vehicle ownership will occur in many of developing countries as incomes rise in the research on relationship between four-wheeled vehicle ownership and CO_2 emission targeted in several countries.

In summary, most of researches dealing with vehicle ownership targeted only four-wheeled vehicles, and shift in ownership between vehicle types are not always focused on existing papers. Methods of vehicle ownership mostly used the macroscopic and microscopic points of view, and the target areas of these researches typically examined developed countries.

Therefore, in this research, the current situation and trends of two-wheeled vehicle ownership in the Asian region especially in developing countries are analyzed together with the ownership tendencies of a four-wheeled vehicle using macroscopic and microscopic analyses.

3. TENDENCY OF VEHICLE OWNERSHIP IN ASIAN REGION

Although there are wide ranges of income levels and transportation situations among Asian countries, comparison of these factors in a cross-sectional view could show some kind of motorization tendencies.

The relationship between two-wheeled vehicle ownership and gross domestic product (GDP) per capita, which can be an index of economic condition, in Asian countries and regions[1] in year 2000 is shown in Figure 1. The number of registered two-wheeled vehicles per 1,000 persons expresses the two-wheeled vehicle ownership ratio.
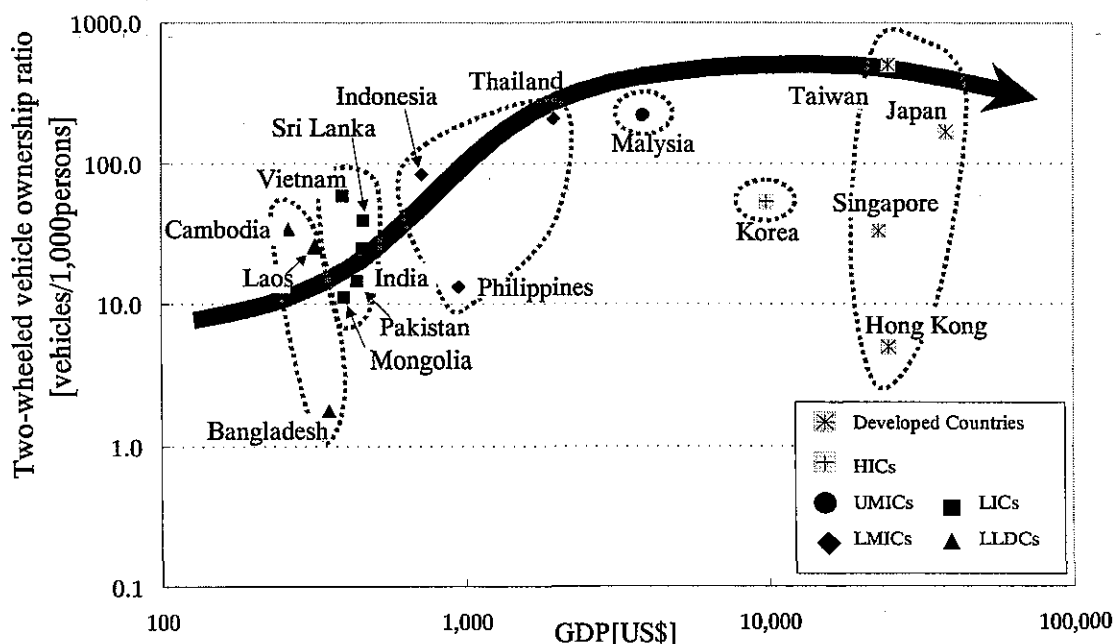
Figure 1. Relationship of Two-Wheeled Vehicle Ownership and GDP per Capita in Year 2000

[1] According to the classification by DAC (Department Assistance Committee) of OECD (Organization for Economic Cooperation and Development), countries are categorized into 6 groups: LLDCs (Least among Less Developed Countries, defined detailedly by the United Union), LICs (Low Income Counties, GNP per capita in 1995 of less than US$766), LMICs (Lower Middle Income Counties, GNP per capita in 1995 exceeded US$766 but less than US$3,036), UMICs (Upper Middle Income Countries, GNP per capita exceeded US$3,036 but less than US$9,386), HICs (High Income Countries, GNPs per capita exceeded US$9,386), and Developed Countries defined as OA (Official Aid) countries

Two-wheeled vehicle ownerships tend to increase according to per capita GDP level except in the People's Republic of Bangladesh (Bangladesh), the Republic of the Philippines (Philippines), the Republic of Korea (Korea), Singapore and Hong Kong. Since these countries are quite unique geographically: for example, although the reasons of Korea could not be found, the land of Bangladesh is unconnected continually because of a lot of rivers, Philippines is consist of numerous archipelagos, and Singapore and Hong Kong are city-state, the two-wheeled vehicle ownership in these countries show different trends.

Except in these countries, the two-wheeled vehicle ownership ratios increase from 11 vehicles per 1,000 persons (Mongolia) to 500 vehicles per 1,000 persons (Taiwan) according to their economic levels. It seems that the positions of these countries are located on the growth curve: LLDCs are located in the beginning stage of a rapidly increasing two-wheeled vehicle ownership ratio. The LICs are positioned in the already started rapidly increasing two-wheeled vehicle ownership ratio. The situation of two-wheeled vehicle ownership ratio of LMICs is now right in the middle of the rapid increase. In the case of UMICs, it is located near the end of the rapidly increasing two-wheeled vehicle ownership ratio. The ratio at this point is higher than 200 vehicles per 1,000 persons. Then, the ratio slowly but surely is still increasing moderately. In the portion where the GDP level increases more, two-wheeled vehicle ownership ratio seems to level off. By then, the two-wheeled vehicle ownership ratio tends to decrease gradually at the position where the GDP is of the same level of that of developed countries. Therefore, the trend showed that the two-wheeled vehicle ownership ratio increases with the GDP level. The increasing trend is along the track of the arrow indicated in Figure 1.

On the other hand, the four-wheeled vehicle ownership tends to correspond substantially to the GDP per capita as shown in Figure 2. These countries seem to be located on the growth curve as well as the trend of two-wheeled vehicle ownership ratios. The ratios are increasing gradually according to the economic level from 0.4 vehicles per 1,000 persons in Bangladesh as the lowest ratio to 707 vehicles per 1,000 persons in Taiwan as the highest ratio. However, the drift of the four-wheeled vehicle ratio tends not to decrease even in economically developed countries such as Japan and Taiwan.
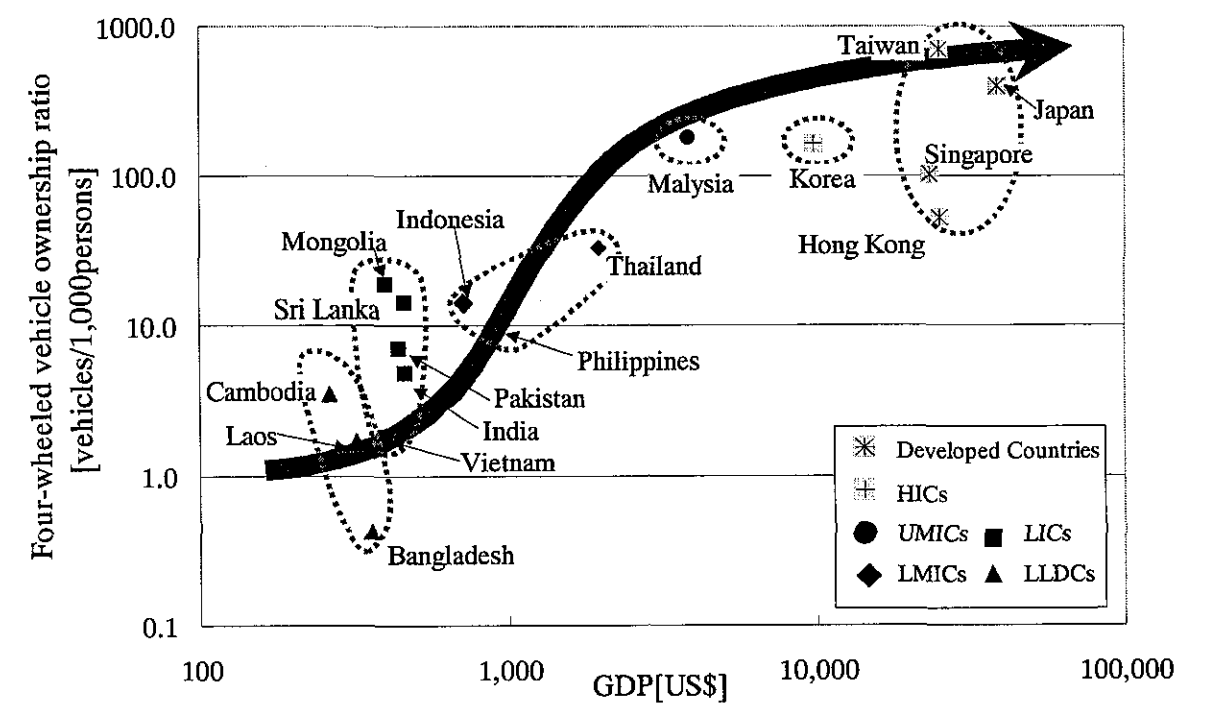

Figure 2. Relationship of Four-Wheeled Vehicle Ownership and GDP per Capita in Year 2000

The economic situation of LLDCs has not yet grown to such levels as to hold four-wheeled vehicles. LICs are located in the position where the ratio slightly increases according to the economic level. The position of the four-wheeled vehicle ratio of LMICs is in the part of the

curve that just started to increase, and it has the possibility to raise the ratio steadily depending on the economic situation. The ratios of UMICs and HICs increase surely along with economic development. And the four-wheeled vehicle ownerships in Developed Countries are well spread, but still their ratios are increasing slightly.

To differentiate the ownership trends of two-wheeled and four-wheeled vehicles, four-wheeled vehicle ownership tends to increase gradually even in the upper bounds of the economic growth level as compared to the decreasing trend of the two-wheeled vehicle ownership. This is the economic situation where two-wheeled vehicle owners, because of high income levels, are shifting to four-wheeled vehicle ownership.

4.MACROSCOPIC ANALYSIS OF VEHICLE OWNERSHIP IN THAILAND

In developed countries it has been verified that there is a significant correlation between the economic level and vehicle ownership ratio of a country. However, in case of Asian countries, since there are large disparities in economic conditions between the urban and rural areas, the transportation situations in these areas are also different. Therefore, it is necessary to validate the above relationships among each region of a country. Hence, the relationship between two-wheeled vehicle ownership and economic situation in Thailand were analyzed together with the four-wheeled vehicle ownership ratio using the macroscopic point of view.

In order to analyze the trends of vehicle ownership in Thailand, the urban and rural areas chosen for the study from each region are the following: Bangkok province from Bangkok metropolitan region as urban area, Chachoengsao province from the western region, Lob Buri from the central region, Kanchanaburi from the eastern region, Khon Kaen from the north-east region, Chiang Mai from the northern region, and Surat Thani from the southern region as rural area. These areas are shown in Figure 3. The 6 local prefectures have important political and commercial roles in major potions of each region.
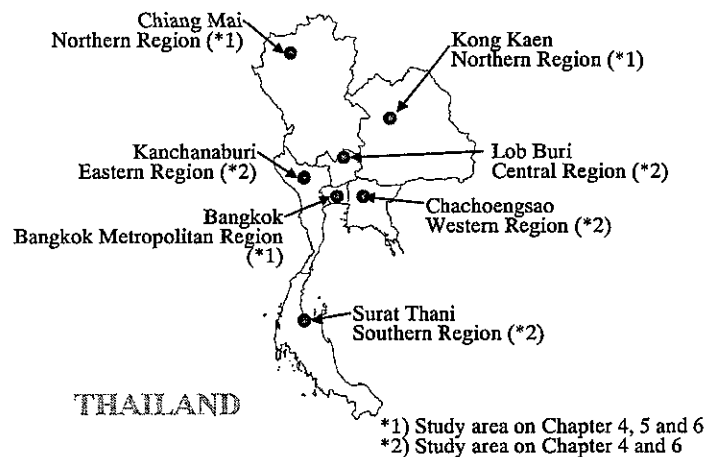
Figure 3. Study Areas

The yearly growth of gross provincial product (GPP) per person of selected provinces from year 1978 to 1997 is shown in Figure 4.

The GPP per capita of local prefectures tend to increase comparatively, these grew from around 2.5 to 5.6 times for a period of 20 years. The economic differentiation among selected local prefectures has approximately doubled in year 1997. The GPP of Chachoengsao and Kanchanaburi are the highest and second highest, respectively, because of the presence of profitable industrial and tourism activities coupled with a relatively lower population. Hence, considering the economic gaps among local prefectures except for these 2 prefectures, the gap in GPP per capita would be about 1.5 times.

However, there are great disparities in GPP per capita between Bangkok and the local prefectures. Surat Thani, with a GPP per capita of US$ 1,908 in 1997, is approximately one

fourth lower than that of Bangkok with a GPP per capita of US$ 8,107, during the same year. Therefore, the per capita GPP of Surat Thani is markedly different from the level of GPP per capita in Bangkok for the same year: Putting it in another way, Surat Thani's GPP per capita in 1997 is of the same level with Bangkok's GPP per capita in 1985. Moreover, Lob Buri, with a GPP per capita of US$ 1,151 in 1997, is approximately one fifth lower than the per capita GPP of Bangkok in 1997 that is the comparable level to the per capita GPP of Bangkok in 1981. Thus, there is a lag of around 12 to 16 years economically between Bangkok and the rural prefectures.
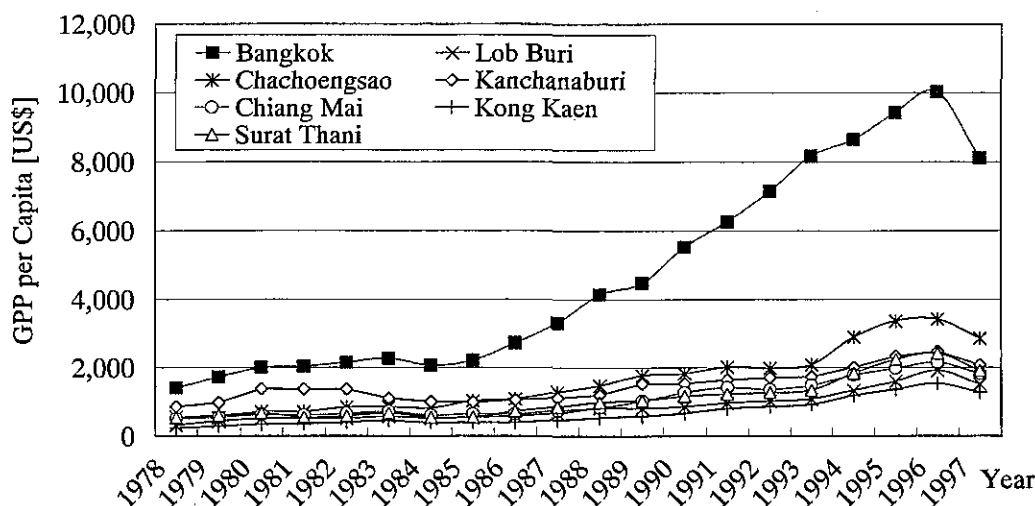
Figure 4. GPP per Capita at Selected Provincials

The trends of two-wheeled vehicle ownership ratio (the number of two-wheeled vehicles per 1,000 population) and four-wheeled vehicle ownership ratio (the number of four-wheeled vehicles per 1,000 population) of selected provinces from 1978 to 1998 are shown in Figure 5 and Figure 6 respectively.

There is a great disparity in the four-wheeled vehicle ownership ratio between the local provinces and Bangkok. The ratios of four-wheeled vehicle ownership in Surat Thani and in Bangkok are in extreme disparity with each other. The four-wheeled vehicle ownership ratio of Surat Thani in 1997 at 82.0 vehicles per 1,000 persons is similar with that of Bangkok in 1982 at 86.7 vehicles per 1,000 persons. This relationship is quite similar to the relationship between the GPP levels between these prefectures. Therefore, it can be considered that four-wheeled vehicle ownerships are significantly affected by economic factors.

As mentioned above, per capita GPP of Lob Buri has been growing in a similar level of that of Surat Thani's case. Likewise, the four-wheeled vehicle ownership ratios of Lob Buri and Surat Thani have been increasing while keeping similar ratios which are 15.6 vehicles per 1,000 persons and 7.1 vehicles per 1,000 persons in 1978, and 46.6 vehicles per 1,000 persons and 42.4 vehicles per 1,000 persons in 1994, respectively.

In this manner, the four-wheeled vehicle ownership of rural areas can be classified into almost the same level of LMICs in Figure 2. Thus it can be considered that the situation of two-wheeled vehicle ownership in rural areas is now on the stage where the ratio has just started to increase in relation to economic conditions.

In contrast, the two-wheeled vehicle ownership ratio has been increasing rapidly in all of the selected provinces. The two-wheeled vehicle ownership ratios of Surat Thani and Bangkok are almost of the same levels in 1979, with 23.5 vehicles per 1,000 persons and 29.3 vehicles per 1,000 persons, respectively. Moreover, these are continuously increasing while keeping almost of the same level until the year 1997, with up to 307.3 vehicles per 1,000 persons and 288.4 vehicles per 1,000 persons, respectively.

However, the ratios of two-wheeled vehicle ownership have some gaps among rural provinces. For example, comparing the ratios between Lob Buri and Surat Thani, 13.6 vehicles per 1,000 persons and 21.2 vehicles per 1,000 persons in 1978, and 121.2 vehicles per 1,000 persons and 42.2 vehicles per 1,000 persons in 1994, respectively.

Accordingly, the ratios of two-wheeled vehicle ownership in the local provinces show two kinds of tendencies: the ratios have increased more than 300 vehicles per 1,000 persons (Tendency A; Bangkok, Chiang Mai and Surat Thani), and below 200 vehicles per 1,000 persons (Tendency B; Kanchanaburi, Khon Kaen, Lob Buri and Chachoengsao). In case of Kanchanaburi, the ratio increased until year 1993 with the same level of Tendency A, and then it shifted to the same level of Tendency B. Therefore, these ratios are different by approximately around 140 vehicle per 1,000 person even among local prefectures.
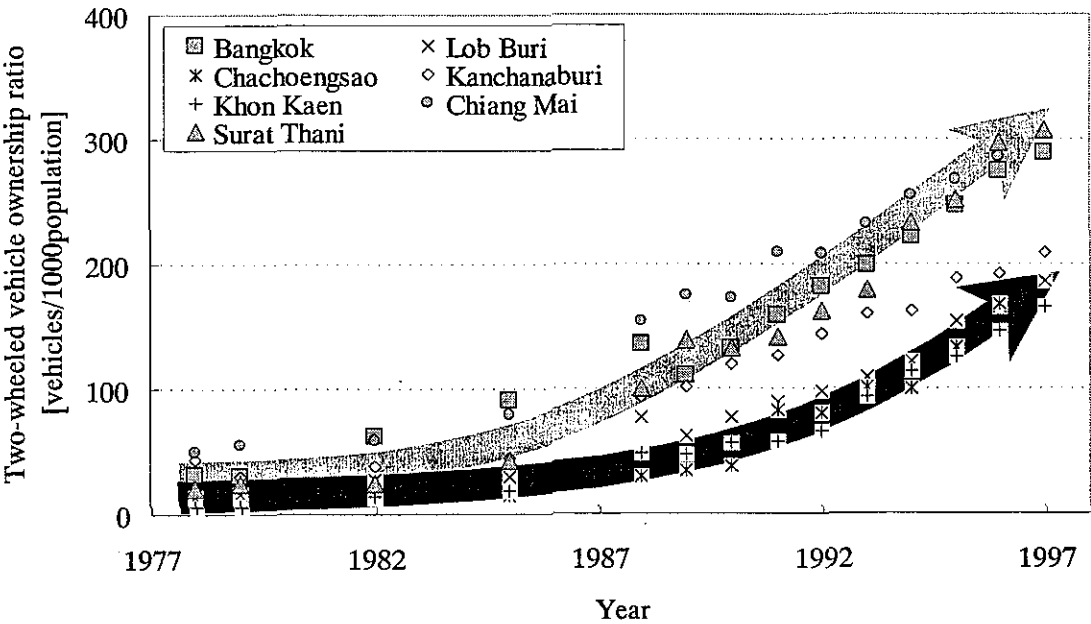
Figure 5. Two-Wheeled Vehicle Ownership Ratio from Year 1978 to 1998
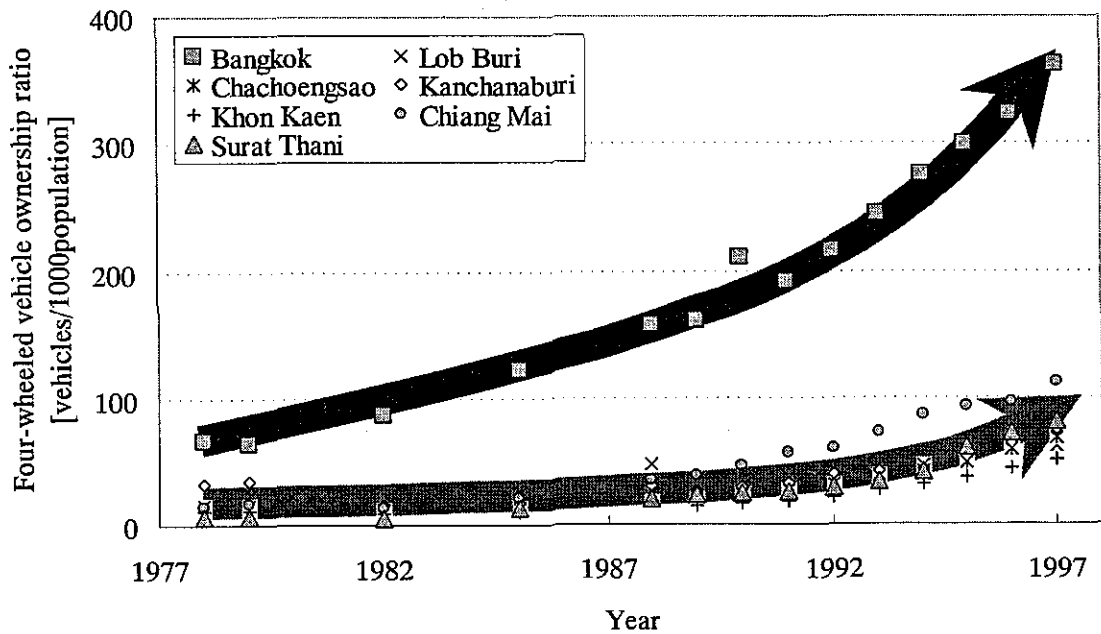
Figure 6. Four-Wheeled Vehicle Ownership Ratio from Year 1978 to 1998

In analyzing these trends among rural prefectures, the time series of two-wheeled vehicle ownership ratio and GPP per capita from 1978 to 1998 in local prefectures are shown in Figure 7. The equations representing the relationship between two-wheeled vehicle ownership ratio and GPP per capita were developed based on regression analysis using exponential approximation method.

As mentioned above, the GPP per capita of Chachoengsao and Kanchanaburi are much higher compared with those of other prefectures because of their particular economic conditions. Therefore, the trends of the relations between the two-wheeled vehicle ownership ratio and GPP per capita may be different. However, the tendencies of the four other prefectures are almost the same and the shapes are very similar in terms of the position of where the two-wheeled vehicle ownership increases rapidly at growth curve. Nevertheless, the two-wheeled vehicle ownership in the rural area is increasing with economic development.
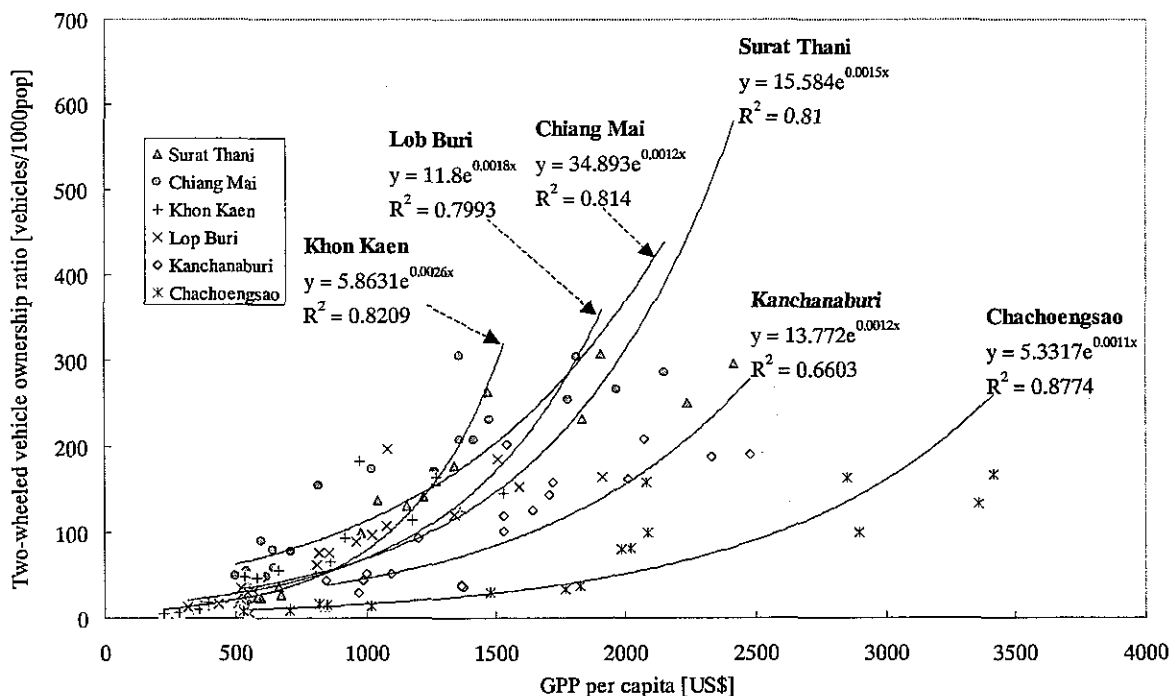
Figure 7. Trends of Two-wheeled Vehicle Ownership and GPP per Capita
from 1978 to 1998

As analyzed above, four-wheeled vehicle ownership ratios are greatly affected by GPP. Since two-wheeled vehicle ownership ratios are also effected by GPP because of the relatively higher two-wheeled vehicle ownership ratio compared with those of four-wheeled vehicle ownership, the economic conditions does not fully affect the two-wheeled vehicle ownership ratio. It can therefore be considered that there are other factors the significantly affect two-wheeled vehicle ownership patterns.

5. MICROSCOPIC ANALYSIS ON VEHICLE OWNERSHIP SITUATION IN THAILAND

The relationship between vehicle ownership and substantial costs is analyzed by using the microscopic point of view. Substantial costs include purchase price and maintenance cost. With regards to income disparities, Chiang Mai and Khon Kaen cities, considered under the local city, and the capital city of Bangkok were chosen as the study areas for the questionnaire survey as indicated in Figure 3 which analyzed the situation of the two-wheeled vehicle and four-wheeled vehicle ownerships with respect to economic factors.

The result of the relationship between income and vehicle holding cost including purchases price and maintenance cost are shown in Table 1. The average income in Bangkok at

US$ 1,033.67 is one and a half times higher than that of the rural areas at US$ 694.78. The two-wheeled vehicle ownership ratio in Bangkok is 27%. On the other hand, the ratio of Chiang Mai is 77%, and it is 100% in the case of Kong Kaen indicating that all respondent's household owned at least one two-wheeled vehicle. Thus, it is clear that two-wheeled vehicle ownership is greatly diffused especially in the local area.

Table 1. Result of the Questioner Survey

Province		Chiang Mai	Khon Kaen	Bangkok	Average
Income [US$]		712.37	677.18	1,033.67	
Two-wheeled vehicle ownership ratio [%]		77	100	27	
Two-wheeled vehicle	No. of Samples	62	119	24	68
	Purchase price [US$]	553.44	869.97	764.27	729.23
	Maintenance Cost [US$]	8.36	11.51	15.05	11.64
Four-wheeled vehicle	No. of Samples	29	30	14	24
	Purchase price [US$]	11,447.63	11,757.79	11.391.95	11,532.45
	Maintenance Cost [US$]	63.44	55.34	86.42	68.07

There is a large gap between the two-wheeled vehicle and four-wheeled vehicle purchase prices. The average purchase price of a two-wheeled vehicle is US$ 729.33. This is 16 times cheaper than the average purchase price of a four-wheeled vehicle at US$11,532.45 and is also equal to 1.05 times of a month's average income in the local cities.

The average maintenance costs of both vehicle types in Bangkok are much higher than that of local cities. The maintenance costs of two-wheeled and four-wheeled vehicles are equal to 1.2 to 1.7 percent and 8.2 to 8.9 percent of a month's salary, respectively. Hence, the maintenance cost of a two-wheeled vehicle is six times cheaper than that of a four-wheeled vehicle. It is clear then that a two-wheeled vehicle is relatively easier to purchase, maintain, and keep compared to a four-wheeled vehicle.

The relations of the number of two-wheeled vehicle ownerships and monthly household income are indicated in Figure 8. Two-wheeled vehicles are widely owned not only in urban areas but also in rural areas. Many households also own more than two two-wheeled vehicles but this fact has a vague relation with income levels.
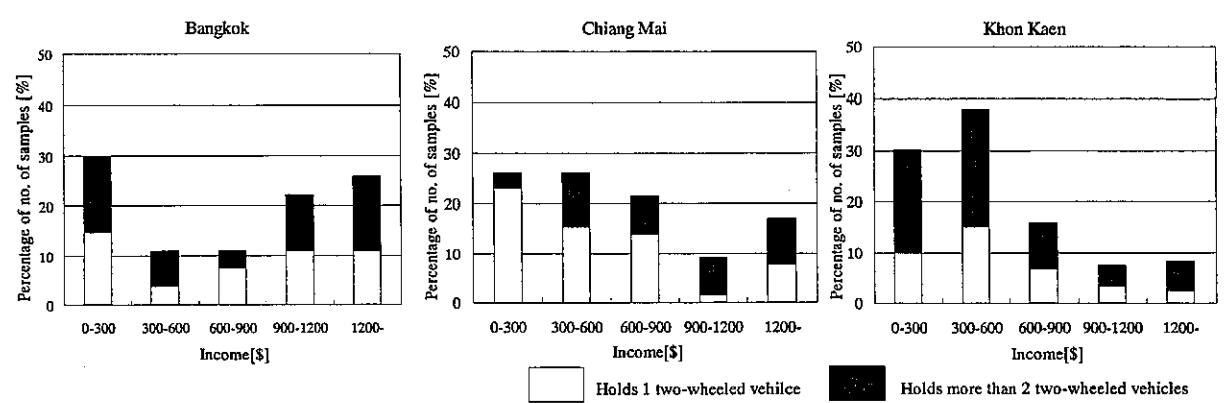

Figure 8. Relationships of Income and Two-Wheeled Vehicle Ownership

6. ESTIMATION MODEL FOR TWO-WHEELED VEHICLE OWNERSHIP

As the resulting trends of two-wheeled vehicle and four-wheeled vehicle ownership by macroscopic and microscopic analyses would show, both types of vehicle ownership are mostly correlated to income levels. However, as indicated, two-wheeled vehicle ownerships

among rural areas cannot be clearly explained by using only income levels.
It can be considered that good public transportation might be able to deter vehicle ownership. In addition, as the city expands it needs good public transport service. When the town expands, more mobility will be desired. For this reasons, trends of vehicle ownerships are also correlated with public transportation service and city expansion.

Thus, in order to understand future trends of two-wheeled vehicle ownership, a two-wheeled vehicle ownership estimation model was developed by multi-regression analysis using statistical data from 1978 to 1997.

The dependent variable (y) is defined as the total number of two-wheeled vehicle ownership, and the independent values are expressed as the GPP per capita as an index for income levels (x_1), the daytime population as an index for accumulation of population instead of the index of city expansion (x_2), and the number of registered buses as an index for service level of available public transportation modes (x_3). The number of registered buses includes intercity buses and para-transit, which is a very popular alternative transportation mode such as the Thongthew in the rural areas. The result of estimation process is shown in Table 2.

Regarding the results, though the t-values are not necessarily high because of the small number of samples, the correlation coefficients of all models are significantly high.

The coefficients of the GPP per capita of all the selected prefectures except Chachoengsao resulted to a positive value from 2.754 to 55.223, with sufficient t-values. As previously mentioned, the growth trend of the GPP in Chachoengsao is different from that of other prefectures because of a particular reason, which is industrial effects. Therefore, according to the increasing trend of GPP, there are other possibilities that the number of two-wheeled vehicles will increase.

Table 2. The Result of Multi-Regression Model

		coefficient	t value	P value	fixed value	Multi valuable coefficient
Bangkok Metropolis	GPP per capita(x_1)	7.748	5.881	0.000	-1129423	0.976
	Population(x_2)	0.329	1.888	0.088		
	No. of registered bus(x_3)	-46.892	-1.726	0.115		
Lop Buri	GPP per capita(x_1)	2.754	6.953	0.000	-71972	0.978
	Population(x_2)	0.082	1.202	0.257		
	No. of registered bus(x_3)	8.299	0.565	0.585		
Chachoengsao	GPP per capita(x_1)	0.473	0.698	0.501	-20820	0.846
	Population(x_2)	0.003	0.015	0.988		
	No. of registered bus(x_3)	55.223	1.312	0.219		
Kanchanaburi	GPP per capita(x_1)	2.784	2.334	0.042	-117545	0.940
	Population(x_2)	0.164	1.000	0.341		
	No. of registered bus(x_3)	-23.260	-0.285	0.781		
Chiang Mai	GPP per capita(x_1)	5.773	5.995	0.000	-443211	0.988
	Population(x_2)	0.385	4.034	0.002		
	No. of registered bus(x_3)	-19.777	-1.172	0.268		
Khon Kaen	GPP per capita(x_1)	7.542	9.120	0.000	-33739	0.977
	Population(x_2)	-0.004	-0.043	0.967		
	No. of registered bus(x_3)	0.477	0.019	0.985		
Surat Thani	GPP per capita(x_1)	4.146	8.842	0.000	-144437	0.988
	Population(x_2)	0.184	1.825	0.098		
	No. of registered bus(x_3)	-18.140	-0.500	0.628		

In case of Bangkok, Chiang Mai and Surat Thani, the coefficients for the population variable on these prefectures resulted to positive values with corresponding appropriate t-values. Therefore, the number of two-wheeled vehicles tends to increase with increasing population. However, the t-values of other prefectures have very low values. Hence, the number of two-wheeled vehicles is not affected by population changes in these prefectures.

For Bangkok and Chiang Mai, the coefficients of the number of registered bus resulted in

negative values but with adequate t-values. Therefore, the two-wheeled vehicle ownership tends to decrease depending on the public transportation provision level in these prefectures. However, two-wheeled vehicle ownership in the other prefectures was not affected by introducing alternative public transportation modes.

7. CONCLUSION

The growth trend of the number of two-wheeled and four-wheeled vehicles in the Asian region seem follow the growth curve according to the GDP levels. Four-wheeled vehicle ownership in developing countries has yet to spread expansively or is just in the beginning stage of growth depending on economic levels. Moreover, the ownership has been increasing even in developed countries. Meanwhile, the number of two-wheeled vehicle ownership has been increasing rapidly according to the economic level of a developing country. However, two-wheeled vehicle ownership tends to decreases in economically well-developed countries.

According to these trends, the increasing number of four-wheeled vehicle ownership is greatly affected by economic levels. On the other hand, two-wheeled vehicle ownership seems to be fully affected by economic levels only in the beginning stages, other stages are not greatly affect by economic conditions.

Thus to understand fully the trends of the two-wheeled vehicle ownership with the four wheeled vehicle ownership in Thailand, a macroscopic and microscopic point of view of analysis was adopted.

According to the macroscopic analysis, the relation among two-wheeled or four-wheeled vehicle ownerships and the GPP level are also connected with the growth curve as expressed by the relationship between vehicle ownerships and GDP in the Asian countries.

The four-wheeled vehicle ownership in Thailand is highly related to income levels. Thus, there are large gaps in terms of four-wheeled vehicle ownership between the urban and rural areas. In the case of an economically advancing prefecture like Bangkok, the four-wheeled vehicle ownership trend has been increasing rapidly. With regards to rural prefectures where relatively lower GPP levels were obtained, the four-wheeled vehicle ownership pattern has been slightly increasing according to economic levels.

Two-wheeled vehicle ownership in Thailand has been expanding considerably even in rural areas. However, among local regions, two-wheeled vehicle ownership ratios were having differences at 140 vehicles per 1,000 persons maximally. The two-wheeled vehicle ownership ratios in rural areas were also affected by economic conditions. However, because of the relation of the ownership ratio and GPP levels, it can be considered that the ratios were not fully affected by GPP level.

The vehicle ownership was also analyzed by using the purchase and maintenance costs from the microscopic point of view. The costs of four-wheeled vehicles are much higher than those of a two-wheeled vehicle. The purchase price and the maintenance costs for two-wheeled vehicle are not related to the monthly household incomes. For that reason, the ownership of a two-wheeled vehicle is popular even in rural areas. Also the economic level of Thailand is already conducive to own a two-wheeled vehicle as the transport needs of an individual arise.

The relationship between vehicle ownership and economic levels was fully analyzed using both the macroscopic and microscopic methods of analysis. As the result of these analyses would show, there are differences in the two-wheeled vehicle ownership patterns among rural areas. Hence, it is necessary to consider not only the economic effects but also other factors that could influence two-wheeled vehicle ownership trends. Thus the estimation models for identifying two-wheeled vehicle ownership trends were developed whose variables include not only the economic index but also the indexes of public transportation service level and town expansion.

For the result of the estimation model, in the case of prefectures with big cities, such as Bangkok, the capital city of Thailand, and Chiang Mai, the second biggest city of Thailand, the two-wheeled vehicle ownership ratio increases accompanied not only by GPP growth but also by the expansion of cities. However, a good public transportation service can control two-

wheeled vehicle ownership, and two-wheeled vehicle owners tend to shift to public transportation if the service is satisfactory.

On the other hand, city expansion and levels of public transportation provision do not affect two-wheeled vehicle ownership ratios of other prefectures. However, two-wheeled vehicle ownership tends to increase more according to economic growth.

REFERENCES

Andou, R., Aoshima, N. and Itou, M. (1997) Effects of House Locating Characteristics on Car Ownership in Local Cities, **Traffic Engineering Vol.32, No. 2**, 27-36.

Ashizawa, T. (1986) The influence of road and population upon car ownership levels in cities, **J. Infrastructure Plan. And Man., JSCE, Vol.4-4, No.365,** 107-113.

Bates, J., Roberts, M., et al. (1981) **The factors affecting household car ownership**, Martin and Voorhees Associates.

Cullinane, S. (2002) The relationship between car ownership and public transport provision: a case study of Hong Kong, **Transportation Policy, Vol. 9,** 22-39.

Dargay, J. (1997) Vehicle ownership to 2015: implications for energy use and emissions, **Energy Policy, Vol.25, Nos. 14-15,** 1121-1127.

Dargay, J.M. (2001) The effect of income on car ownership: evidence of asymmetry, **Transportation Research Part A, Vol.35,** 807-821.

Dargay, J.M. (2002) Determinants of car ownership in rural and urban areas: a pseudo-panel analysis, **Transportation Research Part E, Vol.38,** 351-366.

Dargay, J. and Gately, D. (1999) Income's effect on car and vehicle ownership, worldwide: 1960-2015, **Transportation research Part A, Vol. 33,** 101-138.

Honda Motor Co., Ltd. and its subsidiaries and affiliates (2001) **World motorcycle facts & figures.**

Hook, W. and Replogle, M. (1996) Motorization and non-motorized transport in Asia, **Land Use Policy, Vol. 13 No. 1,** 69-84.

Katoh, H. and Hayashi, Y. (1997) Analyses and Modeling of Passenger Car Ownership Rate Considering Economic Growth Level and Urban Structure, **Traffic Engineering Vol.32, No. 5,** 41-49.

Kitamura, R. (1992) A Review of Dynamic Vehicle Holdings Models And A Proposal for A Vehicle Transactions Model, **Proc. Of JSCE, No.440/4 –16,** 13-29.

Lam, W.H.K. and Tam, M.L. (2002) Reliability of territory-wide car ownership estimates in Hong Kong, **Journal of Transportation Geography, Vol.10,** 51-60.

Nakamura, R., Kashima, S. and Hayes, W. (1991) The Effect of LRT Facilities in Metro Manila on Car Ownership Levels, **Proceedings of infrastructure planning No.11(1).**

OECD, DAC, Geographical Distribution of Financial Flows to Aid Recipients, 1995-1999, p.320.

Roorda, M.J., Mohammadian, A. and Miller, E.J. (2000) Toronto Area Car Ownership Study: A Retrospective interview and Its Applications, **Transportation Research Record, 1719,** 69-72.

Schafer, A. and Victor, D.G. (2000) The future mobility of the world population, **Transportation Research Part A, Vol.34,** 171-205.

II-5 プノンペンのバイクタクシーに関する

修士論文全文

THE ROLE OF MOTORBIKE-TAXI
IN PHNOM PENH CITY, CAMBODIA

By

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ABSTRACT

Transportation system and services, as a whole, serve various purposes of the human being to meet their requirements. Transportation and people must reflect one another but the combination of rapid urbanization and motorization has been a key cause of numerous transport problems. For instance without proper planning and regulation, the mixed traffic flow in Phnom Penh causes deadlock problem to the city and welfare of citizen. Further, it has resulted in deterioration in accessibility, service levels, safety, comfort, operational efficiency and the urban environment.

One of the most notable features of the public transport sector in Phnom Penh in the transitional economies, central market to free oriented market, in recent years has been the explosive growth of publicly available passenger transport services outside the traditional public transport regulatory system. This explosion is referred to the motorbike-taxi business operating within the urban area.

Phnom Penh City, a Capital of Cambodia, has no public transport system such as city bus system or even taxi to serve the need of population, businessman and other purposes, only the Motorbike-Taxi that plays an important role in transporting, moving goods, people to their respective destination if compared to other informal modes operating in the city. Moreover, its transport service is fast, cheap, door-to-door and responsive service.

Under the poor condition, management, maintenance, operation of this transport mode and easy to enter into this business, the growing number of the Motorbike-Taxi Operation has concerned city hall government as well as the central government that is currently creating many problems such as traffic congestion, accidents and air pollution. The high numbers of entrants into the motorbike taxi business, primarily because of the following three reasons 1) There is no need to get license. 2) It is easiest way to earn money to support families of low-income group especially for immigrants from provinces and rural areas to the city and 3) Current drivers have shifted from the cyclo drivers. Therefore, to study the characteristics of this mode and its passengers are very important in setting up the policy, control the flow and management of its operation especially the role of this mode in the future.

To study the characteristics of both passengers and drivers, the study techniques have been established to acquire required information for analysis. The study methodology in obtaining the needed data is to interview the passengers and drivers en-route at selected locations and in some cases, questionnaire forms were distributed to both passengers and drivers to meet the required sample. Furthermore, study has also been done to collect more information about travel behaviors and related urban transportation planning, operation through the Internet, reference books, documents and literature review.

The result of the survey shows that seventy nine percent of respondents have used to ride this transport mode, motorbike taxi, to reach their destination, mostly for home-based market and female passengers used this mode more than male passengers. Therefore, the mode is extremely playing very important role in current urban transport sectors but the quality; performance, morality and its service provided to the public are not yet met. Also the result illustrates that most drivers would quit the current job if they could find another suitable one for themselves, particularly the job which can support their daily life with family. Upon the results and discussions, education both city residents and drivers have been put in first priority prior to the application of other measures such as policy formulation and management and then the role of motorbike taxi must be considered and managed simultaneously as feeder transport mode not only for complementing public transport in city but also for other interchange modal such as inter city taxi bus, inter boat service, etc.

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ABBREVIATIONS

AASHTO	American Association of State Highway Transport Officials
ADB	Asian Development Bank
AFTA	Asian Free Trade Area
ASEAN	Association Southeast Asian Nations
BMR	Bangkok Metropolitan Region
CBD	Center Business District
CC	Cylinder Capacity
CDRI	Cambodia Development Research Institute
Cm	Centimeter
CSD	Center for Social Development
GDP	Gross Domestic Product
Govt	Government
HCM	Ho Chi Minh
HCMC	Ho Chi Minh City
HH	Household
JICA	Japanese International Cooperation Agency
Km	Kilometer
MC	Motorcycle
MEF	Ministry of Economy and Finance
MoTC	Ministry of Transport and Communication
MPP	Municipality of Phnom Penh
MPWT	Ministry of Public Works and Transport
MT	Motorbike Taxi
NMV	Non-Motorized Vehicle
NPRD	National Program to Rehabilitation and Develop Cambodia
NR	National Road
ODA	Official Development Assistance
P-Penh	Phnom Penh
Scho.	School
Sq.km	Square Kilometer
SEDP	Socioeconomic Development Plan
TV	Television
UNCTAD	United Nations Transition Authority in Cambodia
UNDP	United Nations Development Program
Univ.	University
Yrs	Years Old

CHAPTER I

INTRODUCTION

1-1 General

Cambodia has a land area of 181,035 square kilometers in the southwest part of the Indochina peninsula, about 20% of which used for agriculture. The country's capital city is Phnom Penh. International borders are shared with Thailand and the Lao People's Democratic Republic on the west and on the north, and the Socialist Republic of Vietnam on the east and southeast. The country is bounded on the southwest by the Gulf of Thailand. In comparison with its neighbors, Cambodia is a geographically compact country administratively composed of 20 provinces, 3 municipalities, 172 districts, and 1,547 communes. The country has coastlines of 435 km.

After Cambodia began its attempt for a changeover to a market economy, its economy regained stability and now is showing healthy growth and it seems obvious that membership in ASEAN (in April 1999) and the ASEAN Free Trade Area (AFTA) have integrated Cambodia's economy globally and regionally.

The second term of government administration, which there is only one sole Prime Minister, Hun Sen, considerable progress has been made in reviving and upgrading the transport sector, which provides both the country's lifeline to the outside world and its crucial internal distribution system. A sizable amount of donor funding, including Australia, Japan, Sweden, United Stated, ADB and World Bank were mobilized for transport infrastructure rehabilitation. Physical infrastructure rehabilitation and improvement have taken placed, focused on rehabilitating primary road networks, rural roads, bridges and ferry crossings in order to facilitate transport of freight, agricultural products and integration of markets using external assistance support primarily from multi-lateral agencies.

Transport is critical to Cambodia's economy because of its growing regional trade and agriculture and rural development priorities. A more efficient transport infrastructure is essential to facilitate the expansion of micro, small and medium sized export oriented enterprises.

Most of the main road arterials, including many urban, provincial and rural roads have been improved by strengthening, resurfacing or widening as well as by the rebuilding of bridges and culverts. With the reconstruction of the Chroy Changva Bridge over the Tonle Sap River at Phnom Penh, the upgrading of NR6 and the rehabilitation of NR4 to Sihanouk Ville, areas adjacent to these completed reconstruction now enjoy dramatically improved access and benefit from expanded business and economic activities. Secondary and tertiary roads were improved, particularly in the north and northwestern provinces, with road built under targeted rural development programs.

As for Phnom Penh, a metropolitan area's economic and social welfare depends on a large extent on the performance of its transportation system, see figure 1-1. Not only does the transportation system provide opportunities for the mobility of people and goods, but also over the long-term it influences pattern of growth and the level of economic activity through the accessibility it provide to land. In addition it provides connections to other metropolitan areas, to the nation, and to the world. City has played a central role in the cultural, economic and political evolution and development. *Further, recently the Phnom Penh City has hosted the Asian Summit+3.* The city is the artwork of people living in the area; the movement of people and goods within the city is a special area of transportation with several unique characteristics. A large number of modes compete or complement each other in providing transportation services in the city. Urban transportation is among the most important components ensuring the vitality of an urban area.

Due to all these, a mix of traffic flow, illegal of transportation services, poor road condition, unregulated, lack of road facilities and weak control and management affect the efficiency of operation in an urban area and deteriorate the urban environment. Furthermore there is a direct connection between transportation and city growth. Transportation can promote or hinder development and expansion. The opposite is also true: vibrant, growing urban areas invite expansion or implementation of new transportation facilities and services. The public transport modes in the city comprise Bus, Shared Taxi-Bus, Airport-Taxi, Railway, River Transport, Air Transport and Informal Modes known as Motorbike-Taxi, Tricycle (Cyclo), Motor trailer (Motorumok) and Motor Tricycle (Motor Kang Bei).

The traffic flows concentrate into the built-up area and traffic congestion occurs on the arterial roads during morning and evening peak hours. Traffic management facilities such as traffic signals, signs and road markings are nearly non-existent. These poor management

conditions coupled with shortage of traffic safety facilities and traffic safety education contribute to an increase in traffic accidents. In addition, most of public transport is served by Motorbike-Taxi. The facilities of public transport are deteriorated due to poor management and maintenance as well as inadequate improvement.

Main transportation in the city of Phnom Penh is conducted through two-wheeled vehicles and a trend of growing number of four-wheeled vehicles is observed for the last couple years. Because of growing motorization, the city will face some problems in the near future, in terms of traffic congestion, environmental pollution and so on and are needed to pay attention to all these issues immediately. *In general, the motorbike-taxi is a supplemental transportation to the trunk transport system because of the absence of city bus system.*

The main transport system to serve the urban population movements is dominated by the informal transport modes; especially motorbike-taxi called Motodop. As the economic situation and the living standard of the people are not yet well improved, many poor people, unskilled have entered the motorbike-taxi business to response the needs of daily life. Therefore, the study characteristics of passengers and its drivers are very urgent needed before we plan to manage and control them.
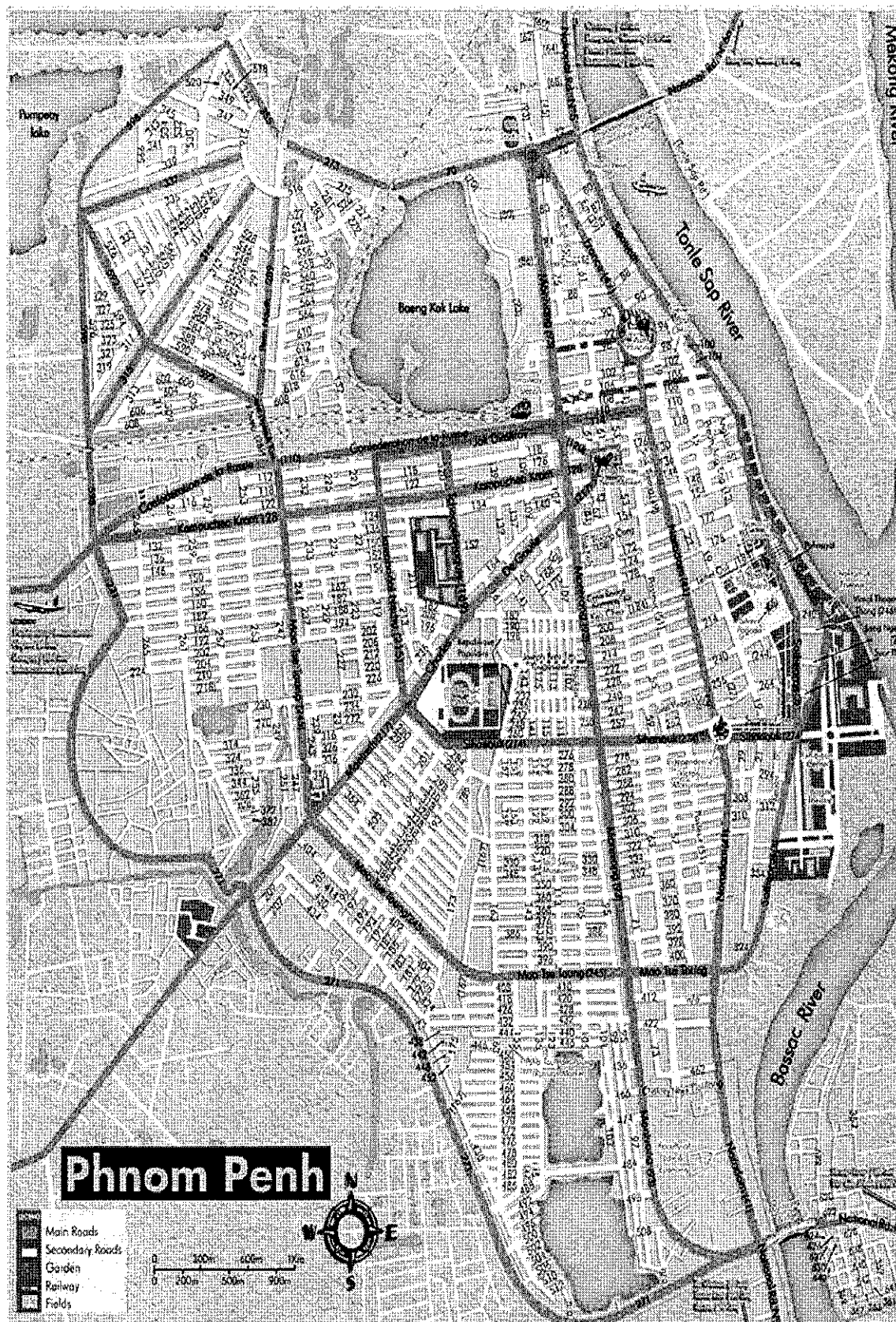
Fig.1-1 Phnom Penh City Map

1-2 Definition

Motorbike-Taxi is hired motorcycle run by individual and 50-100cc capacity with a back seat extended to about 55 cm for accommodating as many as 3 passengers, see Fig.1-2.

Informal adj: not following any rules, not official by HARRAP's Dictionary. Therefore, informal mode here means the mode is not official regulated by the responsible body.

Motor Vehicle is defined here as a propelled vehicle used for land transport such as a car, truck, van, bus, cab that is used for transporting people and goods.

Phnom Penh is the capital city of Cambodia

Transportation a mechanized means of person or goods conveyance such as motor vehicle, air plan, bus, railcar or bicycle.

Urban Area is the area covering the surface of 439 square kilometers.

Private automobile, which can be in the forms of drive alone, drive with passengers, or passenger in a private car.

Taxi, are owner-operators or private companies that provide transportation to the general public.

Trip generation forecasts the number of trips that will be made.

Trip distribution determines where the trips will go.

Mode usage predicts how the trip will be divided among the available modes of travel.

Trip assignment predicts the routes that the trips will take, resulting in traffic forecasts for the highway system and ridership forecasts for the transit system.

Fig. 1-2: Motorbike Taxi and Mixed Traffic Flow in City

1-3 Statement of Problems

As the country becomes more urbanized, the average size of the urban centers and the urban population are increasing rapidly. Consequently, the demand for urban transportation is exploding, resulting in rapid motorization, serious traffic congestion, and deterioration of urban environment and unplanned sprawling of the city. It has been recognized that the pattern of urban growth is not sustainable and that the urban transport sector plays a fundamental role in addressing these issues.

Due to the fact that there is over supply rather than demand side leads to a traffic congestion between the transport operators within the same mode of transport service as well as competition across the modes. Moreover, as a result, there is no restriction for entering to the markets leads to the problem of over supplying of service in the most populated and higher profitable areas.

Currently, the motorbike-taxi is taking over a road space using it as a parking area for picking up and alighting passengers, which blocks the traffic flow during rush hours. This causes traffic jam in some segments of a major route of the city. The following statements are the main features of problems of public transportation in the capital city.

At the mean times, identified problems based on the existing public transport situation in Phnom Penh can be summarized as below.

- ❖ Bad behavior of drivers, no education institution in urban transport planning and training centers;
- ❖ Public transport supply is inefficient due to the lack of mass public transport system because the urban area in Phnom Penh is small and densely populated-a condition resulting from a limitation of topographical condition.
- ❖ There are a very high number of entrants into the informal transport modes operation primarily because of the following three reasons: 1) there is no need to get a license; 2) it is easiest way to earn money to support families of low-income level and 3) the shift from the cyclo's driver to motorbike's taxi driver. Increase of the motorbike-taxi operation is one of the most serious factors leading to the traffic congestion in the urban area.
- ❖ Traffic congestion can be seen in the morning and evening peak hour

❖ No safety measure use such as helmet, no uniform or training prior to the operation

❖ No respect the rules and regulations causing many accidents

❖ Traffic management and control are very weak, not effective.

❖ Imbalance of growth rates between vehicles and road network and its facilities;

❖ Inefficient quantity of and quality of public transport;

❖ Low discipline of urban transport users and operators, which causes traffic congestion and traffic accidents;

❖ Inefficient use of private cars and there is no policy toward the use of informal modes.

1-4 Purposes of Study

The main purposes of the study are to:

❖ Identify the existing characteristics of passengers and drivers of motorbike-taxi transport mode and identify the current condition of the mode;

❖ Conduct surveys and collect necessary data and information for the improvement of existing travel behavior, travel characteristics and service by mean of education and other appropriate measures;

❖ Show the real image of this transport mode use in the city for the current condition and illustrate that how this mode importance are to the public service and how users view it.

❖ To look ahead and determine the proper course for the future role of this mode following the results collected and recommendation given for future betterment.

❖ Collect and accumulate the data information in terms of transportation system in the City of Phnom Penh by mean of en-route interview and questionnaire distribution. If we understand how and why people choose mode of transport to their destination we better understand and plan for our future transportation needs

❖ Raise the case study for the cities having similar transportation modes and review the related studies through literature review for easing the analysis and comparison. Then laws and regulations for urban transportation planning of those cities will be considered for appropriate application in Phnom Penh City.

❖ Upon the data collection, analysis will be done and recommendation for improvement will also be suggested for efficient, effective, convenient, reliable, safe and comfortable passenger transport mode, especially recommendation will be

focused on the role the motorbike-taxi in the future in case of mass transit introduced in the city.

❖ Therefore, study the characteristics of this mode and its passengers are very important in setting up the policy, control the flow and management of its operation especially the role of this mode in the future.

1-5 Methodology Of Research

1-5.1 Introduction

Phnom Penh is the administrative, commercial and cultural center and the capital of Cambodia. Its transportation system and service is very far behind from other capital cities in the region because this sector has been left for three decades due to civil war and no maintenance efforts have been done. Recently, this sector has been concerned the city hall in terms urban transport issues.

1-5.2 Study Area

Obviously, before the work is done, study area must be clearly defined in order to facilitate the data collection. The study areas include the seven districts in Phnom Penh City. Those districts consist of markets, hospitals, factories, schools and special corners where the surveyors chosen for interviewed and gathered information, see figure 1-3 the location of survey.

1-5.3 Methodology

Two times survey, first in the middle of March and April, 550 interviewees and the second survey in July, 391 interviewees. The first survey was about passengers used motorbike-taxi only and the second was about passengers used all transport modes and shares of those modes, see table 1-5 for detail of survey. Three areas of information have included in the methodology of study, the statistics, Literature and the interview that is done by En-route interview. En-route interview including passengers and drivers at selected locations such as markets, in university campus, employment areas and some strategic corners. Some cases, questionnaire form distributed to selected passengers and drivers then collected back to

meet the required number of sample. Questionnaire form includes travel information and household information.

Table 1-5 Summary of Survey, 2002

	Number of Samples			Function	Location
	1st Survey for trips by motorbike taxi and its drivers *(Mid. March-April, 2002)*		2nd Survey for trips by all transportation modes *(July, 2002)*	-Govt.officer -Sellers -Students -Housewives -Workers -Polices	-Market -University campus -Employment areas -Home -Near hospital, hotel and some corners -En-routes
	Passengers	Drivers	Passengers		
Male	234	129	192		
Female	316	n.a	199		
Total	**550**	**129**	**391**		

1-6 Organization of the Thesis

The paper is organized as follows. Chapter II provides information related to the previous studied called literature review, which can be helpful in further analysis. Chapter III demonstrates the current situation about the transportation systems, services and its operation in the city. Chapter IV raises case study cities where there is similar transport modes serving in the cities. Chapter V gives the characteristics of trips by motorbike taxi. Chapter VI illustrates the characteristics of Motorbike Taxi drivers. Chapter VII demonstrates the problem structures and finally, the Chapter VIII provides conclusions and recommendations. It summarizes the whole task following the results and discussions and gives the judgement.
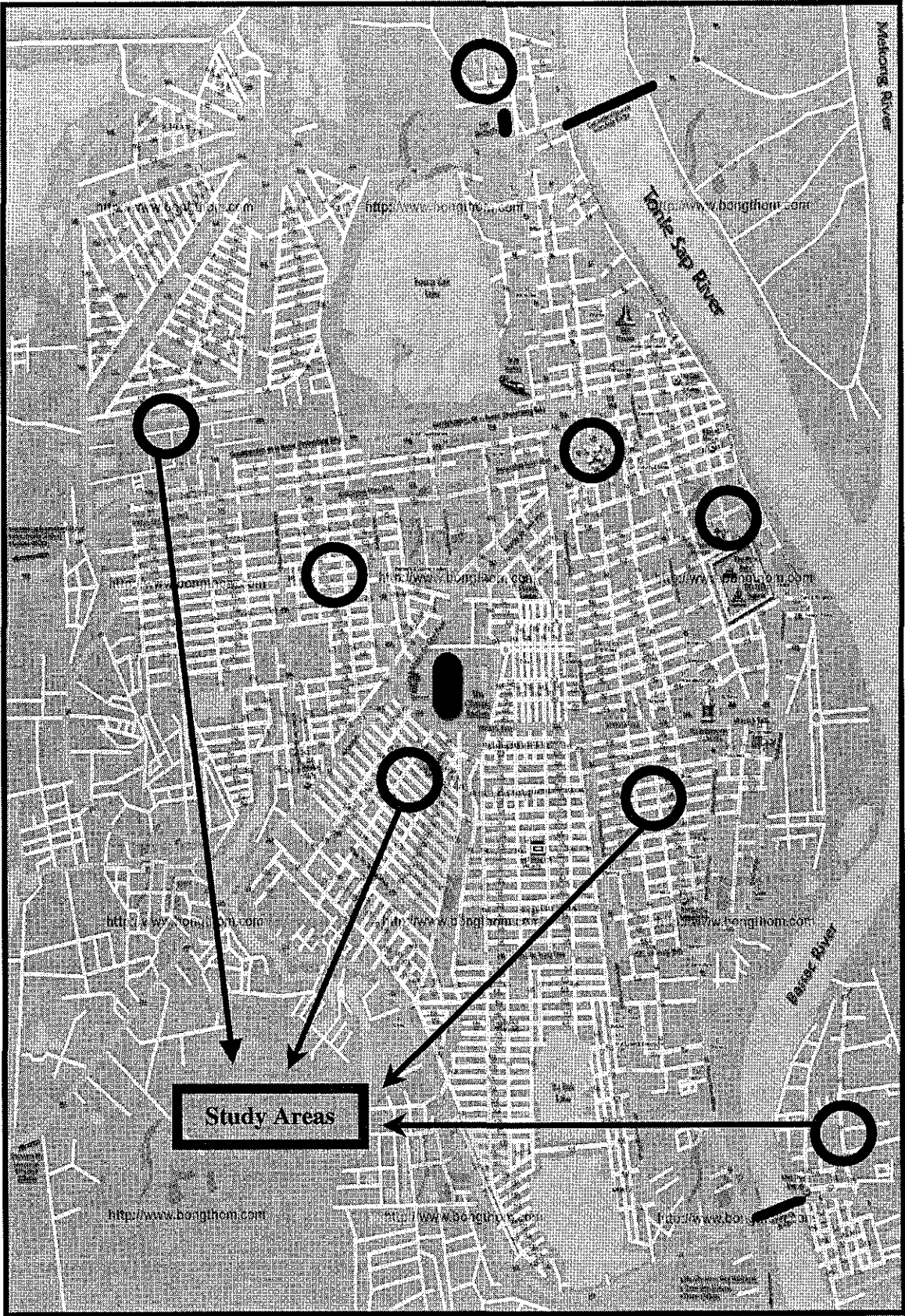
Fig.1-3 Location of Study Areas

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to provide a general picture of the current transport situation in the country, especially in Phnom Penh City. Recent relevant studies and reports are available will be reviewed, these will include plans and policies affecting the future of the industry.

2-1 National Issues Forum Report

On September 28, 2001, the Center for Social Development (CSD) conducted a Public Forum on *"Traffic Regulation: Implementation and Practice"* at the Russian Cultural Center, Phnom Penh. The purpose of the forum was to collect views, ideas and opinions about the successes and failures of implementation of Cambodian Traffic Law, and to find measures to strengthen the effectiveness of traffic regulation, in order to alleviate the high incidence of traffic accidents.

Members of the public who participated in the forum said that the traffic is so difficult due to the lack of knowledge of, or lack respect for, the traffic laws. Few drive carefully and responsibly and there are many underage drivers on the roads. Most of the dangers were caused by people driving at high speed, which cause accident with high death rates. At corners, traffic approaches from both the left and right, making it difficult to see. Further, they accused parking station concessionaires of allowing drivers to overload their cars with passengers and luggage in order to maximize income while ignoring the risk of accidents. Additionally, drivers do not respect pedestrians' right to cross the roads, and if they want to turn, they just do so immediately without giving way to oncoming traffic.

The attendees were also concerned the traffic authorities must exercise greatest honesty in educating the public about the traffic law. Such law must be implemented fairly by, for example when issuing tickets, giving official receipts to acknowledge payment of fines. A further issue was the use of sidewalks by street vendors and the chaotic parking along the sides of roads, both of which create traffic jams and badly affects public order in the city.

The government should stop the importation of the right-hand drive vehicles claimed the Parliamentarian for Kandal and Phnom Penh. Also he was concerned that the morality of Cambodian people is so low, that may regard person's life as cheaper that the cost of vehicle repairs. The government and relevant institutions should therefore take measures to educate citizens to respect the law and high-ranking officials should set a good example for the public.

The followings are the recommendations from the forum;

2-1.1 Recommendations from the public

- ❖ Motorbike-taxi drivers should be educated in traffic law
- ❖ Police should ensure discipline along the streets near to the markets
- ❖ Department of Public Works and Transport should have signs on major roads and especially in front of schools and at public gathering places, to educate drivers about vehicle control and the safe use of headlights
- ❖ The authorities should be enlarged the four crossroads for easier traffic
- ❖ Vehicles that violate the traffic law should be fined, but registration plated should not be revoked
- ❖ Station concessionaires should be comply with the terms of the registration book
- ❖ Heavy trucks should not be allowed to drive in the city during the day
- ❖ Garbage collection vehicles should only operate at night
- ❖ Strict measures should taken against speeding young motorists
- ❖ All fines should be properly ticketed
- ❖ All business vehicles should have insurance
- ❖ Relevant ministries should provide more education on traffic law through TV and Radio
- ❖ The responsible authorities should instruct school principals to provide more training for school bus drivers
- ❖ Stricter measures should be found to stop drunk and drug-affected drivers
- ❖ There should be more sidewalks for pedestrians
- ❖ Education about traffic laws should be incorporated into school curriculum.

2-1.2 Recommendations from the Relevant Institutions and Authorities

❖ Market sites should be enlarged, with separate parking lots for cars and motorbikes to alleviate traffic jams

❖ There should be greater control over driving school to ensure the quality of the teaching

❖ Leaders should set a good example to citizens

❖ The relevant institutions should have strict measures for controlling overloaded vehicles and when importing vehicles should consider whether the weight of a vehicle is in proportion to the standard of Cambodian Roads

❖ There should be no further importation of right-hand drive vehicles and there should be greater limits on the use of "powerful" registration plates for example police, military, government and parliamentary plates.

❖ The relevant institutions should pay greater attention to fulfilling their duties in relation to strengthening the traffic law.

2-2 Governance Challenges

Good governance involves participation, rule of law, transparency, responsiveness, consensus orientation equity, effectiveness and efficiency, accountability and strategic vision (UNDP, 1997). In the transport arena efforts aimed at better governance are needed to correct both market failure and administrative or government failings. Categories of actors and stakeholders in urban transport are numerous and their interactions complex. Too much urban transport decision-making is reactive to immediate problems, such as local traffic congestion, rather than being guided by a long-term strategic vision.

Transport is an area in which there is a great danger of corrupt practice; both at a small-scale (such as by traffic police) and at a very large scale such as improper influence on the award of major contracts, in city at all levels income.

Integration is vital in transport planning but is difficult to achieve. The planning of various sectors and modes of transport (including land use planning, development approvals, local roads, regional roads, expressways, railways, buses, pedestrians facilities, taxation policies towards vehicles, etc.) must all be integrated to some extent. Responsibility for decisions often rests with an inappropriate level of government (for example, where local public

transport initiative is stifled by the central government). However, currently many local governments face a shortage of trained staff able to handle transport planning effectively.

Respect for the rule of law is diminished daily by the widespread failure to establish enforceable and respected road rules or to enforce many of the existing road rules in an impartial and just manner. Petty corruption by enforcement officials can undermine many efforts to improve road behavior. Laws that are not enforced effectively come to be disrespected and even disregarded.

2-3 Driving Behaviors

The majority of drivers in the city do not seem aware of the danger and seriousness of traffic accident and the need to observe traffic safety rules. Most of these drivers can be seen to drive with the notion that if they act more aggressively, other road users would surely give way to them. Including the motorcycle drivers, most drivers in the city can be observed to behave with the following manners, especially the dangerous driving shown in Fig.2-3 below.

- ❖ There is no concept of "give way" to pedestrians on sidewalks, pedestrian crossings or at/near to bus stops or other public vehicle terminals.
- ❖ There is a lack of respect for "the right of way" of vehicles already traveling within the designated traffic lanes.
- ❖ There is no awareness of priority traffic stream at non-signalized intersection.
- ❖ Some even travel against the designated traffic direction just so they can ahead and cut into the opposite side of the road. This is a total disregard of traffic safety of other road users and should be strictly prosecuted.
- ❖ Drivers are also found to ignore the left turning prohibition measures. This is another serious traffic offence.
- ❖ Ignoring traffic signals (another serious traffic offence)
- ❖ Parking within or near to intersections (another traffic offence)
- ❖ Entering the intersections even though the downstream exit is already congested, thus creating gridlock situation when signal light changes.
- ❖ Rampant changing of lanes when traveling and keeping unsafe headway to the vehicle in front
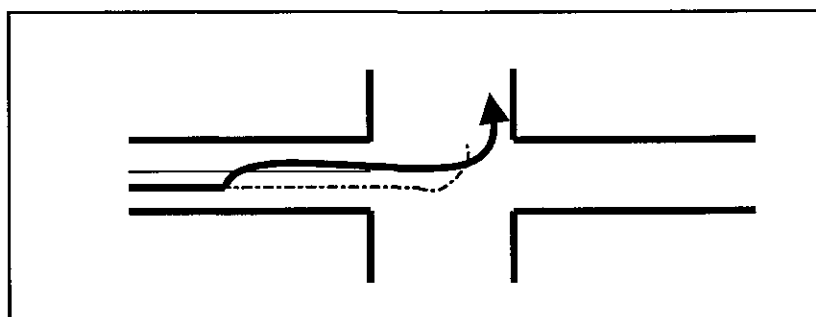
Fig.2-3. Dangerous Driving Behavior

Motorcyclists also have the following undesirable behaviors:

❖ Too many passengers are riding on motorcycle.

❖ Ignore the requirement to use safety helmets when driving. Many of them are seen to wear high heel sandals without realizing the danger they pose.

❖ Many young motorcyclists are driving without licenses. Stricter enforcement on underage motorcyclist should be carried out. (3% of the total reported traffic accidents involved drivers who are below 15 years of age).

Characteristics of Feeder Trip Mode

Table 2-3: Characteristics of Feeder Trip Mode of Inter-Regional Public Transport Passengers

Mode	River Ferry		Railway		Airport		Buses, Taxi-Buses	
	%	Reason	%	Reason	%	Reason	%	Reason
Motorbike-Taxi	**48**	Fast(32.3%), Convenient(24.2%), Safe(24.2%)	**30**	Fast(29.1%), Convenient(15.7%), Cheaper(35.8%)	-	Fast(10.7%), Convenient(17.9%), Safe(51.3%)	**76.2**	Fast(32.3), Convenient(24.2%), Cheaper(20.3%)
Own Motorbike	19		-		-		-	
Passenger Cars and Pickups (Taxis, Taxis-Buses)	26		21		80		-	

Source: JICA Master Plan Study, Phnom Penh 2001

Table 2-3 illustrates that motorbike-taxi is the most favor among feeder trip passengers among other transport modes. They use this mode to transit their journey before reaching the desired destination. For instance, to reach the ferry terminal 48% of passengers employed Motorbike-Taxi and for the Railway and Bus, Taxi-Buses Terminal share 30%

and 76.2%, respectively, In case of Airport people use passenger car or pickups, which shares 80%.

Summary of the Person Trip Survey

Items		Figures
Average Household Size		5.69
Average Household Income (Thousand Riels Per Month)		315
Average Vehicle Ownership Ratio Per Household	Car, Private Own & Company Own Total	0.24
	Motorcycle	1.22
	Bicycle	0.54
Driving License Possession (%)		6.7

Source: JICA Master Plan, Phnom Penh 2001

2-4 Future Plans of Signal Control and Operation

In coincidence with increasing traffic demands and improving the road network and the facilities, the signal operation should be improved. Thus a staged improvement plan proposed for the traffic signal facilities, considering the future traffic demand increases and effective signal operation.

Stage 1: From 2001-2002

❖ To operate signals with an isolated control according to a time schedule. The cycle time and splits can be changed based on time of the day parameters in weekday, Saturday, Sunday and Public Holiday.

❖ To signalize all the 33 intersections

Stage 2: From 2003-2007

❖ To operate signals along the main routes using a progressive control in accordance with a time schedule.

❖ The cycle time, splits and offsets can be changed based on time of day parameters in weekday, Saturday, and Sunday in order to permit continuous operation of groups of vehicles at a planned speed.

❖ Local signal controller may have a time clock adjusted automatically to accurate time in the box in order to coordinate with other signal timings. It is not preferable to install communication cables under the ground by MPP.

Stage 3: From 2008-2015

Stage 3 traffic control system should comprise of 2 main functions: Area Signal Control system and traffic information system. It is proposed to be introduced a computerized area signal system with a centralized traffic control center to Phnom Penh.

2-5 Transport Master Plan Conclusions

2-5.1 Transport Systems

❖ A bus favored policy by encouraging bus operation with coexisting of bus and 2-wheel vehicles is selected as the most appropriate transport system approach in view of traffic flow condition, system efficiency, environmental impact and social acceptance.

❖ This system is required particularly in the near future when the social and economic activities are revitalized with economic development and population increase, thus requiring the shift from Para-transit oriented public transport system (motodop) to a comprehensive system (bus).

2-5.2 Road Developments

❖ In the urbanized area where the road network is well developed, pavement improvement of existing arterials, collectors and local streets is in a very urgent need.

2-5.3 Public Transports

❖ Bus services planned to be operated first only on limited high demand routes and to be extended in the future based on the demand growth and road network

improvement. Accordingly, improvement of bus terminals, stops, shelters and depots is highly required to attract bus passengers.

❖ Other public transport modes such as taxi, motorbike-taxi is proposed to operate in accordance with their characteristics and function with coexistence of bus services.

❖ Policy on such co-existence shall be established including zone system for motorbike-taxi and traffic regulation of 2-wheel vehicles on major roads.

2-5.4 Traffic Management

❖ Traffic management is identified as an effective measure, especially in the urbanized area, to be implemented in the short-term with low cost, in order to prevent future deterioration of traffic condition and traffic nuisance as well as traffic accidents.

❖ Measures to be undertaken in the short-term include the provision of traffic signals improvement of on-street parking facilities, development of accident analysis system and implementation of enforcement and education.

2-5.5 Institutional and Capacity Development

❖ Organizational reform involving establishment of budget formulation unit, public transport management unit, and laboratory and data base formulation unit as well as urban transport research center is required.

❖ Human resource capacity is urgently needed to be developed in all fields covering top management and computer operation technique, and achieved through on-the-job training and foreign-assisted training program.

2-5.6 Institution and Finance

❖ The sub-degrees and details of present legislation related to transport are recommended to prepare and promulgate to ensure the transport system, including vehicle registration system, driver license system, among others.

❖ The fund for the implementation of the plan is expected to arrange through local fund, ODA and private participation is highly recommended to be encouraged in all possible ways.

2-6 Traffic Campaign

The Department of Public Works and Transport, the Traffic Police Office and the Municipality of Phnom Penh carried out a traffic safety campaign in the city, sponsored by JICA from January 27 through February 4, 2001.

The goal of campaign is to reduce traffic accidents and to promote smooth of traffic flow. The objectives and target groups are to educate the public on traffic safety knowledge and basic traffic rules and to educate drivers on traffic rules and safety driving.

The effectiveness of the traffic safety campaign was demonstrated to the City of Phnom Penh with its citizens appreciating its importance and positive impacts on the traffic conditions. If such a campaign is carried out regularly, the effects will be accumulated over time and eventually contribute greatly to decreasing traffic accidents while increasing road capacity and smoother traffic flow. In addition, through such a campaign, each driver can recognize that using appropriate driving manner by following traffic rules does contribute to his/her own benefit such as shorter travel time, degreasing dangerous situation, relieving frustration and so forth. Such learning will eventually enhance an improvement of driving manner.

CHAPTER III

CURRENT CONDITION

3-1 Urban Structure and Development

Phnom Penh is the Cambodia's largest and most important city. Phnom Penh is divided into seven districts. The city has been established for over 567 years in history,*See Fig.3-1*.
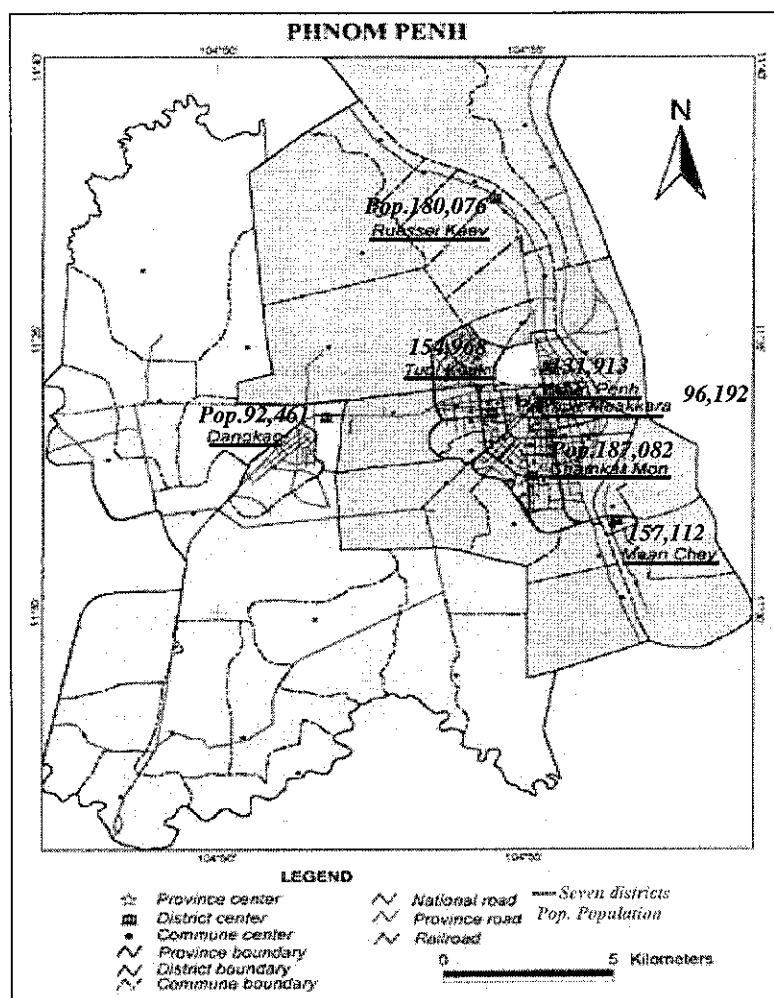
Fig. 3-1: The Boundary of Seven Districts of Phnom Penh City

Phnom Penh has an excessive concentration of urban activities. The high concentration of commercial activities attracts people to travel in and out of Phnom Penh. It has also generated development in surrounding area as a center of industry and trade.

The setting of urban and transport infrastructure development in Phnom Penh area shows that there are a number of access modes for people to travel within the city center to the surrounding areas. Both urban development and transport infrastructure development have

contributed to the high economic growth of the city; see table 3-1.1 for development comparison between neighboring countries and table 3-1.2 for employment by industrial group in Cambodia and Phnom Penh.

Table 3-1.1: Comparison of Major Development Indicators between Cambodia and Neighboring Countries

Factors	**Cambodia**	Lao PDR	Vietnam	Thailand
Surface Area	181	237	332	513
Population (1,000,99)	12,000	5,000	78,000	62,000
Pop.Density (pop./km2,99)	67	22	238	121
GNP (bil.US$, 99)	3.0	1.4	28.2	121.0
GNP per capita (US$, 99)	260	280	370	1,960
Pop. Growth Rate (%, 90-99)	2.8	2.6	1.8	1.7
Paved Roads (%of total, 98)	7.5	13.8	25.1	97.5

Source: World Bank (2000b)

Table 3-1.2: Employment by Industrial Group

Major Industry Group	Cambodia			Phnom Penh		
	Both	Male	Female	Both	Male	Female
Agriculture	4,202	1,935	2,267	32	14	18
Agriculture, Forestry	4,097	1,860	2,237	30	13	17
Fishing	105	75	30	2	1	1
Industry	352	168	184	84	35	49
Manufacturing	263	91	172	67	22	45
Construction	89	77	12	17	13	4
Services	954	523	431	273	158	115
Retailer	402	102	300	95	25	70
Hotel, Restaurants	28	11	17	13	6	7
Transport, Communication	121	113	8	36	35	1
Financial, Real Estate	17	11	6	7	4	3
Public Adm., Defense	187	168	19	68	59	9
Education, Health	116	71	45	19	11	8
Others	83	47	36	35	18	17
Total	5,508	2,626	2,882	389	207	182

Source: Ministry of Planning, Cambodia Socioeconomic Survey 1999

3-2   Urban Growth and Its Population

There has been a long-term trend to urbanization but that trend has accelerated significantly over the last 50-60 years and continues to growth, see figure 3-2.1 about the urbanization trends in Asian Countries. There are a number of reasons for this, as well as a number of results: some beneficial and some not.

It is estimated that over 50% of national economic output is generated in urban areas of developing countries. Since city is of such great economic performance, it follows that efficient functioning influences future national economic growth. The rapid increase in population causes a shortage of facilities to meet the increasing demand in such services as adequate housing, water supply, power and public transport. Figure 3-2.2 shows the urban population indicators in Asia and table 3-2.3 illustrates the population and household number in Cambodia and Phnom Penh in 1999.

In the first place the transport system has improved so that journey times has been reduced. Personal mobility has been enhanced by the increased use of personal rather than public transport.

Transportation is important in both economic and social terms. Transport policy can influence the development of urban areas in both the short term and long term. Enlightened transport policy can assist in alleviating endemic traffic congestion, which causes significant disruption to business and economic activities.

The high rate of urbanization, economic growth and rise in personal incomes are generating demands for personal mobility that threaten to engulf the city with level of congestion and air pollution.

The growing of the city need urban transport services, which increasingly relying on road transport modes such as motorcycle-taxi, buses, shared taxis. These kinds of transport cannot accommodate the demand of transport in the city due to their limited capacity and low level of services. This has lead to the increase of people using the private cars, which in turn is resulting in congestion and air pollution.

Table3-2.1: Urbanization Trends in Asian Countries

Countries	Degree of Urbanization (%)						
	1999	2005	2010	2015	2020	2025	2030
Cambodia	23	26.6	29.7	32.9	36.2	39.5	42.8
Thailand	34	23.7	26.2	29.3	32.5	35.8	39.1
Vietnam	20	20.6	22.1	24.3	27.3	30.4	33.7
Japan	79	79.8	80.9	82.0	83.2	84.3	85.3

Source: United Nation 1998 and ESCAP, 1999

Table3-2.2: Population and Development Indicators for Asia

Countries	Elderly Dependency Ratio	Urban Population	
		Percentage urban 2002	Annual Growth rate (%)
Cambodia	5	17	4.2
Thailand	9	31	0.6
Vietnam	9	20	2.2
Japan	26	79	0.3

Source: United Nation 1998 and ESCAP, 1999

Table 3-2.3: Households and Population by Stratum, Cambodia 1999

Household and Population	Cambodia	Phnom Penh
Number of Households	2,165,000	174,000
Population	11,561,000	958,000
- Male	5,590,000	460,000
- Female	5,971,000	497,000
Average Household	5.3	5.5
Average Income Per HH/month	80US$	150US$

Source: Ministry of Planning, Cambodia

3-3   Economy

3-3.1   Transition to Market Economy

Cambodia's civil war came to an end when the Paris Peace Accord was signed in October 1991. Elections were held in May 1993 under the auspices of the United Nations Transition Authority in Cambodia (UNCTAD), after which Cambodia seemed to enjoy relative political stability.

In Cambodia, a full-scale transition of a centrally planned economy to a market economy started after August 1994 when the *law on investment* was promulgated, with which the Royal of Cambodia intended to induce foreign companies to invest in Cambodia, see table 3-3 for the economic index in previous years that Cambodia had achieved after the transition to market economy.

Table 3-3: Economic Index, Cambodia

Items	1995	1996	1997	1998	1999 (Est.)	2000 (Pro.)
Real GDP Growth (%)	7.6	7.0	1.0	1.0	4.3	5.5
GDP (Usm$)	2.925	3.123	3.033	2.869	3.133	3.43
GDP/Capita (US$)	284	292	276	252	268	285
CPI, Consumer Price Inflation Rate (%)	3.5	9.0	9.0	12.6	9.0	6.0
Exchange rate (riels per dollar)	2,569	2,462	3,000	3,800	3,819	3,830

Source: Socioeconomic Development Requirement and Proposals, MEF

Note: Est. Estimate, Pro.: Projection

3-3.2   National Program to Rehabilitate and Develop Cambodia, NPRD

The National to rehabilitate and develop Cambodia (NPRD) describes two principles and six actions objectives toward the rehabilitation and development of Cambodia. *The first principle* is that the Cambodian Government should plan and control the development process. *The second one* is that the government should be a partner of the domestic private sector. The six action objectives are:

❖ To establish the rule of law

❖ To achieve economic stability and structural reform with the aim of doubling the GDP by 2004

❖ To extend education and healthcare in order to build up human resources and to improve people's living standard

❖ To restore, re-establish and develop the infrastructure and public facilities

❖ To reintegrate the Cambodian economy into regional and international economies

❖ To emphasize rural development and to manage the environment and natural resources sustain ably.

The NPRD has the following three pillars supporting this development: (1) continued economic development, (2) sustained development of human resources, (3) sustainable management and use of natural resources.

3-3.3   Socioeconomic Development Plan (SEDP)

Regarding Cambodia as a nation with a market economy, the SEDP stressed the development of rural infrastructure (especially roads) and proposed the following policy agendas: *to introduce a market economy; to improve rural living standards; to promote and attract domestic and international private investment; to privatize state-owned enterprises, and to strengthen administrative services.* Focusing on the development of rural districts where 90% of poor population resides, SEDP intends to allocate 65% of public investment to rural districts (Note: on the completion of SEDP, 35% of public investment was allocated to rural districts, and 65% to urban areas).

SEDP proposed a developmental framework on the assumption that total amount of investment be US$ 2.2 billions during the period of 1996-2000.

3-3.4   Household Income

The average household income obtained by the person trip survey by JICA was 79 US$ per month. The future household income was assumed to be increase in the same rate as GDP per capita. The following tables show the future household income and vehicle forecast;

Table 3-3.1: Future Household Income

	2000	2005	2010	2015
GDP per capita (US$)[1]	215	267	350	447
	(1.00)	(1.24)	(1.63)	(2.08)
Average Household Income (US$)[2]	79	98	129	164
	(1.00)	(1.24)	(1.63)	(2.08)

Note: 1- Estimate by CDRI, (1993)
2- JICA Study Master Plan, Phnom Penh

Table 3-3.2: Vehicle Ownership Forecast

	2000	2005	2010	2015
GDP per capita (US$)	215	267	350	447
Average Household Income (US$)	79	98	129	164
Car Ownership Rate	0.16	0.23	0.29	0.30
Motorbike Ownership Rate	1.25	1.43	1.61	1.68

Source: GDP per capita was projected by CDRI

Table 3-3.3: Estimated Number of Motor Vehicles

	2000	2005	2010	2015
Car	48,132	77,000	120,000	166,000
Motorcycle	247,507	342,000	458,000	570,000

Source: JICA Master Plan Study, Phnom Penh

3-4 Urban Streets

Minor arterials streets cater for traffic with shorter trip length. The urban road network is well planned and developed. Table 3-4 shows a summary of the urban road inventory. The total length of the network is approximately 306 Km. The typical distribution of functional urban system as per American Association of State Highway and Transport Officials (AASHTO) is shown in table 3-4.1 below. A comparison for the case of urban roads in Phnom Penh shows that the urban road network has well balanced road hierarchy.

The total area of the streets in the urbanized area is estimated as about 5 Km^2 accounting for 18.5% of the urban area, which favorably when compares with other capital cities as shown in table 3-4.2.

Table 3-4: Urban Road Networks

Road Classification	Total Length (Km)	Percentage	Total Area (Km^2)
Arterial Road	56	18.3	1,431
Collector Street	30	9.8	618
Local Street	220	71.9	2,944
Total	306	100	4,993

Source: JICA Master Plan, 2001

Table 3-4.1: Typical Urban Functional System

Systems	Length (%)
Principal Arterial Plus Minor Arterial System	15-25
Collector Street System	5-10
Local Street System	65-80

Source: A policy on geometric design of highways and streets, AASHTO, 1994

Table 3-4.2: Road Area Rate in Phnom Penh and Other Capital Cities

Name of the City	Road Area Rate (%)
Washington DC	25
Paris	20
London	16.6
Tokyo (urban)	15.2
Phnom Penh	**18.5**

Source: JICA Master Plan, 2001

3-5   Road Condition in Phnom Penh City

The following problems of the present road system in the city can be pointed out as below:

❖ Well-balanced road network, but poor pavement condition of collector streets and local streets in urbanized area.

❖ Collector streets and local streets occupied by street vendors. Street vendors occupy not only sidewalks but also part of carriageway. Also the owners of shops along the road use sidewalks and part of carriageway as the extension of their shops. Customers coming to these shops and vendors park their vehicles (motorcycles and four wheel vehicles) on the street or side walks. All of these causes undesired road

condition as follows: i) Sidewalks are impassible for the pedestrians, ii) Carriageway becomes narrow and side friction to the traffic increases, and the traffic capacity of the road reduced.

❖ Inadequate road network, and narrow width and poor pavement condition of sub-urban roads. Present poor conditions of municipal roads in the suburban area are hampering these roads from fully functioning as road network. In addition, there are some areas, which is supposed to have potential of future development but not served by the present road network. Improvement of the existing municipal roads and new construction of some roads may be necessary.

❖ Inundation of Roads: many roads sections, especially in the urban area are often inundated during the rainy season. Malfunctioning of drainage/sewerage system is the major cause of inundation. The vehicles cannot pass the inundated sections and have to detour to passable major roads causing excess concentration and resultant traffic jam on the passable major roads. Inundation causes not only traffic congestion but also another problem. Flooded water tends to seep in to the ground and reduce the bearing capacity of the sub-grade of grade, substantially reducing the pavement life span. Therefore, rehabilitation of drainage/sewerage system is needed for road improvement.

3-6   Public Transportation in Phnom Penh

There are mainly eight (8) public transport modes currently operate in the Phnom Penh City. The typical feature of public transport in Phnom Penh is the absence of a city bus system and ordinary taxi service.

❖ Bus and taxi-buses, figure 3-7.3, mainly provide inter-city services. Bus terminals can be found at the central market. Private companies operate buses. There used to be the city bus system in Phnom Penh before, however, service had been suspended due to the deteriorated road conditions caused by the large number of motorcycles. On the other hand, taxi-buses are one of the most convenient public transport modes from/to provinces. Included under this category are vans, pickups and sedan type of vehicles; which are called "location" as painted in Khmer language on one side of the vehicles. Just like ordinary buses, taxi-buses have specific routes, but when these are disregarded and passengers are brought to their desired destinations,

they assume a taxi-like function. There are four terminals for taxi-buses in the CBD, mostly located near a market.

❖ There are 82 taxis in Phnom Penh, painted Yellow and White. These taxis usually wait for passengers at airport, serving as airport taxis. There is no ordinary taxi in the city.

❖ Motorbike-Taxi and Motorumok and Cyclo are the Para-transit modes in Phnom Penh. They are the most common public transport modes in the city, especially the Motorbike-Taxi. Because of its high level of service, in terms of frequency and door-to-door trips, the Motorbike-Taxi is regarded as the trunk public transport mode in Phnom Penh City. The Cyclo, which is a traditional three-wheel bicycle taxi, serves as a public transport mode in the CBD also. However, the number of Cyclos has drastically decreased from more than 10,000 to just 1,200 in recent years due to speed concern and their friction with other transport modes on roads. Motorumok usually caters to the suburban areas in Phnom Penh. This mode is used mainly by factory workers to commute to/from work and by farmers to transport their goods to the market.

❖ Royal Railways of Cambodia operates a 650 Km railway network in the country. See figure 3-7.5 the Phnom Penh railway terminal for departure. There is no urban railway service within the Phnom Penh Metropolitan Area like City Subway or JR of Yokohama and other cities in Japan.

❖ River transport, including navigable sections of main rivers, totals about 1,400 Km in rainy season and less than 650 Km at other times in the country. There is seven ferry jetties in Phnom Penh for public transport use: 3 for intra-city use and 4 for inter-city. See figure 3-7.6.

❖ Air transport network comprises 9 international routes and 7 domestic routes, centered at Pochentong International Airport. Total annual air passengers are approximately 800 thousand in 1999.

3-7   Public Transport Modes

3-7.1 Buses and Taxi-Bus Traffic

Main inter-city public transport mode is buses and taxi-buses, which is a shared-taxi with the word 'location' in Khmer painted at its side and composed by vans, pickups and sedans. Bus and taxi-bus terminals are scattered in the CBD (north, south and west) because of the arterial road network configuration. Especially, the heaviest traffic volume of bus and taxi-bus of 635 vehicles/day can be found at the north entrance of CBD (in front of the French embassy near the Japanese-Cambodian Friendship Bridge), because this point connects to Road No.6A, which has no alternative transport mode, such as railroad.

3-7.2   Bus and Taxi-Bus Terminals

Most of bus and taxi-bus terminals locate at strategic points for urban transport, such as markets. However, not only inside terminals but also adjoining thoroughfares are almost always congested because a large number of bus and taxi-bus traffic converges at limited terminal spaces.

3-7.3   Vehicular Composition of Taxi-Bus

A taxi-bus, see figure 3-7.2 while loading passengers, comprises a variety of vehicle types, such as vans, pickups and sedans. With the wide selection of taxi-buses, passengers can choose whichever type they prefer depending upon their travel circumstance, i.e. trip purpose, number of luggage and road conditions. On the other hand, it is necessary to control the entry of vehicles as taxi-buses, considering the aggravation of traffic congestion caused by complicated vehicular composition and the lack of ordinary city taxi service.

3-7.4   Para-Transit Transports or Supplemental Transports

In general, the term of 'Para-transit' is defined as supplemental transportation means to the trunk transport system. However, the main public transportation modes in Phnom Penh are the Para-transit such as Motorbike-Taxi, Cyclo, and Motorumok, because of the absence of

a mass transit system such as buses in the Municipality of Phnom Penh. There was a city bus system before, however, it was suspended because of mainly two reasons;

❖ The size of the city was deemed too small to operate a bus system
❖ The large volume of Motorbike-Taxi

Among the three Para-transit modes, the Motorbike-Taxi is the dominant mode of public transport in Phnom Penh.

i) Motorbike-Taxi

As motorcycles drastically increased in the 1990s, the Motorbike-Taxi, see figure 3-7.7, became a popular and convenient transportation mode, because of its high level of service in terms of cheaper fare, frequency and door-to-door services. They were used to transport people, with passengers (2 to 3 maximum, sometimes) sitting on the back seat. Number of motorcycles and Motorbike-Taxi are 76,225 and 6,098 in 1999, based on the survey done by the Department of Public Works and Transport in the Municipality of Phnom Penh.

The Motorbike-Taxi provides important service to the city and supports the urban activities in Phnom Penh. It may not be the most efficient system for the city, as contribute to congestion and traffic problems but it provides a substantial income for thousands of marginal families, including many students who support themselves by working as Motorbike-Taxi drivers. There is very high number of entrants into Para transit operation primary because of the following two reasons:

❖ There is no need to get license
❖ It is the easiest way to earn money to support families of low-income level.

ii) Cyclo

Nowadays, use of the Cyclo, see figure 3-7.1, as urban public transport mode is definitely unsuitable because of speed concern and its influence on the other transport modes on thoroughfares. However, the historical importance and uniqueness of the Cyclo should be taken into account. It is therefore recommended that Cyclos be allowed to ply designated areas, such as tourist zones, in Phnom Penh in the future.

iii) Motorumok and Motorkangbei

The main public transport system in the suburban area in Phnom Penh is the Motorumok. See figure 3-7.8, Usually, the motorumok serves rural roads, especially trunk roads such as the two-ways, two lanes National Roads in the suburban areas. It is considered dangerous to operate along these national road due to the faster and much heavier truck traffic. This observation has been borne out by the motorumok drivers interview survey in which one of the serious problems of motorumok operation pointed out by respondents is the accidents along trunk roads. Therefore, it is necessary to introduce mass public transport modes, such as bus, along the trunk roads in suburban areas. The motorumok can serve as feeder transport mode to the bus in the future.

A few recent years, there is new transportation mode called Motorkangbei (three-wheel motorcycles), see figure3-7.6, which can accommodate passengers upto five. It is also provide both comfortableness and inefficient for the citizens and city hall.

All supplemental transportation modes mentioned earlier play an important role in serving the both city residents in urban and suburban areas.
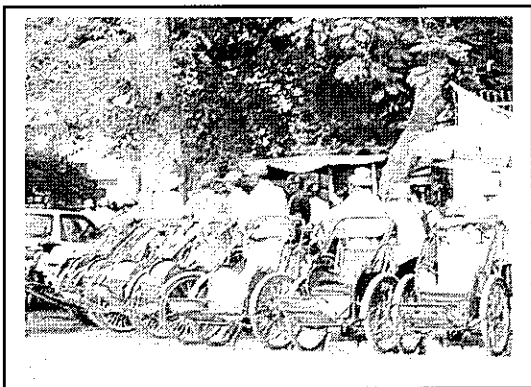
Fig.3-7.1 Cyclos (Tricycles)

Fig3-7.2.Inter-City Taxi-Bus
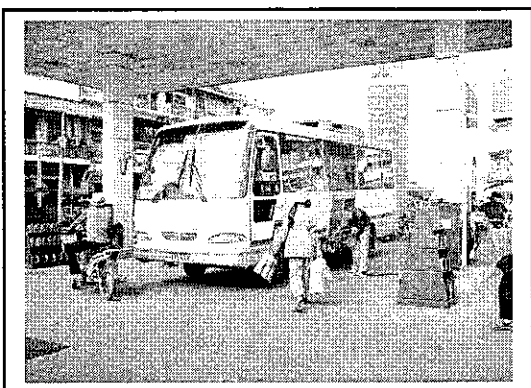
Fig.3-7.3 Intra City Bus, Phnom Penh
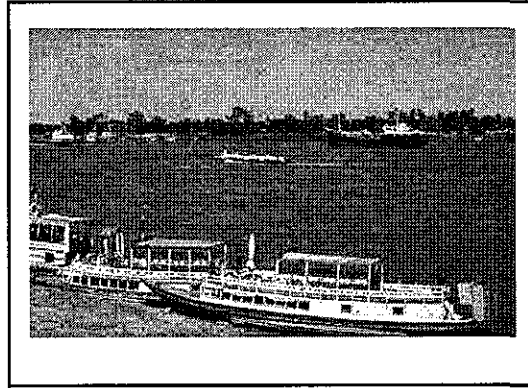
Fig.3-7.4 Inter River Boat Service
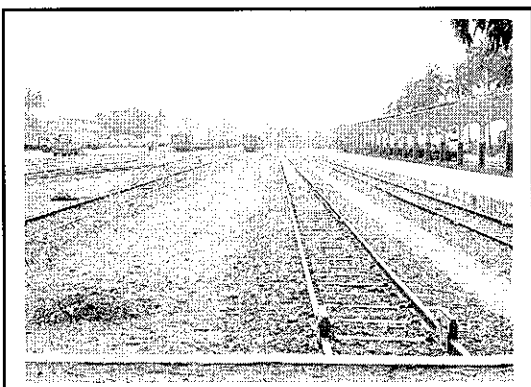
Fig.3-7.5 Railway Terminal, Phnom Penh
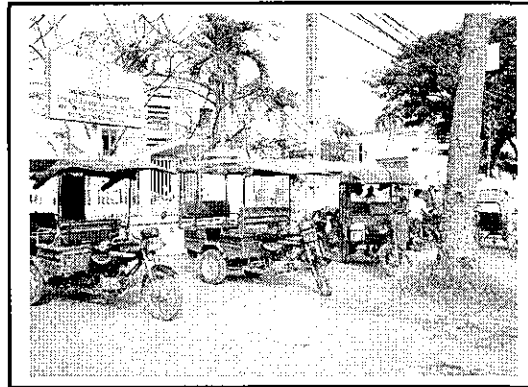
Fig.3-7.6 Motorkangbei-Taxi

Fig.3-7.7 Motorbike Taxi& Its Passengers

Fig.3-7.8 Motorumok & Transported Goods

3-8   Existing Bus Services

3-8.1 Bus Transport

The bus transport, which is centered at Phnom Penh, is composed of ordinary buses and taxi-buses.

Bus System

1-   Bus

There are 4 bus companies operate for the inter/international services from/to Phnom Penh. City bus operation started in 1996. There were originally 7 routes consisting of 2 circular routes and five radial routes, which were operated by Ho Wah Genting Transport Co.,Ltd a Malaysian firm. However, city bus operation was suspended after just a few months due to the deteriorated operational brought about the large volume of Motorbike-Taxi traffic. Therefore, Ho Wah Genting shifted from intra-city bus service to inter-city.

Two other bus companies operate inter-city services to Sihanoukville and Konpong Cham province from on street terminals near the Central Market.

There are currently 161 buses departing from the Central Market bus terminal everyday and the number of departing passengers is about 5,500 per day.

There is also an international long distance bus service to Ho Chi Minh in Vietnam (2 trips/week), operated by the Department of Public Works and Transport in Municipality of Phnom Penh.

2-   *Taxi-Bus*

The taxi-buses such as vans, pickups and sedans have 6 terminals, including one in the central market. These public transportation modes have fixed long distance routes but they are often changed depending upon the request of passengers; sometimes taxi-buses serve as in intra-city operation. The terminals are always congested because of the large number of participating taxi-buses.

3-   Absence of City Bus System and Ordinary Taxi Service

The typical feature of public transportation in Phnom Penh is the absence of a city bus system and ordinary taxi service. Phnom Penh used to have a city bus system; however, it was suspended within only a few months of operation due to the relatively small scale of service in the CBD compared to the city's population and the large volume of motorcycles plus convenient motorbike-taxis which provide fast door-to-door service.

The lack of city bus system causes the increase of motorbike-taxi and other informal modes. This eventually leads to traffic congestion in the CBD and to exposure of informal mode passengers to the danger of traffic accidents and inclement weather condition.

On the other hand, although there are taxis in Phnom Penh, they serve as airport taxi only. Lack of ordinary taxi service causes inconvenience to passengers who have business and private purpose trip in particular and to foreigners who are unfamiliar with Phnom Penh.

The lack of proper public transport system to cope with various trip purposes as mentioned above causes serious problems relating to safety, convenience of urban trips and proper utilization of urban facilities such as roads. The fast growing of transport means, where the urban transport network planning and construction is too slow, results in overloaded situation for old streets and causes traffic accidents.

On the basis of forecasts of Phnom Penh's average income growth rate per capita up to the years 2015 (US$350/year/capita) it can be said that motorbikes will remain as one of the major traffic means in Phnom Penh in the future.

3-8.2 Obstacles for Public Transportation

Similar to the experience of many countries have faced, public transportation in Phnom Penh also confronts with the same problems such as unattractive, poor service, high cost and requiring subsidies. The implication of these problems leads to a problem of private vehicles dependence and thus contributing to an increase in the number of traffic congestion, accidents and pollution. Furthermore, there is a problem of excessive in the number of transport operators competing in a small market, which sometimes leads to problems of price war and competing for passengers. In addition, we are experiencing a

problem of inadequate of capacity, which derives from a low number of buses to cover a service in many part of the country. This also contributes to the problem of having low frequency of service, and unreliable services.

There are many issues that have to be carefully dealt with in order to bring a public transport into a position where it can serve our community in a satisfactory level. These issues may be related to management and planning with the emphasis given to benefiting users of public transport as our ultimate objective.

3-9   Traffic Management

The traffic in the city is characterized by heterogeneous traffic (a mix of non-motorized and motorized modes of transport) and mixed land use pattern. This traffic is characterized by a lack of any effective channelization, mode segregation or speed control.

In contemporary society, motor vehicles play an indispensable role in transporting people and goods. However, a variety of problems traffic accidents, traffic congestion, environmental pollution, and massive consumption of fossil fuels, etc are becoming serious global problems and critical issues for all humankind.

In general, road traffic management movement in the capital city is quite chaos due to the fact that there is inadequate road signs, marks and traffic lights in many big roads and junctions. In the same time there is an increase in the number of imported vehicles into the country, especially motorcycles and cars.

Unmanaged growth of motorization is the root cause of many of toady's urban transport problems. Consequently, it has lead to a waste of resources, insufficient funds to develop and maintain infrastructure, distortion in modal choices and the generation of externalities (pollution and congestion). Serious consideration needs to be given the introduction to measures, which include, *inter alia,* restraint and demand management measures to control the growth and usage of motor vehicles, particularly the usage of private motorcycles and cars. Furthermore, education peoples all aspects of urban transportation problems are very urgent in all else.

CHAPTER IV

CASE STUDY CITIES

4-1   Introduction

The provisions of adequate, reliable and comfortable of urban transportation system are the challenges to be solved in most cities in the world. Cities are always face new problems arising from their transport systems as provision of transport is affected by many factors in a constant changing environment.

The cities in developing countries of the world are generally dependent for their urban transportation on road traffic, including buses, taxis, public transportation system, motorcycles, motorcars and other private means. The cities which depend mainly on road transportation are experiencing social and economic difficulties resulting from increased population and increase in the use of motor vehicles. There have been, for instance, increase in travel time and frequent traffic accidents due to chronic road congestion, as well as environmental problems such as noise, vibration and air pollution and increase energy consumption. These problems will only be further aggravated with increasing urban transportation demand so long as urban transportation continues to rely on road transportation.

To supplement the information concerning the urban transportation planning and regulation, Case Studies on urban transport development in two developing countries, Ho Chi Minh and Bangkok Cities are presented in this section. These cities represent cities at different stages of development and reflect the diversity in the form of and approaches to urban transport development; especially these cities have some similar transport modes and characteristics. Furthermore, these cities are deficient in provision of public transportation causing increased dependence on private motorcycles and cars leading to traffic congestion, accidents and other issues such as pollution that is hopefully to gain more data or best solution for urban transport issues.

Through the case studies, the good examples such as regulation, policies will be reviewed for appropriate condition in Phnom Penh City.

4-2   Various roles and Definition of Para-transit in developing countries

The public transport sector in many developing countries and transitional economies in recent years has seen the explosive growth of publicly available passenger transport services outside the traditional public transport regulatory system, often referred to as *"Para-transit"*. This does not necessarily mean that they are operating illegally, as in many countries the entry to the sector is effectively free, with operators subject only to the general rules of the road and law of the land.

Typically, Para-transit services are usually characterized by;

❖ Services that are usually scheduled and mainly on demand responsive routes, filling gaps in formal transit provision, such as public bus services and taxis.

❖ Vehicles that are operated are typically small, including motorcycles. Smaller vehicles are used partly because of the lower financial requirements, the flexibility of operation, and partly because the control over small vehicles is lax even in situations where entry to the large vehicle market is strictly controlled. The vehicles used are also very simple, and include non-motorized vehicles, motorcycle-taxis and motorized rickshaws.

Para-transit services provided by informal operators have the following characteristics;

They are *"non-corporate"*, usually operated as single person enterprise, although frequently with a vehicle owner who is not operator. Often the drivers pay daily fees to the owner incur operating and maintenance costs and keeps all revenue in excess of the fee. This gives a high incentive to obtain paying passengers by all available means. They are often outside the tax system or benefit from favorable treatment of the non-corporate sector. They may also have advantage in competition with public sector operators with costs inflated by minimum wage regulations.

Para-transit performs many roles-in some countries it is the dominant mode of public transport "of the poor, by the poor". It also supplements a declining formal sector or complements the formal sector by providing different service in identified market niches. In other countries, it increasingly competes directly with traditional providers.

Para-transit also provides a range of services including;

❖ Feeder services linking inaccessible housing areas to the main transport routes;

❖ Local distribution in accessible areas that are not served by conventional public transport;

❖ Trunk services complementing or competing by quality differentiation with, the formal sector on major routes;

❖ Direct longer distance services in area where the formal sector supply is spares or infrequent.

Para-transit services also represent a very significant entry point to urban employment for rural-urban migrants and those with the lowest levels of education and lowest incomes. Informal transport is often the mode of transport "of the poor" as well as "by the poor", particularly in lower income countries such as Cambodia, Vietnam and Laos. It is usually market responsive, provide access to the poor areas, and direct routing, speed and flexibility of service. This high degree of market responsiveness means that there may be little need of government support or economic regulation.

Despite these advantages, informal transport is perceived as;

❖ Resulting in competitive pressure that leads to excess capacity, low load factors and consequently anti-social and often dangerous operating practices, in terms of road behavior, and is associated with crime and violence;

❖ Contributing to urban congestion and adverse environmental impacts resulting from the use of small, old and ill-adapted vehicles;

❖ Undermining of basic network of services.

Two economic distortions have contributed to the rapid expansion of informal services in small vehicles. *First,* there is often an excess supply of labor in urban areas co-existent with minimum public sector wage rates and inefficient operation for the formal operators. *Second,* in the absence of any pricing system for the use of scare road space or adequate proxy priority given to large vehicles, the informal sector small vehicle is able to provide a faster and sometimes cheaper service than formal operators. As a consequence, totally unregulated entry in low-income countries is likely to result in a higher level of congestion and environmental impact than is socially desirable.

These form important reasons why any regulatory framework must embrace the formal and informal public transport sectors. Government should examine why Para-transit exists in any case, and then try to identify a regulatory and administrative framework within which the potential of the sector can be mobilized and developed.

4-3   Ho Chi Minh, Vietnam

4-3.1 Introduction

Vietnam is experiencing rapid urbanization and motorization owing to economic development after the introduction of Doi Moi policy. Urban transportation problems such as traffic congestion and accidents are becoming important challenges for the nation's two major cities of Hanoi and Ho Chi Minh. This study outlines the current status and issues of motorcycle-dominated urban transportation in Ho Chi Minh City, and reviews the present regulatory improvements for the promotion of public transportation and informal transport modes.

4-3.2 Characteristics of Urban Transportation

Motorcycle ownership rates at city are extremely high, nearing 300 vehicles per 1000 person and the modal shares of motorcycle and bicycle exceed ninety, percent 90%. High usage of motorcycle can be explained by three reasons;

   ❖ No driver's license obligation,
   ❖ Its asset value; and
   ❖ Convenience.

In Vietnam's large cities (Ho Chi Minh and Hanoi), three kinds of private transport means have been popular and increasing number of bicycles, motorbikes and cars. The shortcoming of public transport in the city is one of the major reasons for the increasing the number of private traffic means. Table 4-3.1 shows the motor vehicles registered in Ho Chi Minh City in 1997 and the number of motorcycles registered exceeded one million.
In Ho Chi Minh City, the total number of private two wheel traffic means is over two millions vehicles, of which almost 600,000 were motorbikes (1991). Motorbikes have accounted for 31% of the total number of two wheel traffic means.

Table 4-3.1: Vehicles Registered in Ho Chi Minh City, 1997

Type	Number
Trucks	14,073
Company Operated Bus	591
Vans and Small Trucks	1,082
Small Buses	1,601
Standard Car Taxis	2,712
Three Wheeled Taxis	1,935
Cars	194,777
Motorcycles	1,288,754

Table 4-3.2 Registered Motor Vehicles in HCMC

Year	Cars	Motorbikes
1986	30,738	306,340
1988	39,428	359,456
1989	44,336	361,818
1990	48,829	443,737
1992	70,900	599,729
1997	194,777	1,288,754
2000	-	1,500,000

Source: HCMC Traffic Police Division

The table 4-3.2 shows more than five times increasing of registered motor vehicles in HCMC from 1986 to 2000. The Ministry of Transport and Communication (MoTC) said traffic jams in Hanoi and Ho Chi Minh are causing $230 millions in losses a year or VND9.7 billion ($65,000) a day. Last year around 2 millions motorcycles were sold and every year sees more people switching to cars. A total of 20,000 new cars hit the country's roads, in 2001 a 40% rise in the previous year. Clearly the increasing number of vehicles on the road reflects the growing wealth of a country that is rapidly strengthening its economy. But in addition to traffic congestion, this new affluence is bringing increased traffic accidents and air pollution in the city. The authorities fear congestion and air pollution are only to get worse as the economy grows.

4-3.3 Urban Area, Population, Development Framework and Strategies

Master Plan of Ho Chi Minh City expects that population will be doubled by 2020 and urbanized areas will be largely spread out beyond the city boundaries. The plan targets to develop decentralized spatial structure with expanded road network. The study estimated the capital requirement, but its financing sources are not so fully examined because both cities' detailed budgets have not been disclosed. Table 4-3.3 illustrates the development framework in both cities, Hanoi and Ho Chi Minh. The population of Ho Chi Minh City is over 5 millions. As the country becomes urbanized, the number of urban centers, the average size of urban centers and the urban population are increasing rapidly. Consequently, the demand for urban transportation is exploding, resulting in rapid motorization, serious traffic congestion, and deterioration of urban environment and unplanned sprawling of the city. It has been recognized that the pattern of urban growth is

not sustainable and that the urban transport sector play a fundamental role in addressing these issues.

Table 4-3.4 outlines the strategy's projected level of urbanization in Vietnam. The strategy raises the following issues for immediate importance;

City Size: the recommendation prescribing city size should be perusing with caution. International experience suggested that there is no optimal size of a city. The larger the city, the more jobs are created. The larger cities also tend to be more efficient than smaller ones. For example, labor and productivity in Paris are respectively 34% and 27% higher than in the whole France.

Table 4-3.3: Development Framework

		Present	Projection/Plan	
		1997	2005	2020
Population (000)	Hanoi	1,312	1,730	2,500
	HCMC	4,990	6,200	9,000
Road Space Against City Area	Hanoi	7.7%	n.a	25-30%
	HCMC	7.0%	n.a	25-30%

Note: HCMC has much wider area thus the percentage of road space at present is lower than Hanoi. But in the city center HCMC has spacious grid roads.
Source: Each city's master plan 2020

Table 4-3.4: The current and future status of urban development in Vietnam

Items	2000	2010
Urbanization Level	23.5%	33%
Urbanization Rate	5%	5.5%
Urban Population	19 millions	30 millions
Ho Chi Minh	Over 5 millions	4.5 to 5 millions limit

Source: long term vision for urban sector in Vietnam

Urban Management: Cities differ in their size, economic strength and management capacity. However, eight areas in urban management that are common to all cities require priority attention. Those eight areas are Land, Co-ordination, Resource mobilization, Environment, Partnership, Information, Human Resources, Urban Upgrading; Community based development and urban poverty.

Migration: Ho Chi Minh registered 80,000 new arrivals each year. In HCM City, about 576,000 out of 700,000 migrants were not registered (1996). Those who are not registered are not entitled to access city services. The mobility of people and capital is the major determinant of the extent to which urbanization can contribute to economic development. In most cases rural to urban migration is a result of increasing demand for labor in the destination cities: a policy that restricts migration may harm the economy.

4-3.4 Measures to Tackle Problems

❖ To reverse the trend, the MoTC has submitted a list of measures to tackle traffic congestion in the city, which will include efforts to improve public transport systems, enlarge streets, taxes to discourage people from owning motor vehicles and the banning of traffic in some areas of the cities. The ministry said the measures required expenditure of $1.13 billion and $1.84 billion between now and 2005 for Ho Chi Minh.

❖ Attempts to increase the use of public transport have so far proved a problematic. Vietnamese urbanites are not in the habit of using public transport. Currently only 2 percent of Ho Chi Minh City's five million residents commute to work by public transport. Changing the habit of people requires time, but most importantly public transport must be readily available, reliable and welled services.

❖ Motorcycles and cars would be barred from some parts of streets of the city as a part of efforts to solve congestion and to discourage people from using private transport. The MoTC is also considering vehicle registration or road tax to restrict motorcycle ownership in the big city. There has also been discussion on halting vehicle imports.

❖ Proposal on appropriate portion of private transport means in the city up to the year 2010. The following mark-given method can be applied for evaluation as shown in table4-3.5;

Table 4-3.5: Development priority of private traffic means chosen by mark-given method

Main Factor	Public Transport	Car	Motorcycle	Bicycle
Income	3	1	2	3
Implementing Traffic Rule	4	3	2	1
Air environmental protection	3	1	1	4
Road Safety	4	2	1	3
Occupying Road Surface	4	1	2	3
Requirement of vehicle park	4	1	3	4
Total	22	9	11	18

Note for the mark: 4-Good, 3-Fair, 2- Average, 1-Bad
Source: Project KC.11.06.03, Draft-National Institute for Urban and Rural Planning-1994

❖ Relationship of Urban Scale and Transport Means Selection: City scale is one of the most important factors affecting transport means selection. According to urban planners, travel time from residential area to working place should not exceed 30 minutes (including time walking to public station). To meet this target, maximum travel distances for each transport means, on the basis of average travel speed, can be seen in table 4-3.6 below.

Table 4-3.6 Maximum travel distances for every kind of traffic means

Traffic Mean	Average Speed (Km/h)	Max. Travel Distance (Km)
Bicycle	12	6
Motorcycle	35	17.5
Car	30	15
Bus	30	10

❖ Transport development strategy for Vietnam's city up to year 2010, public transport should meet 40% passenger transportation demand in urban area. The remaining 60% will be met by other transport modes, of which, bicycles 30%, motorbikes 20%, Cars 5% and other 5% (taxis, cyclo, walking etc.)

4-4   Bangkok, Thailand

4-4.1 Introduction

Bangkok has an estimated population of 7.3 millions spread over an area of 1,568 sq.km. The primarily served by a road-based car dominated transport system. In recent year, impressive road infrastructure development has taken place, with the involvement of both public and private sector, to alleviate the city's traffic congestion problem.

Bangkok is heavily dependent on private cars. Compared with other Asian Cities in the region, both the level of passenger car ownership and car use are significantly higher, and are still increasing at a rapid rate. Roads cover an estimated 11 percent of the urbanized area in Bangkok. A wide variety of public and private transport modes provided by formal and informal sector serve the transportation needs of Bangkok. The public transport modes include buses of various types, rail transit, boats and ferries, and a wide range of para-transit modes and informal transport including taxis, samlors (3 wheelers), silors (4-Wheelers), vans, and hired motorcycles. Buses carried 41 percent of total passengers compared with 23 percent by car, 14 percent by motorcycles, 5 percent by taxis and about 15 percent by walking and other modes.

The Bangkok Metropolitan Region (BMR), the most urbanized area in Thailand, is probably best known for its incredible traffic congestion. Everyday there are millions of people traveling in the road network, which has never seemed to be sufficient for the last growing demand. Now that over 90% of the total trips depend solely on road transport, a large number of economic activities are being obstructed and suppressed by the inefficiency in transport system.

4-4.2 Number of Privately Owned Automobiles

So far, Bangkok's most popular modes of travel are passenger cars, buses and motorcycles. All of them share the same congested road space. The motorcycle is probably the one of the fastest way of travel in this heavily congested road network. But sometimes it also obstructs the movement of other modes.

It can be seen that over acceleration of economic growth without sufficient infrastructure development plan may result in a number of problems. And these problems, on the other hand, cause hundreds of million-bath worth of economic loss every year. Traffic congestion in BMR is the prime example for this matter.

Bangkok has a large Para-transit fleet of 49,000 licensed taxis; 7,400 three-wheeler Tuk-Tuks; 8,400 silor-leks (small 4-wheelers) and about 40,000 hired motorcycles (which provide services in the lanes). Table 4-4.2 provides the statistic of number of vehicle registered by type in Thailand and Bangkok in 2000.

Table 4-4.2: Statistics of the number of new vehicles registered by type in Thailand, Year 2000

Type of Vehicle	Thailand	Bangkok
Total Vehicles Under Motor Car Act, 1979	938,836	249,910
-Sedan (Not more than 7 passengers)	102,875	69,185
-Microbus & Passenger Pickup	9,972	6,955
-Van & Pickup	133,270	56,834
-Urban Taxi	3,439	3,407
-Motor Tricycle Taxi (Tuk Tuk)	191	-
-Motorcycle	682,929	112,850
-Others	6,160	679

Source: Department of Land Transport, Ministry of Transport and Communications

4-4.3 Transportation Services

i) Taxi Services

There are two kinds of taxis, one with meter and the other not. As for taxi with meter, 34,500 are registered. In the charge, the first 2 Km is 35 Baht. Afterward, it goes up 3.5-5.5 baht every 1 Km and 1.25 baht every 1 minute for waiting time. As for taxi without meter, 13,500 are registered and charge depends on the negotiation with the driver.

ii) Tuk-Tuk and Silor

Tuk-Tuk is a three-wheeler with the capacity of three people and Silor is a four-wheeler of 6 people. Total of 7,400 vehicles are registered for both types and carry 150,000

passengers per day. These cars can run in narrow Sios and crowed roads because their body is small allowing easy maneuver in the heavy traffic. The charge depends on the negotiation with the driver, but it is the same level as taxis.

iii) Motorcycle-Taxi

Though the motorcycle taxi was used originally within Sios, they now operate on trunk roads as well because of increasing traffic congestion. Now, 40,000 motorcycle-taxis registered and the number increases rapidly in recent years. However, accidents involving two-wheeler vehicles are increasing, so the law obliges wearing helmet. Motorbike taxi drivers can be identified by their colored and number vests. For short journeys they are fastest way to get around as they can dodge in and out of other traffic.

4-5   Urban Transport Problems

In 1990 it was estimated that 45% of the world's population lived in urban areas. Of these 2.4 billion people almost 41% lived in Asia. By 2020 half of population will live in urban areas and Asia will contain more than half of the world's population. This means that 1.5 billion more people will be residing in urban areas in Asia by 2020.

This drift to urban areas, which can be explained from economic standpoint, causes a number of problems which if unresolved will limit the ability of the city to support the population. The rapid increase in population causes a shortage of facilities to meet the increasing demand in such services as adequate housing, water supply and public transport.

Transportation is important in both economic and social terms. Transport policy can influence the development of urban areas in both the short and longer term. Enlightened transport policy can assist in alleviating endemic traffic congestion, which cause significant disruption to business and commercial activity and causes higher than necessary distribution costs in urban areas.

Congestion is a common mark of motorization in most growing cities. The central parts of Bangkok are congested, with weekday peak hour traffic speeds reported to average 10 km per hour or less. Delays due to congestion account for a significant proportion of the total trip time, the estimated social cost of congestion could be enormous.

Air pollution from motor vehicles have become a significant health problem in the region with people, in some cities spending three hours a day traveling to and from work in the polluted road environment. Most pollution is caused by diesel and petrol driven motor vehicles. The threat to health has significant economic and social consequences.

4-6   Public Transport

Public transportation has a very important role in urban transportation. Many cities such as Tokyo, Singapore where the modal share of public transport is 70 per cent or more of total person trips are deemed to be public transportation oriented. In Bangkok, the modal share of public transport varies between 40 and 60 per cent of total person trips. In most of those cities, the majority of the common people, the poor and other disadvantaged group are very heavily dependent on public transportation. Compared with private cars, public transportation is more sustainable on economic, financial, social and environmental grounds. However, the fallings of public transportation have become the major challenges faced with many cities such as Phnom Penh City and HCMC. Dissatisfaction with the level and quality of public transportation services leads those people who can afford to it to turn to private mode of transport.

4-7   Concluding Remarks

In cities of developing countries, population growth rates 3-5% are common. Population growth leads to increased demand for travel and population pressures, which in turn leads to spatial expansion of urbanized areas and to increase journey lengths. Parallel growth in city economies, and household and personal incomes also lead to further increases in travel demand, car ownership and car use. In Asia, Singapore represents an example of what must be one of the most efficient urban transport systems in the world and Bangkok provides an example of one of the least efficient and congested city in the world. Transport technology ranges from the most sophisticated in Japan (monorails, linear induction motors, automated guided transit systems, people movers, etc.) to most simple in Cambodia (walking and cycling). For the two cities above, it is expected that they will continue to experience high rates of vehicle population growth, particularly in private vehicles, for many years to come. The number of vehicles in Bangkok grew more than sevenfold between 1970 and 1990. Bangkok currently has an estimated 2 million motorcycles. Ho

Chi Minh has about 300 motorcycles per 1000 persons. This is partly due to the government policy, which has significantly influenced the growth of motor vehicles in the cities. Efforts must be made to use more effectively what exists rather than try to build more infrastructures in an attempt to cater the demand and to cope with the traffic congestion.

The high rate urbanization, economic growth and rises in personal incomes are generating demands for personal mobility that threaten to engulf the cities with levels of congestion and air pollution. The problems confronting urban transportation fall in two categories. The first concerns short-term measures that utilize traffic management techniques, which can be adopted without the need of large amounts of money, and there are longer term planning measures, which can be used to try to reduce the growth of population and improve the efficiency of existing transport systems in urban areas which usually require careful planning and large amount of investment.

Fig.4-7 Modes Split Among Comparison Cities including Central Tokyo
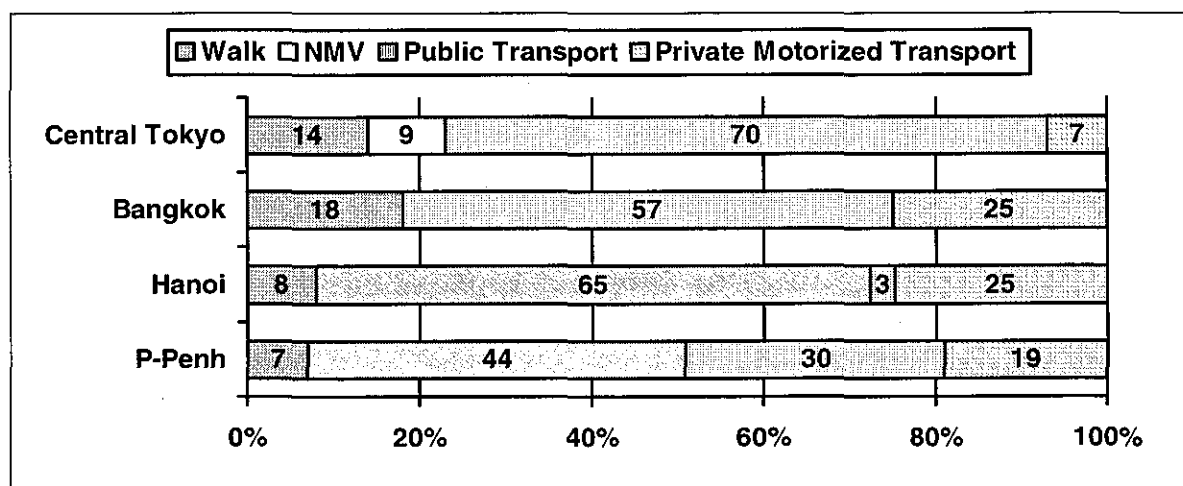
Source: Midgley, 1994

According to the statistic as depicted in figure 4-7, Phnom Penh and Hanoi Cities have shown that NMV is still the dominant mode in these cities. But in case of Bangkok and Central Tokyo, Public Transport is the dominant mode. Public transport supply is drastically low in Phnom Penh and Hanoi as shown in the figure, only 3% used public transportation, while private motorized transport share (primarily motorcycles) increases and varies between 15 to 25 %.

Table4-7 describes the summary of the urban and transport characteristics in comparison cities.

Table 4-7 Comparison between the three cities

Urban & Transport Characteristics	City		
	Phnom Penh	Ho Chi Minh	Bangkok
A- Urban Characteristics			
1-Total City Population (million)	Over 1.1	Over 5.1	Over 7.2
2-Urban Pop. Growth Rate (%), 2002	4.2	2.2	0.6
3-Area (sq.km)	490	2,100	1,568
B- Transportation Characteristics			
1-Total Road Length (km)/area	18.5	7.0	11.0
2-Total No.of Motorcycles	247,507	~1.5 millions	~2.0 millions
3-Motorbike Taxi			
❖ Schedule	On demand	On demand	On demand
❖ Route	Irregular	Irregular	Regular
❖ Price	Negotiation	Negotiation	Negotiation
❖ Capacity	1-4	1-3	1-2
❖ Service Niche	Short trip, feeder	Short trip, feeder	Feeder, some long distance
❖ Uniform & Number	No	No	Yes
C- Regulation	No	No	Yes and No
D- Congestion	Yes	Yes	Yes
E- Demand	Yes and No	Yes	No
F- Supply	Too many	Too many	Too many
G- Safety	No	No	Better
H- Environment	Yes	Yes	Yes

CHAPTER V

CHARACTERISTICS OF TRIPS BY MOTORBIKE TAXI

5-1   Introduction

Prior to embarking on the analysis, a significant amount of work is necessary to accumulate the information that drives the analysis process. Therefore, the survey is conducted two times; the first time survey was conducted during March-April, 2002, with the targeted passengers are those who used to take the motorbike-taxi. To make sure that those taken the motorbike-taxi or not, the preliminary question was asked. When we approached the potential passenger, the question is *"Have you ever taken/hired the motorbike-taxi?"* If yes, then we asked for favor from him/her in sharing the time helping answer the following questions shown in the questionnaire form. See Appendix.

Information on how, when and where people are currently traveling is obvious importance in the forecasting process and analysis. This information or we can say the characteristics of passengers, drivers as well as transportation systems per se, is studied to determine the underlying factors causing people to make certain travel decision. To be able to analyze trip making, information such as where the trips come from, where they go, by what mode, for what purpose and the characteristics about trip maker and activities at the origin and destination of the trip are needed. This information is termed origin and destination data. See Appendix for detail information about O-D, and other questions, (Questionnaire Form).

The total number of interviewees was 550, which female and male shared 57.45% and 42.55%, respectively for the first survey. The second survey was conducted in the month July 2002. This time the survey interviewed all passengers using transportation modes within the Phnom Penh City. This means that those who we approached will be asked or handed form to complete the questionnaire about their characteristics and behaviors in utilizing the transportation mode. The total number of interviewees was 391, which female and male shared 199 and 192, respectively.

Occupation of those interviewed includes Government officials, Students, Housewives, Freelance, NGOs staffs, Workers, Ordinary Citizens and Sellers.

Location of interview: In and Surrounding Market, University Campus, High School, Employment Areas, Hotel, Hospital and Home as shown in the map, figure1-3.

5-2   The Composition of Passenger Trips by Sex and Age Group

The distribution of trips made by individual is influenced by the age structure and gender. In the sense of these, the Table 5-2 and Figure 5-2 have shown the shares of Motorbike-Taxis' passenger as follows:

❖ By all age groups female passengers use the motorbike-taxi more than male, 57.45% of female and 42.55% of male.

❖ In every group, except the age between 30 and 39, females make more trips than male (Fig.5-2). Male passengers used more as they employed for work purpose.

❖ The greatest use of this mode is between the age 18 and 24, which shared 56.9% of all ages and follows by the age group 25 and 29, which shares 13.8%.

❖ This mode is not attracted among the age up to 17 years old and the age of 40 years old and older, which shared 8.16% and 9.14%, respectively.

It revealed that passengers age between 18 and 39 are favoring in this mode, which shares 82.7% and female's share is higher than male because most of females' passenger are housewife and sellers in market. They use this mode for home-based market.

Males' passenger age between 30 and 39 used this mode more than females' passenger as it is easy to access, handy mode, cheap and fast and they use this mode for home-based work purpose. See trip purpose in figure 5-4.

As for passengers age less than 17 and over 40 use this mode less if compared to other age's people because it is not yet attractive, safe and reliable to them or they have their own motor vehicle or other transport mode. While the greatest usage of this mode is age between 18 and 24 because they used for home-based school or university, see trip purpose in figure 5-4.

Table 5-2: The Composition of Motorbike-Taxis' Passenger Trips by Both Sex and Age Group

Sex / Age (Yrs)	Male	Female	Total
Up to 17	2.36% (13)*	5.80% (32)	8.16% (45)
18-24	23.1% (127)	33.8% (186)	56.9% (313)
25-29	6.70% (37)	7.10% (39)	13.8% (76)
30-39	7.80% (43)	4.20% (23)	12.0% (66)
40-49	2.00% (11)	5.10% (28)	7.10% (39)
50+	59% (3)	45% (8)	0.4% (11)
Total	42.55% (234)	57.45% (316)	100% (550)

*The number in the parentheses is the number of passengers interviewed.
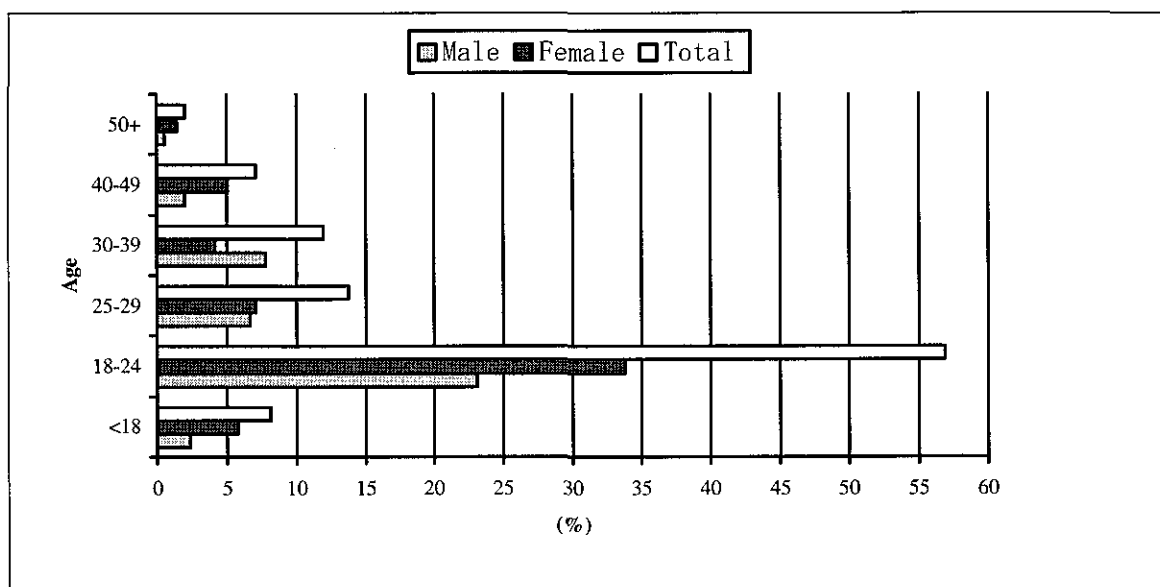Source: 1st survey, April 2002

Fig. 5-2: Shared by Both Sex and Age Hired The Motorbike-Taxi

5-3   Trip Origin

People make their trips from one location to another location called origin and destination trip. To understand the trip origin of the city residents by motorbike taxi, question no.1, see appendix, was asked to the passengers we approached. The results in Table 5-3 and figure

5-3 illustrates that 63% of all respondents used this mode from home and followed by from market, which shares 11% and other origin as shown in the table and figure.

Table 5-3 Trips Origin made by motorbike taxi

	Home	Market	Univ./school	Work	Others
Up to 17	9.38 %	5.48 %	29.85 %	2.98 %	5.41 %
18-24	56.80 %	46.57 %	52.23 %	55.22 %	56.75 %
25-29	15.06 %	10.95 %	11.94 %	19.40 %	13.51 %
30-39	11.11 %	15.06 %	4.47 %	16.42 %	18.92 %
40-49	5.92 %	20.55 %	1.51 %	2.98 %	0 %
50+	1.73 %	1.39 %	0 %	2.98 %	5.41 %
Total	62.40 %	11.25 %	10.32 %	10.32 %	5.70 %

Fig.5-3 Trip Origin by Motorbike Taxi Shares
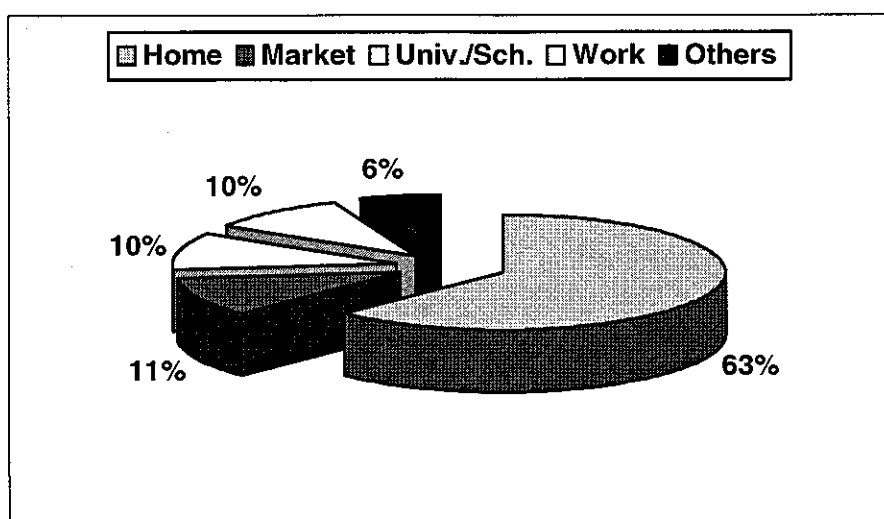
5-4   Trip Purposes

Trip purpose is identified here by the purposes of both trip ends. Common trip types in the survey include:

❖ *Work trips:* trips made to a person's place of employment such as factory, a store, or an office. For example in this survey those who are teachers, NGO staffs, part-time job students, private tutors, security guards, company car and truck drivers,

police and company employees as well as factory workers, restaurant service workers.

❖ *Market Trips:* trips made to a retail establishment regardless of the size or type of purchase. Trips made to a store "just to look" are Market trips even though no purchase is made.

❖ *Business trips:* Trips made to a course of performing a normal day's work. The origin of such trips is often the place of employment. For instance, in the survey those people categorize as someone owns his business even small or big, construction contractors, sell radio, tape recorder in the market, and sewer in market as well as fruit sellers.

❖ *School/University trips:* Trips made by students to an institution of learning. School trips include to school or university.

❖ *Others:* Trips made by individual to somewhere not specific points like pick-up station, sightseeing, visit relatives or friends, ferry station and training center for sports.

❖ *Trips* are defined as one-way movements, another purpose called "home" is often appended to the trip purpose and is used to classified trips into one of five categories: home-based work, home-based market, home-based school, home-based other. See figure 5-4.1 for detail.

Figure 5-4 shows the trip purpose of urban passengers traveled by motorbike-taxi in Phnom Penh City:

❖ The major trip purposes were "To University/School" with a share of 24.0% and followed by "To Work" with 20.0%.
❖ "To Home", "To Market" and "To Business" share 17.0%, 16.0% and 11.0%, respectively.
❖ These five purposes made up 88.0% of all trips and age groups.
❖ The mode is quite popular among the age group 30-49 for work purposes with a share of 77.42% while for business purposes is between age 40 and 49 with 37.5%.
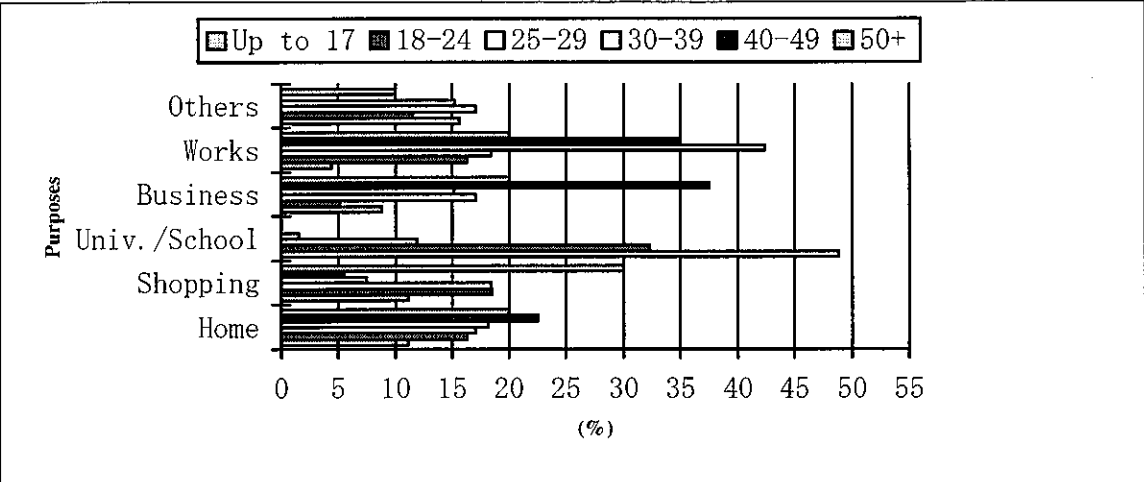
Fig.5-4 Trips by Age Group and Purposes
Source: 1st survey

❖ Most passengers take the same mode for the return trip. For instance, if one hires the motorbike-taxi to his work place, he will ride the motorbike-taxi again to return to his origin.
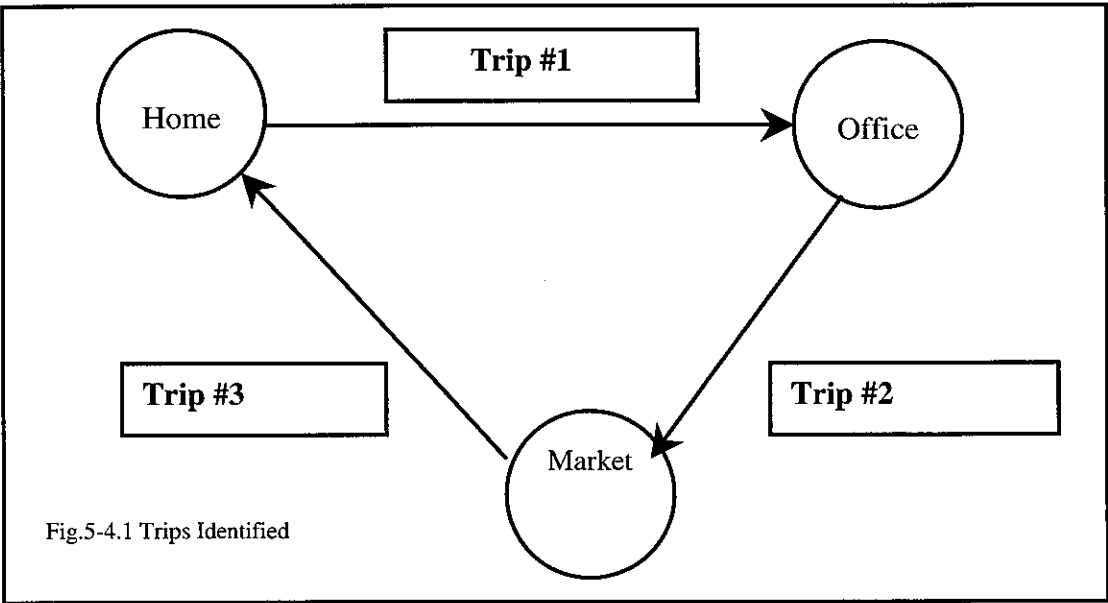
Fig.5-4.1 Trips Identified

❖ Trip #1 was produced at home and attracted to office, therefore a home-based work trip.

❖ Trip #2 was produced at the office and attracted to the market, therefore a non-home-based other trip.

❖ Trip #3 was produced at home and attracted to the market, therefore a home-based other trip.

5-5   Trip Frequencies of Passenger

The number of trip made by passenger in a day by the motorbike-taxi, which is the dominant mode in terms of cheaper, faster, handy mode, frequency and door-to-door service, is presented in the table 5-5 and Fig.5-5.1&5-5.2 below:

Table5-5: Trip Frequencies of Passenger

Trip Frequencies	Percentage Shares
One-way Trip	40.44 %
Round-Trip, Same Driver	5.56 %
Round-Trip, Different Driver	54.0 %
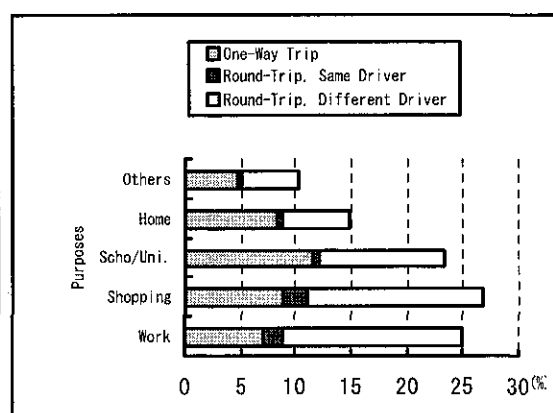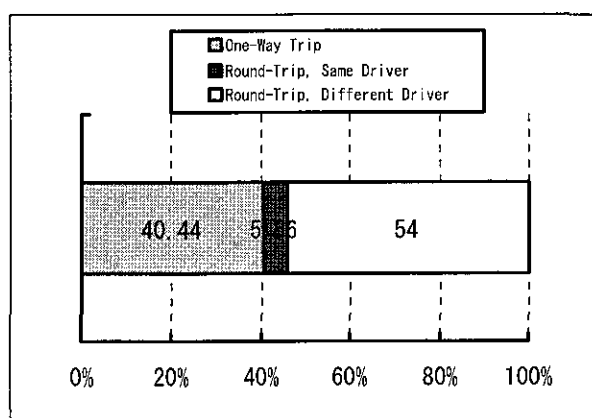
Fig. 5-5.1: Trip Frequencies of Passenger   Fig. 5-5.2: Trip Frequencies by Purpose

The table and figures above show that:

❖ 54% of all passengers use the mode for round trip but different drivers. This illustrates there are many motorbike-taxis currently operating in the city, so they do not need to make their return by employing same driver but however, there are small shares, 5.56% who made their return by the same driver because the same driver made them more comfortable and reliable than others or they made a short stop at feeder trip before reaching their final destination.

❖ 40.44% employs the mode for one-way trip only.

❖ Figure 5-5.2 depicted that round trips by motorbike taxi and same driver usually occurred for those used for market and for work purpose. They chose the same driver because it is very convenient, especially trustworthy in the driver, for them to make the return trip without wasting time to access to another driver and fare

negotiation. In some case, they are the regular passengers of the driver and the home resident locates near each other. As for round trips by different drivers mainly used for market and work purpose too.

5-6 Payments for the Ride

Costs are incurred whenever a trip is made. This cost of travel is often defined and perceived differently by users, system providers or through negotiation basis. The table5-6 and Figure 5-6 show the current cost roughly is charged through the time spent.

❖ 52% of passengers paid 500 riels for the time less than 5 minutes, and for the time 5-10 minutes; 77.77% of passengers are charged 700 riels.

❖ 2000 riels are charged for the time 10-20 minutes, which shares 60.6% and 2500 riels for 20-30 minutes, which shares 57.14%.

❖ For the time over 30 minutes, all passengers paid between 3500 and 4000 riels to their destination.

Table5-6: Fares related to times, (Unit Riels)

Times (min.) Fares, Riels	< 5	5-10	10-20	20-30	>30
500	52% (52)	44% (44)	4% (4)	0	0
700	3.71% (1)	77.77% (21)	18.52% (5)	0	0
1000	20.5% (41)	55.5% (111)	22% (44)	2% (4)	0
1200	28.57% (2)	71.43% (5)	0	0	0
1500	6.96% (7)	38.23% (39)	45.01% (46)	9.8% (10)	0
2000	0	0	60.6% (20)	33.33% (11)	6.07% (2)
2500	0	0	57.14% (4)	42.86% (3)	0
3000	0	0	0	40% (4)	60% (60)
3500	0	0	0	0	100% (1)
4000	0	0	0	0	100% (1)
Average	11.17%	28.69%	20.73%	12.8	26.6%
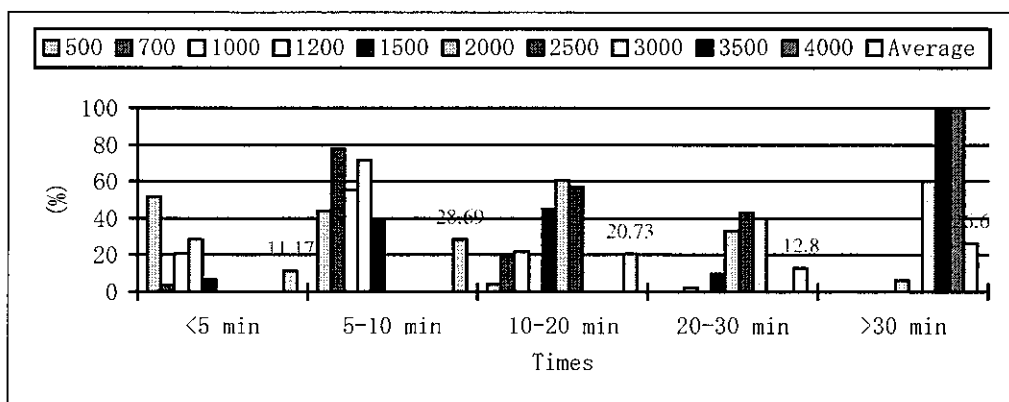
Fig. 5-6: Fare Paid Related to Times Spent

5-7   Travel Duration

As Phnom Penh City Area is still small compared to other Asian Cities in the region, so the travel duration within the city is not taking much time from one origin to destination. Table 5-7 and Figure 5-7 show that almost 90% of all travels within the city spend less than 20 minutes.

Table 5-7: Travel Duration

Travel Duration	Percentage
- < 5 min	19.27 (106)*
- 5-10 min	48.18 (265)
- 10-20 min	22.54 (124)
- 20-30 min	8.20 (45)
- > 30 min	1.81 (10)

* Number of Passengers Interviewed
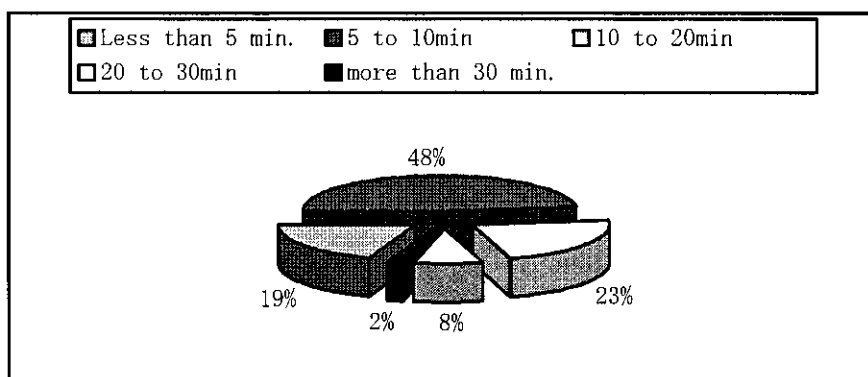
Fig.5-7: Travel Duration Spent by Motorbike-Taxi Within The City

5-8   Travel Times Taken During the Day

Time during the day is very important in deciding to make a trip. Table 5-8 illustrates that 47.96% of all passengers of motorbike-taxi employ this mode from 6:00-9:00 am and followed by 21.16% from 4:00-6:00 pm. This means that this mode is attracted to passengers during the peak-hours, the times people go to work, students go to school, housewives go to markets and people come back home from their respective duties.

Table5-8: Travel Time During the Day

Travel Times	Percentage Shares
6:00-9:00 a.m	47.96 %
9:00-1:00 p.m	13.16 %
1:00-4:00 p.m	11.75 %
4:00-6:00 p.m	21.16 %
After 6:00 p.m	5.97 %

5-9   Access time to the Mode

Access time is the time required to reach the motorbike-taxi from origin. Usually passengers prefer convenient access to get any mode of transport and desire it as close as possible from their origin. Table 5-9 shows that all respondents replied that the waiting time for the mode is not long as we can find them easily on the street, near the market, handy mode service or anywhere else in the city. Mostly, all of them spend less than 3 minutes, 73.58% and followed by 3-5 minutes, which shares 20.52%. It exhibits that more than 90% of all respondents spend less than 5 minutes to access the motorbike-taxi because there are many drivers and more will be the driver of this mode.

Table5-9 Time Access to Motorbike-Taxi

Less than 3 min	3-5 min	5-10 min	Over 10 min
73.58%	20.52%	5.18%	0.72%
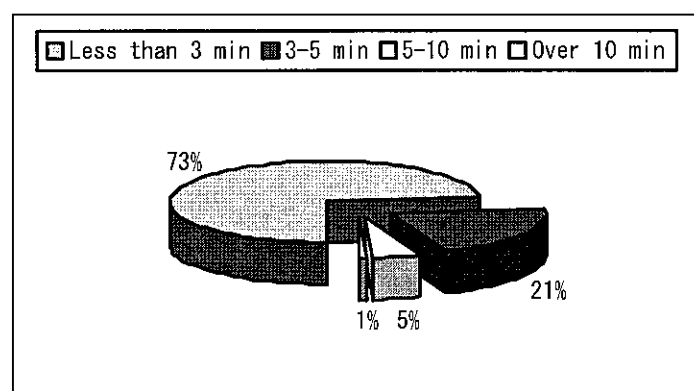
Fig. 5-9: Time Access to the Motorbike-Taxi

5-10   The Reasons of Using the Motorbike-Taxi

The choices of motorbike-taxi by different genders have different reasons and the distribution of reasons for using the motorbike-taxi service is given in table 5-10 below. The table showed that both sexes choose this mode to ride because they do not "Own the Motorcycle" and followed by "No Alternative" and then "Faster".

Table 5-10 Reasons of Using Motorbike-Taxi Share

Reason of Choice	Male	Female	Total
No alternative	7.63%	8.17%	15.8%
Not own motorcycle	17.45%	26.18%	43.63%
Cheap and Good	1.81%	0.89%	2.7%
Door-to-Door	1.81%	3.49%	5.3%
Easy to reach	3.1%	4.35%	7.45%
Faster	4.18%	8.72%	12.9%
Others	5.81%	6.41%	12.22%
Total	41.79%	58.21%	100%
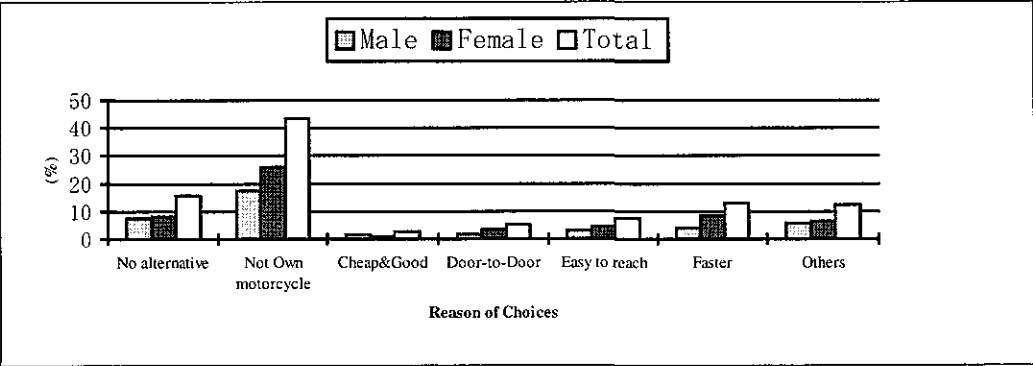
Fig.5-10: Reasons to Take the Motorbike-Taxi

The Figure 5-10 shows that the passengers are likely not to take the motorbike-taxi if they "Own One", 43.63% and followed by "No alternative", 15.8% and in case of "Cheaper& Good" and "Easy to Reach" this mode shares only 10.15%, "Door-to-Door Service", 5.3%, "Faster", 12.90% and "Others" hold 12.22%. It also illustrated that in all reasons female passengers shares higher percentage than male passengers except in case of "Cheaper&Good", male passengers use this transport mode more than female passengers because they do not so care about the fare and the performance of driver and motorcycle itself. This means that if the economic growth and living standard is high. People are afforded to buy motorcycle and car they will do so leading to more traffic flow, volume in the city on a limit road space and then common problems such as traffic congestion, accidents and air pollution will happen as experienced in cities in the region, HCMC and Bangkok.

Motorbike taxi is said very convenience, door-to-door, fast and responsive service but the survey clearly tell that if the city residents can possess their own private transport mode, this kind of transport mode will surely be less popular and attractive such as in case of Thailand, people use their own private transport mode to meet their demand.

5-11   Travel Frequencies by Age Group

Travel is strongly related to the age structure. As the purpose of survey is to interview the passenger for a number of trips per day so the result focuses on a number of trip in a day. Table 5-11 and figure 5-11.1 show that 17.46% of all age group made a trip per day and 23.22% of all age group made two trips per day. In case of 3 or more times in a day trip the

age of over 50 years old shares 22.22% and followed by the age between 30 and 39 years old, 12.7%.

Table5-11: Trip Frequencies by Age Group

Day(s) / Age Group	1/day	2/day	3or more/day	1/week	2-4/week	1/ month
Up to 17	18.2% (8)	22.72% (10)	0	29.54% (13)	11.34% (5)	18.2% (8)
18-24	18.43% (54)	17.4% (51)	2% (6)	18.43% (54)	24.23% (71)	19.51% (57)
25-29	13.51% (10)	31.08 (23)	2.7% (2)	24.32% (18)	21.62% (16)	6.77% (5)
30-39	20.63% (13)	27% (17)	12.7% (8)	15.87% (10)	9.52% (6)	14.28% (9)
40-49	15.78% (6)	44.73% (17)	5.26% (2)	7.9% (3)	21% (8)	5.33% (2)
50+	0	33.33% (3)	22.22% (2)	0	33.33% (3)	11.11% (1)
Total	17.46% (91)	23.22% (121)	3.83% (20)	18.81% (98)	20.92% (109)	15.76% (82)

For a trip in a day, the age between 30 and 39 years old shares 20.63% the highest rate among other age group and for two trips a day, the age between 40 and 49 years old shares 44.73%, the highest rate among all age group and followed by the age over 50 years old, 33.33%. This mode of transport is favored by the age over 40 years old for two trips a day, which shares 78% of all age group.
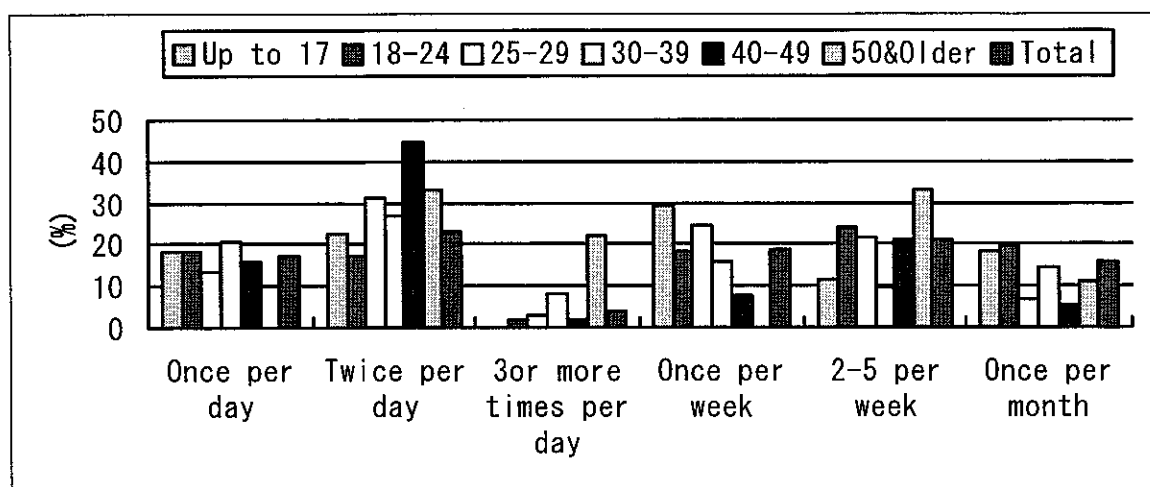
Fig. 5-11.1: Trip Frequency by Age Group
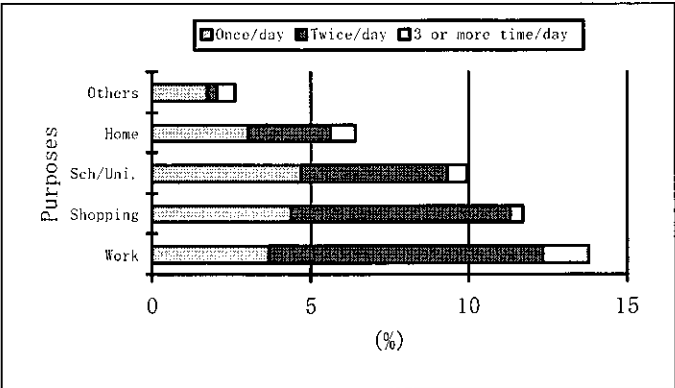
Fig.5-11.2: Trip Frequencies per day by purposes

Figure 5-11.1 illustrated that for those used this mode for work and shopping trip usually employed two times per day. It is the same as said above in figure 5-5.2.

5-12 Transportation Mode Usages By Distances

The choice of mode of transport depends on the distance. Figure 5-12 shows that Walking is substantially decreasing through the distance. In the Figure5-12, walking shares 58.65% for the distance less than 1 Km. As for, traveling by motorcycle is substantially increasing its share of journeys for all distances. The Figure also tells that even the length of journey over 10 Km, Motorcycle is most favored among the residents in Phnom Penh, 85.71%. For the distance from 1-2 Km, motorbike-taxi shares the highest rate, 20.25% while car shares the highest percentage from the distance 5-10 Km, 16.23%. It can be concluded from the fig. 5-12 that MT use for short distance within the city less than 5 km, urbanized areas.
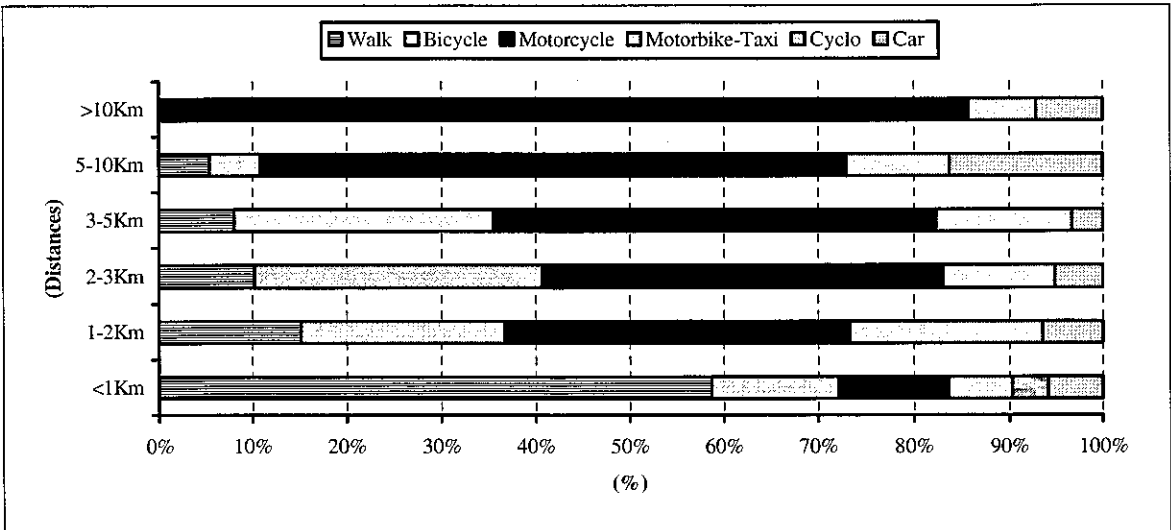
Fig. 5-12: Transport Modes by Distances
Source: 2 nd Survey July 2002

Fig. 5-12.1 Shares of Transport Modes in Japan by Distances
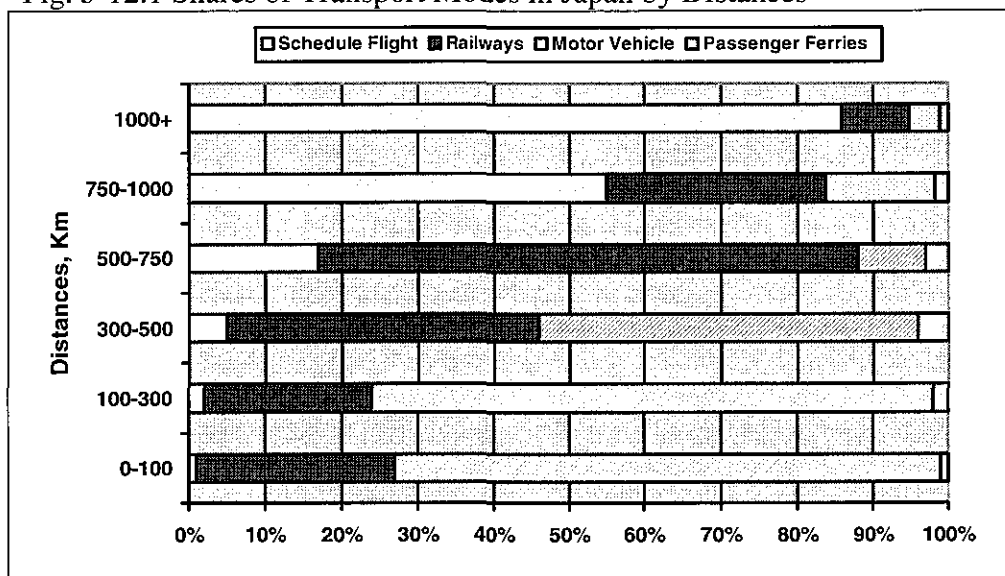
Source: Adapted from Japanese Ministry of Transport Statistics

5-13   Motorbike-Taxi Shares Among The Respondents

Figure 5-13.1 shows that 79% of all respondents have used the motorbike-taxi to their destination while 21% said "No". This form of mode is popular in the urbanized areas for the residents to compliment their travel needs within limit length as described in fig. 5-12.
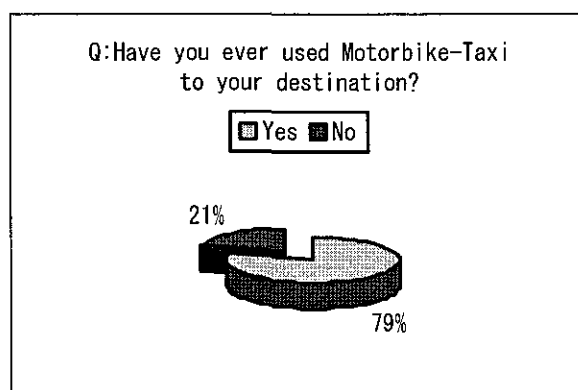
Fig.5-13.1: Motorbike-Taxi Used by Public

Table5-13: Motorbike-Taxi Shared by Purposes

	Yes	No
To Work	81.56 %	18.44 %
To School/University	62.43 %	37.57 %
To go Market	97.91 %	2.09 %

Back Home	87.85 %	12.5 %

Source: 2nd Survey, July 2002
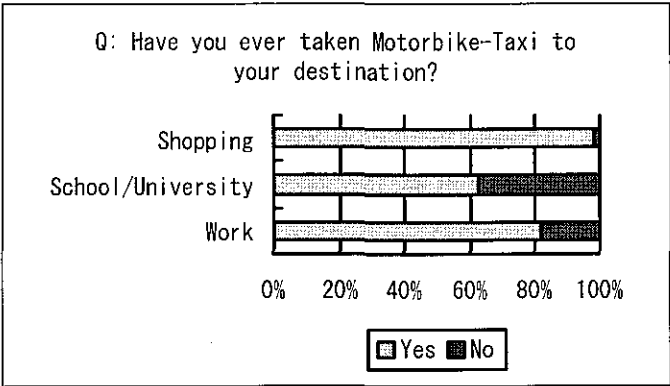
Fig.5-13.2: Shares of Motorbike-Taxi Used by Purposes

The Figure 5-13.2 shows that 97.91% use motorbike-taxi to go Market and followed by 81.56% employs this mode to go to work while only 62.43% use this mode to go to school.

5-14   Modal Shares By Purposes

The compositions of choice of modes by trip purposes are shown in table 5-14 and figure 5-14. These table and figure represent the percentage of different modes by each trip. It shows that 45.14% of all residents go to work by their own motorcycle and followed by 23.61% walking. Motorbike-taxi shares third rank in this purpose, 13.89%. For the purpose to go to school or university by own motorcycle and bicycle share the same highest rate, 30.36%, among other modes. 36.17% of residents to go Market by someone's drop-off at the market. Motorbike-taxi is more attracted to passengers from Market and those go back home from selling something in the market, which share 31.92% and 46.15% respectively.
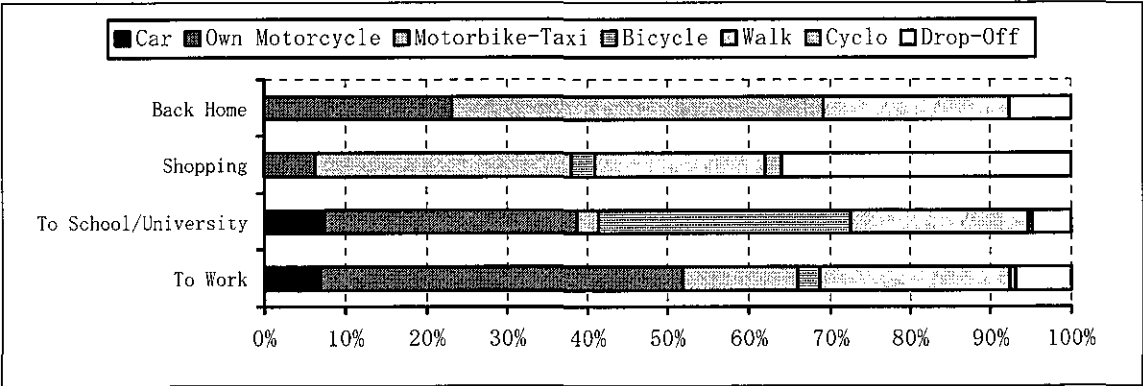
Fig.5-14: Modal Shares by Purposes
Source: 2nd Survey, July 2002

Table5-14: Modal Shares by Purposes

Modes / Purposes	Car	Own motorbike	Motorbike-Taxi	Bicycle	Walk	Cyclo	Drop-Off (By Car, motorbike)
To Work	6.94 %	45.14 %	13.89 %	2.77 %	23.61 %	0.7 %	6.95 %
To School/University	7.33 %	30.36 %	2.62 %	30.36 %	21.46 %	0.54 %	4.71 %
To go Market	~	6.38 %	31.92 %	2.13 %	21.27 %	2.13 %	36.17 %
Back Home	~	23.10 %	46.15 %	~	23.10 %	~	7.65 %

Source: 2nd Survey July 2002

Fig.5-14.1 Modal Shares by Trip Purposes in Central Tokyo, 1998
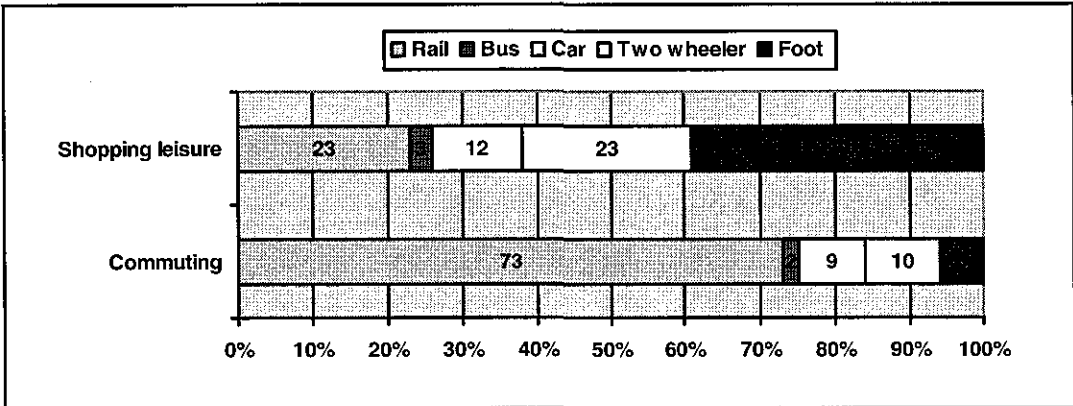
5-15   Modal Split By Income Group

Average monthly income is one of the most important indicators of socio-economic position of the passengers. It normally controls overall behavioral characteristics of passengers which in turn is reflected in travel pattern. It is usual and common practice in all urban areas for upper income groups to spend more on transport with a tendency towards the use of comfortable and convenience modes for travel. In overall, the choice of transportation modes is varied among the income groups.

Table 5-15: Modal Split by Income Group

Income,$ Modes	<50	50-80	80-100	100-150	150-200	200-300	300-500
Car	3.5 %	5.71 %	4.35 %	14.28 %	3.24 %	0	28.57 %
Own Motorbike	27.51 %	44.3 %	60.87 %	33.33 %	38.71 %	50 %	28.57 %
Motorbike-Taxi	10.5 %	7.14 %	74 %	28.57 %	9.67 %	25 %	14.29 %
Bicycle	29.25 %	0	0	0	0	0	0
Cyclo	0.86 %	1.43 %	0	0	3.25 %	0	0
Walk	21.40 %	34.28 %	13.04 %	9.54 %	16.13 %	0	28.57 %
Drop-Off	6.98 %	7.14 %	0	14.28 %	29 %	25 %	0

Source: 2nd Survey July 2002

Table 5-15 and Figure 5-15 show that car; motorcycle and walking are the dominant mode among the income groups 300-500US$ per month while motorbike-taxi shares 14.29%. For the income groups 80-100 US$, motorbike-taxi is the dominant mode among other modes which shares 74% and followed by motorcycle, which shares 60.87%. Walking and Bicycling are favored by the income groups less than 50US$ a month, which share 29.25% and 21.4% respectively. By looking a bit more, in every income groups, residents are favored motorbike-taxi and motorcycle modes.
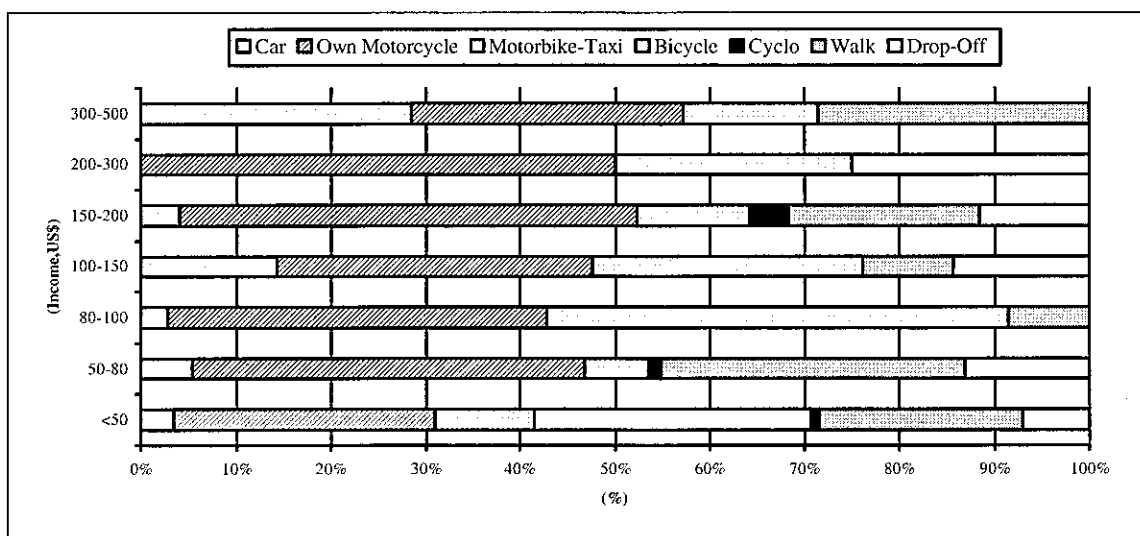
Fig. 5-15: Modal Split by Income
Source: 2nd Survey July 2002

5-16   Modal Shares in City of Phnom Penh

To understand the modal shares among the transport modes in Phnom Penh City, a question was asked to the respondents (see Appendix). Figure 5-16 illustrated that:

❖ 38% shares by motorcycle and 12% by motorbike-taxi. These two modes made up 50% of other modes, While Car shares only 6%.

❖ 24%, 19% and 1% shares by walking, Bicycle and Cyclo, respectively.
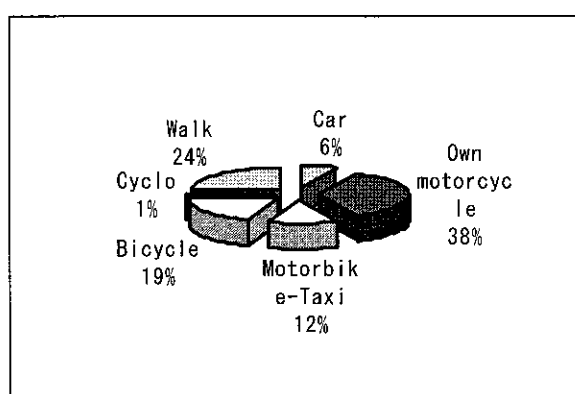
Fig. 5-16: Modal Shares
Source: 2nd Survey July 2002

5-17   Travel Distance By Age Group

Travel length is strongly related to the age structure. The table 5-17 illustrated that:

❖ For the length less than 1 Km, age up to 17 years old share the second highest percentage, 35.96% of all distances after the age 18-24.

❖ For all distances, the age between 18 and 24 years old shares the highest percentage among other age group.

❖ For the age 25-29 years old prefer to travel more than 10 Km, which shares 23.53% of all length.

❖ For the age 30-39, 40-49 and 50+ traveling is between 5-10 Km, which shares 25%, 12.5% and 10% respectively.

Table 5-17: Travel Distance By Age Group

| Distance, Km Age Group	<1	1-2	2-3	3-5	5-10	>10
Up to17	35.96% (41)	24.72 % (22)	26.56 % (17)	20.89 % (14)	15 % (6)	5.58 % (1)
18-24	40.35 % (46)	30.33 % (27)	35.93 % (23)	52.24 % (35)	35 % (14)	52.94 % (9)
25-29	3.51 % (4)	10.11 % (9)	6.25 % (4)	10.44 % (7)	2.5 % (1)	23.53 % (4)
30-39	10.52 % (12)	19.10 % (17)	15.62 % (10)	13.43 % (9)	25 % (10)	5.88 % (1)
40-49	6.14 % (7)	10.11 % (9)	10.93 % (7)	3 % (2)	12.5 % (5)	5.88 % (1)
50+	3.51 % (4)	5.63 % (5)	4.71 % (3)	0	10 % (4)	5.88 % (1)

Source: 2nd Survey July 2002

5-18   Travel Distance By Gender

Travel distance is related to the sex therefore table5-18 and Figure 5-18 show that:

❖ Male passengers prefer to travel longer distance than female passengers, their travel distance is increasing from 2 Km on ward while female passengers share the highest rate for the length less than 2 Km.

❖ Both male and female prefer to travel for the distance less than 1 Km, which shares, 29.15% the highest rate of all length.

❖ Overall, for both sexes almost share the same rate of all distances

Table 5-18 Travel Distance by Gender

Distance, Km Gender	<1	1-2	2-3	3-5	5-10	>10	Total
Male	35.96 % (41)	42.69 % (38)	57.81 % (37)	62.68 % (42)	52.5 % (21)	76.47 % (13)	49.1 % (192)
Female	64.04 % (73)	57.31 % (51)	42.19 % (27)	37.32 % (25)	47.5 % (19)	23.53 % (4)	50.9 % (199)
Total	29.15 % (114)	22.76 % (89)	16.37 % (64)	17.13 % (67)	10.23 % (40)	4.36 % (17)	100 % (391)

Source: 2nd Survey July 2002
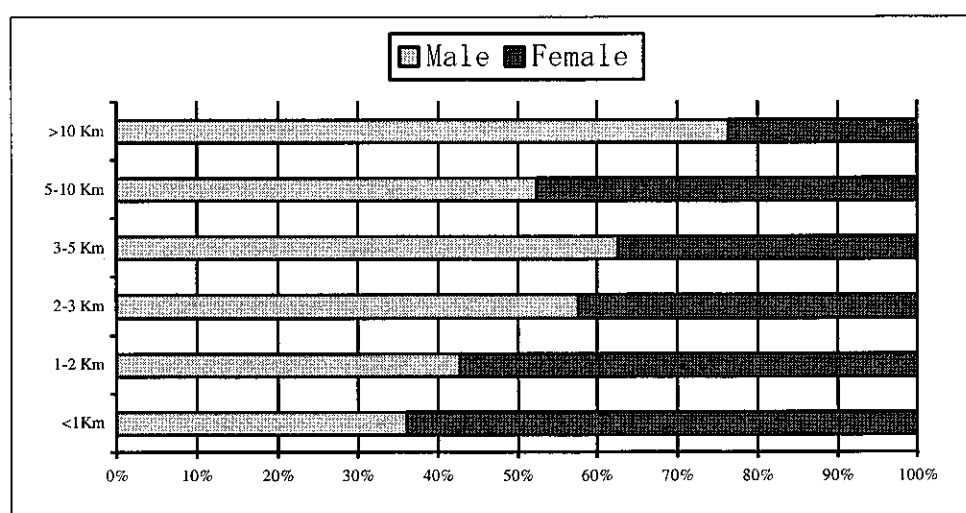
Fig.5-18: Travel Distance by Gender

5-19   Fares For The Ride By Distances

The fare for the ride of Motorbike-Taxi in Phnom Penh City currently is priced through the negotiation between the drivers and passengers. There is no ticket-price, meter-price as in other countries do. To understand or estimate the rough fare for the ride, a question was asked about the minimum paid and maximum paid for the drive through distances. Table 5-19 shows that average paid for the distance and the average payment that the residents are willing to:

Current Paid for the Drive

❖ Less than 1 Km: 650 Riels

❖ 1-2 Km: 1150 Riels

❖ 2-3 Km: 1250 Riels

❖ 3-5 Km: 1500 Riels

❖ 5-10 Km: 1750 Riels

❖ Over 10 Km: 2500 Riels

Willing to Pay

Less than1 Km: 600 Riels

1-2 Km: 1150 Riels

2-3 Km: 1150 Riels

3-5 Km: 1200 Riels

5-10 Km: 1250 Riels

Over 10 Km: 2000 Riels

Table 5-19: Current Price for the Ride and Price Willing to Pay with Distances, Unit 100 Riels

Distance, Km	<1		1-2		2-3		3-5		5-10		>10	
Min&MaxRate	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Current Paid	3	10	3	20	5	20	10	20	10	25	15	35
Willing to Pay	2	10	3	20	3	20	4	20	5	20	10	30
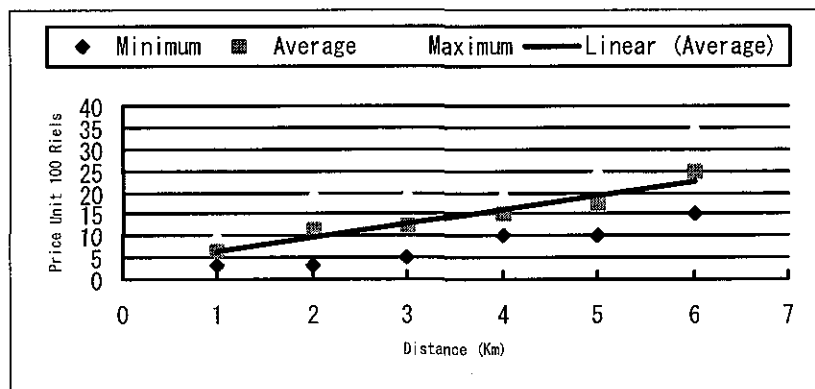
Fig.5-19.1: Current Prices for the Ride by Distances
Source: 2nd Survey July 2002
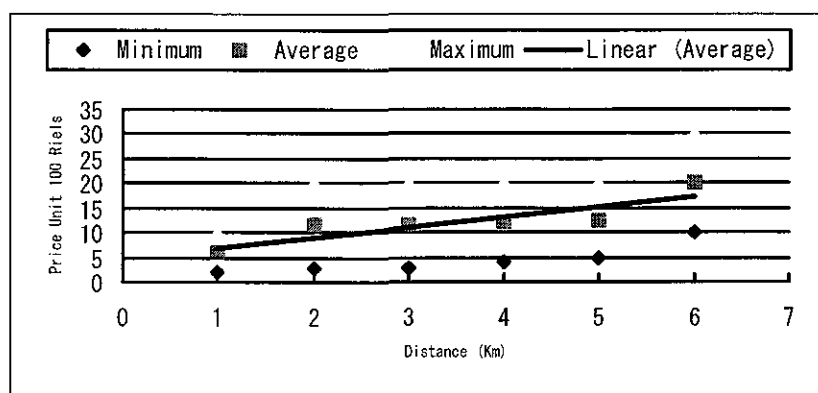
Fig.5-19.2 Price Willing to Pay for the Ride by Distances
Source: 2nd Survey July 2002

5-20   Times Taken To Work, School/University And Market

Time spent to the destination is very crucial in transportation planning. Table 5-20 shows that all residents reach their destination by purposes between 5-10 minutes, which shares 43.61%.

❖ Time spent to work is from 5-10 minutes shares, 39.85% the highest rate and then followed by 10-20 minutes, which shares 23.19%.

❖ Time spent to school or university shares 41.36% from 5-10 minutes.

❖ For Market, residents spent about 10 minutes or less for the drive, which is the highest rate of all times and purposes.

Table 5-20: Times Spent to Work, School/University and Market

Times, min / Items	<5	5-10	10-20	20-30	>30	Total
Work	17.39% (24)	39.85% (55)	23.19% (32)	13.76% (19)	5.81% (8)	36.7% (138)
School/University	21.99% (42)	41.36% (79)	14.13% (27)	19.89% (38)	2.63% (5)	50.8% (191)
Market	23.4% (11)	63.83% (30)	10.64% (5)	2.13% (1)	0	12.5% (47)
Total	20.47% (77)	43.61% (164)	17.02% (64)	15.42% (58)	3.48% (13)	100% (376)
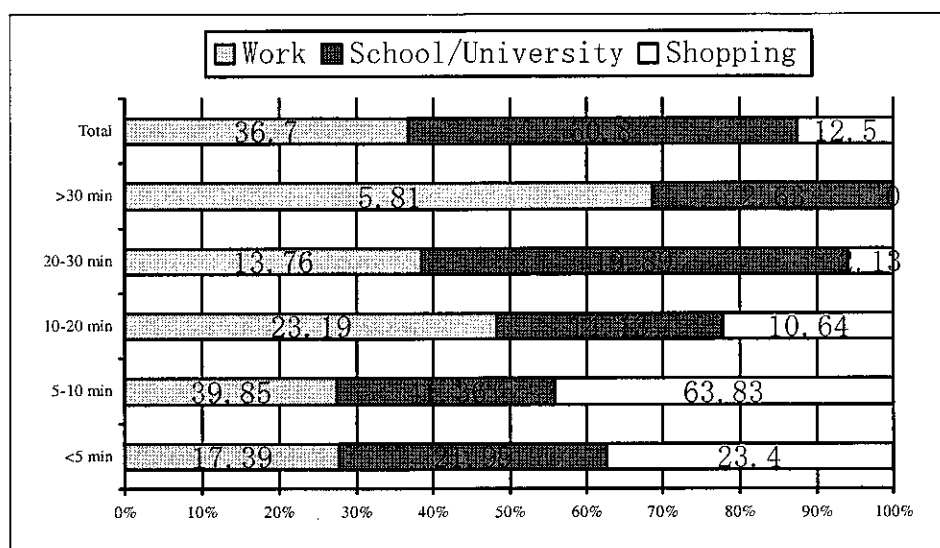
Fig. 5-20: Times Spent to Work, School/University and Market

5-21   Automobiles and Motorcycles Availability Per Household

The numbers of ownership of motorcycles and cars have shown in the table 5-21 and figure 5-21 that:

❖ 44%, 26%, 6.66% and 4.68% of household has owned 1, 2, 3 and 4 unit(s) of motorcycle while 18.66% is not available to own a unit.

❖ 11.33% and 2.01% of household has owned 1 and 2 unit(s) of car while 86.66% is not owned a unit.

Table 5-21: Motorcycles and Cars Availability per Household

Items \ Number of Ownership	0	1	2	3	4
Motorcycles	18.66 % (28)	44 % (66)	26 % (39)	6.66 % (10)	4.68 % (7)
Cars	86.66 % (130)	11.33 % (17)	2.01 % (3)	0	0

Source: 2nd Survey, July 2002
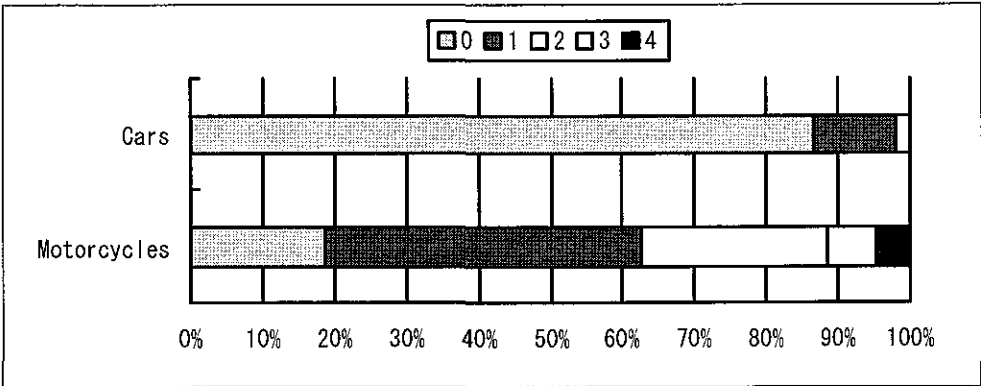
Fig.5-21: Cars and Motorcycles Availability per Household

5-22   Public Attitudes

5-22.1 Toward the Motorbike-Taxi

To understand the quality and efficiency of the motorbike-taxi operation and especially to evaluate of this mode presenting in today society, a question No.10 (see Appendix) was asked to the respondents. Table 5-22.1a and Figure 5-22.1 show that: 52% of all passengers are favored of this mode while 25% said this present mode is bad for the modern society and 23% no comment.

Table 5-22.1a: Public Opinion Toward the Mode

Good	Bad	No Comment
51.43%	25.49%	23.08%
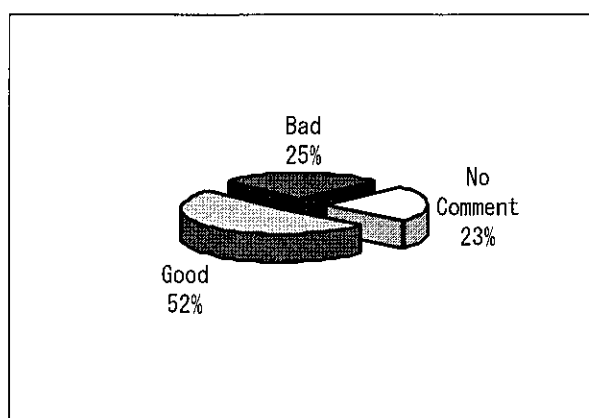
Fig.5-22.1a Public Attitude toward the Mode Purposes
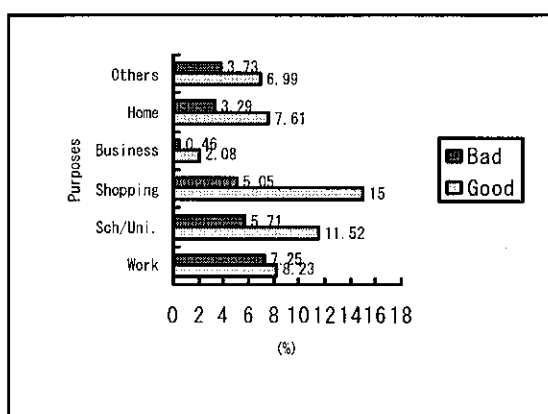
Fig.5-22.1b Public Attitude toward the Mode by
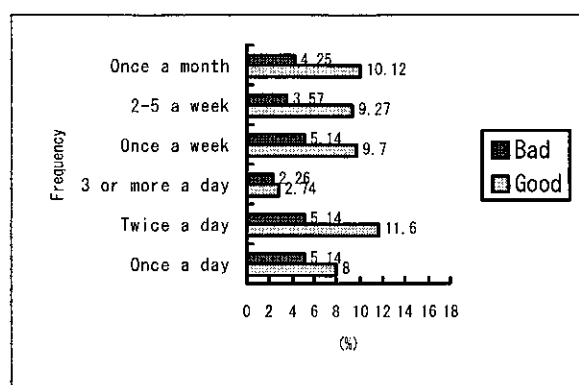
Fig.5-22.1c Trip Frequencies by Bad and Good Attitude

The table 5-22.1b is the summary of collected ideas of those who answered "Good" and "Bad" for the current Motorbike-Taxi Service.

Table 5-22.1b: Public Opinion Over The Current Mode, Motorbike-Taxi

Good	Bad
1-For Driver	1-For Driver
❖ Get money immediately to Support their family's difficulties. ❖ To pay for everything such as children's school fees, stationary for kids and others. ❖ Many poor people rely on this kind of job, help reduce the poverty for the time being in response to the government policy in combating the	❖ Bad behavior, dirty cloth, smelling, not wash up, hairstyle. ❖ No mutual understanding, do not understand the traffic regulation, traffic signs, accidents, driving very fast. Overtaking other modes without the consent of risks. ❖ No safety facilities such as helmet, uniform. No driving license, No

poverty issues.

2-For Passenger

❖ To help the urban population for their transportation needs such as goods transport, emergency needed and *those not own any vehicle.*

❖ Help people meet each other, with their family, friends, relatives.

❖ Fast, cheap, frequency and door-to-door service as well as easy to *access to this mode. Save time, no* need waiting time. Responsive mode.

❖ Help those who use this mode everyday for their purpose such as study, Market, *work and hunt for* job.

❖ Use as feeder mode to shift to another mode.

❖ Many motorbike-taxi compete one another leading fares fall down. This benefits the passengers.

3- For Society

❖ Help social exclusion.

❖ No discrimination between drivers and passengers.

❖ Reduce poverty reduction.

skillful.

❖ Scramble for customers, many drivers, picked pocket. Some drivers take the opportunity to rob the passengers while in dark or quiet place. This happened to passengers from the rural provinces *that come to Phnom Penh to expect* the job and other purposes.

❖ Charge high price and drop at the wrong destination.

❖ Many conflicts due to the *passengers scrambling causing* fighting, accident and lost. Smoking, drinking and gambling at the corner.

2-For Society

❖ No good for city development, backbone to city management and bad image for social concerns.

❖ Many drivers causing congestion, air pollution and slow down the movement of other modes in the city, disorder.

❖ Accidents, robbery.

❖ Discrimination among people, rich and poor.

❖ Increase the burden to the government; many people are still coming to operate this kind of transport.

5-22.2 Introduction Of City Bus Service
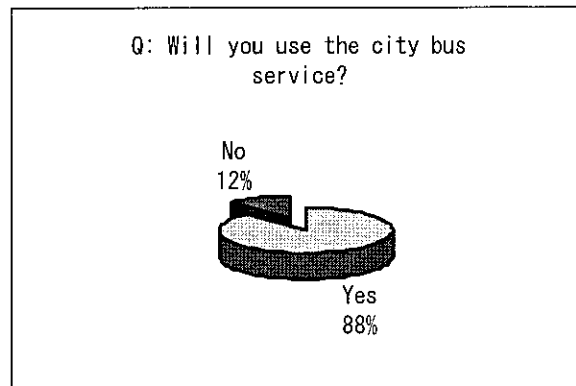
Fig.5-22.2: Public Bus Service Opinion Survey
Source: 1ˢᵗ Survey April 2002

The survey shows that:

❖ 88.0% of all interviewees answered ' I will use the bus' in case of introduction of city bus but demand that the bus fair should be cheaper than the Motorbike-Taxi and safety, regular schedule and responsive service, information, and walk able terminals are also included. Bus service is comfortable, cheap and reaches our destination, no dusty, spacious, large space for belongings, relax, healthy, save money, cold not hot as well as improve the environmental aspects.

❖ 12.0% said 'No'. When Asked Why Not Use the Bus? The answers were long time waiting, many stops and transit, slowly, expensive, not comfortable, many turning points, airsick, not responsive service, irregular times and others said if they use the bus service, many poor motorbike-taxi drivers will loss the job and daily earnings.

CHAPTER VI

CHARACTERISTICS OF MOTORBIKE TAXI DRIVERS

6-1   Introduction

As motorcycles drastically increased in the 1990's, the motorbike-taxi became a popular and convenient transportation mode, because of its high level of service in terms of cheap fares, frequency and door-to-door service trips. They were used to transport people, with the passengers (2 to 3 maximum, sometimes) sitting on the back seat. Number of motorcycles and motorbike-taxi are 76,225 and 6,098 in 1999, based on the survey done by the Department of Public Transport in the Municipality of Phnom Penh. But according to the JICA study for master plan there are 33,000 units of motorbike-taxi operating in the Phnom Penh City, among those drivers, some possess the registration identification for motorbike some are not. The driving license for motorbike nationwide is not yet introduced.

The motorbike-taxi provides important service to the city and supports the urban activities in Phnom Penh. It may not be the most efficient system for the city, as it contributes to congestion and traffic problems, but it provides a substantial income for thousands of immigrant families, including many students, civil servants who support themselves by working as the motorbike-taxi drivers.

The motorbike-taxi is a motorcycle with a back seat extended to about 55 cm in length for accommodating as many as 3 passengers. It is supposed to get 1 or 2 passengers, but in many occasions it is accommodating 4 passengers (3 in the back seat and 1 in front). The fares range from 500 Riels for the minimum up to around 2000 Riels for a distance of 3 Km. Its engine capacities is between 50cc and 100cc.

Motorbike-taxi is considered to come to the intra-city transit services just meeting the demands of the consumers for very handy, convenient and economical means of transport mode. Most of the Cambodian people prefer to choose Motorbike-Taxi for their transit services not only in the metropolitan areas but also everywhere in the country. It is easy to get into the motorbike-taxi business; all it takes is capital between US$300-450 to purchase a second hand motorcycle. Most of the motorbike-taxi drivers borrowed either the full amount or part of the cost from their relatives to buy the motorcycle. And many

participants are still entering this business, because there are not many complicated procedures for permission to get licenses.

6-2   Certification for Motorbike

The survey showed in the Figure 6-2 that:

❖ 89% of all drivers hold the registration identification for motorbike but not a license while 11% don't.

r.i.f.m: registration identification
for motorbike

r. i. f. m
89%

no
11%
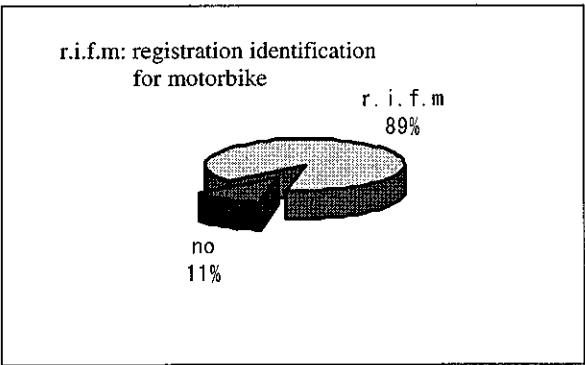
Fig. 6-2 The motorbike-taxi driver's certification

6-3   Regular Customers

To understand whether, the driver has the regular customers or not, a question was asked to the driver (see Appendix). Figure 6-3 shows that 17% of their customers are regular while the rest are irregular one.

Q: Are they regular or irregular
customers?

17%

83%

☐ Regular Customers ☒ Irregular Customers
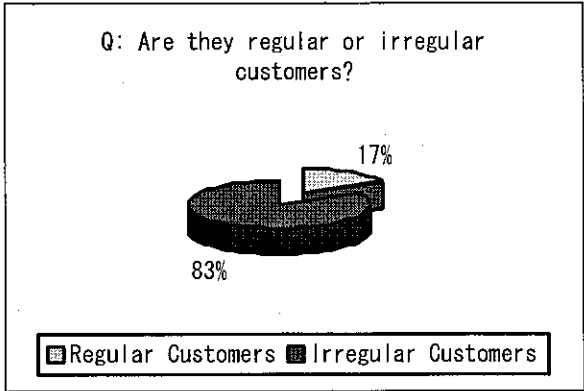
Fig.6-3 Customers for Drivers

6-4   Driver's Age

Figure 6-4 illustrates 80.72% of all drivers age between 25 and 40 and followed by the age 41-50, which shares 12.62%.
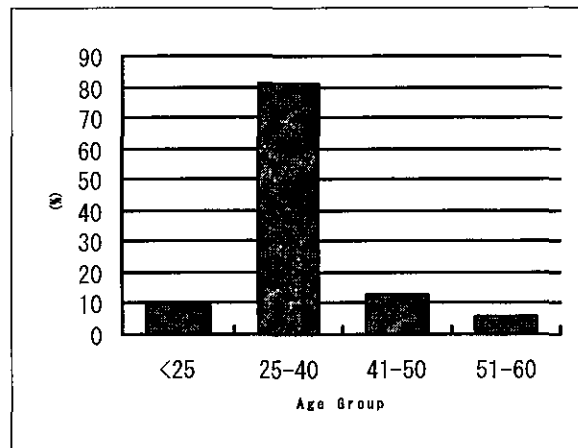
Fig.6-4 Age Group of Motorbike-Taxi Driver

6-5   Year Of Operation

Figure 6-5 shows that 39.13% of all drivers have been in operation for this business from 3-4 years and followed by 26.95% from 1-2 years.
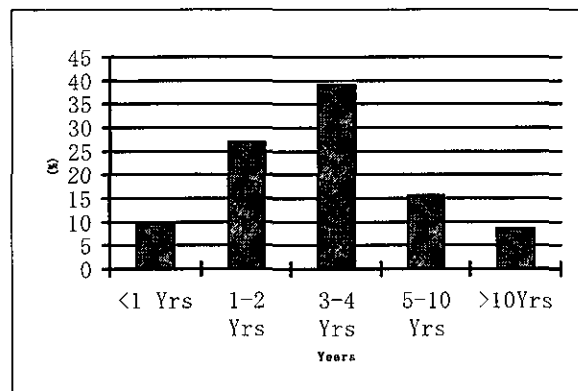
Fig. 6-5 Years of Operation

6-6   Passengers During The Day

Table 6-6 illustrates that 49.61% and 14.73% of all passengers travel during the morning and evening peak hours from 6:00-9:00 am and 4:00-6:00 pm respectively. While those who answered "Irregular Time" share 12.4%. Further, it reveals that the passengers of this mode are likely to employ this mode in the morning rather the afternoon and evening.

Table 6-6 Shares of Passengers during the day

6:00-9:00 a.m	9:00-12:00 a.m	12:00-1:00 p.m	1:00-4:00 p.m	4:00-6:00 p.m	After 6:00 p.m	Irregular Time
49.61%	17.83%	1.55%	1.55%	14.73%	2.32%	12.4%

6-7   Location To Expect Passengers

Location of operation of any transportation modes is very important to expect the passengers and earnings. Table 6-7 illustrates that 62.06% of all drivers choose to operate this mode "Near the Market" to expect the customers while 18.1% said "No Fixed Terminal" for their operation. "Special Street Corner" and "Near Hotel" and "Others" share the same percentage, 4.31%.

Table 6-7: Location of Operation of Motorbike-Taxi

Special Street Corner	Near Market	Near Hospital	Around Public House	Near Hotel	No Fixed Terminal	Others (School,TV Station,Pagoda)
4.31%	62.06%	3.45%	3.45%	4.31%	18.1%	4.31%

6-8   Services Provided to Passengers (Level of Service)

When asked the drivers how you provide services to your customers, Table 6-8 and Figure 6-8 illustrates that 89.38% of all drivers said it depends on the passengers' requirement wherever they want to be dropped-off, while 8.89% and 1.73%, services are provided as "Door-to-Door" and "Curb-to-Curb" respectively.

Table 6-8 Service of Motorbike-Taxi

Services	Percentage
Depend on Passengers	89.38%
Door-to-Door	8.89%
Curb-to-Curb	1.73%
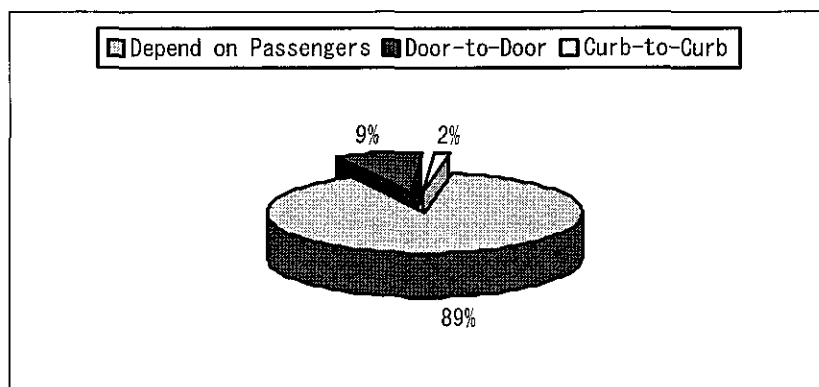
Fig. 6-8 Shares of Motorbike-Taxi Service

6-9   Working Days

Figure 6-9 shows that 89% of all drivers are still operating this mode on the Weekend while 11% said "No"
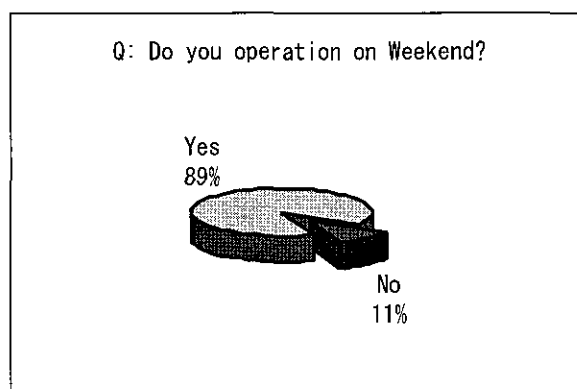
Fig. 6-9: Days of Operation

6-10   Number of Passenger Loading in a Trip of Motorbike-Taxi

Table 6-10 shows that 53.33% of all drivers carried one passenger for one-way trip while 11.44% carried two passengers for one-way trip.35.23% of all drivers said that it depends on the passengers whether they want to employ a single motorbike-taxi or want to be assembled in one motorbike. In this case the driver may load three or four passengers in one-way journey.

Table 6-10: Number of Passengers loading

Number Loading	Percentage
One Passenger	53.33%
Two Passengers	11.44%
Irregularly	35.23%

6-11   Complaint from Passengers

Figure 6-11 shows that 33% of all drivers get complaints from passengers while the rest, 67% said they never get complaints from passengers.
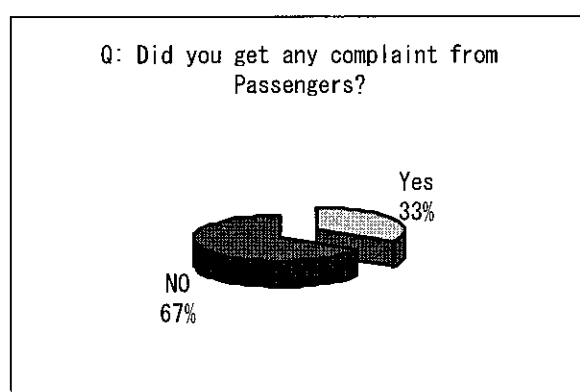
Fig. 6-11: Complaint from Passengers

6-12   Experiencing the Accident

A primary goal of the urban traveler is to arrive at the destination safely. Motorcyclists have fatality rates an order of magnitude greater than the other modes. The declining the fatality rates are most likely due to safety belts, airbags, child safety seats, and motorcycle helmet use, in addition to police enforcement of tougher drunk-driving laws.

The Figure 6-12 shows that: 70.0% no accidents while 30.0% experienced the accidents. But most accidents were slightly injured such accidents by chance, overtaking other modes causing little collision, speedy driving, other drivers crashed and in some cases met the robbery or cheated
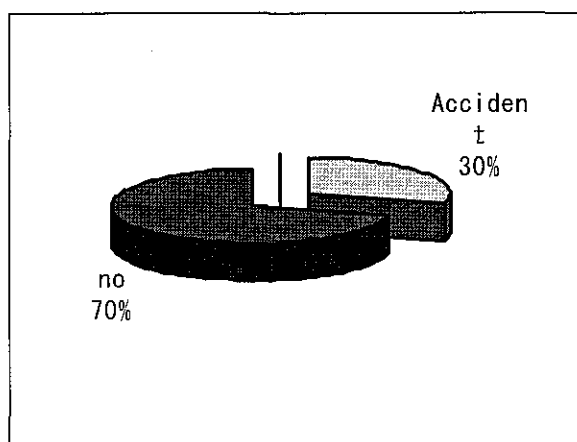
Fig. 6-12: Accident Shared

6-13　Job Categories

To understand further whether the current job is a part-time or permanent one, a question was asked to the motorbike-taxi drivers (See Appendix). Figure 6-13 illustrates that 87% of all respondents are permanent job while 13% is part-time job.
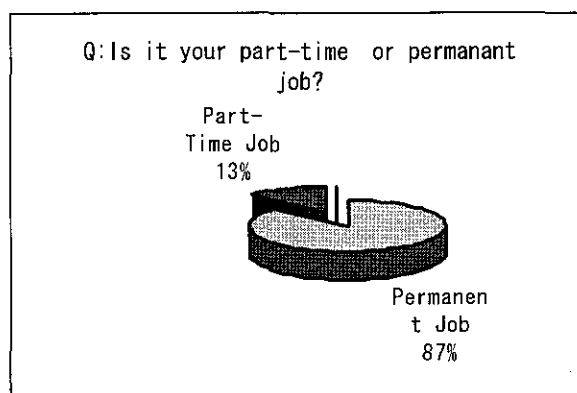
Fig. 6-13: Job Categories

VII   PROBLEM STRUCTURES

7-1   Introduction

In order to alleviate urban transport problems and ensure its proper operation, it is necessary that characteristics of transport modes, trips by those transport modes and other related components such as city scale/urban areas, development areas as well existing condition must be identified and then raise the most concern issues which are very useful for better improvement and development. Therefore, this chapter will identify different issues considered to be relevant for further information. As for the problems concerning to the motorbike taxi, detailed will be given based on the previous Chapter V and VI.

7-2   Current Issues, Phnom Penh

Table 7-2 Urban Issues, Phnom Penh

<table>
<tr><td colspan="2" align="center">PROBLEMS</td></tr>
<tr><td>1-Urban Characteristics</td><td>2-Roads & Its Facilities</td></tr>
<tr><td>-Densely populated areas
-Historical city, restraint development project
-CBD and Residential areas
-Random development, sprawling</td><td>-Well balanced road network but poor pavement (collector and local streets)
-Streets occupied by sellers
-Inadequate road network, narrow width
-Inadequate road signs, markings etc.
-Inundation of roads</td></tr>
<tr><td>3-Administration</td><td>4-Public Transport</td></tr>
<tr><td>-Weak and non systematic organization
-Lack of human resource
-Not enacted law and regulation
-Limit fund and resource</td><td>-Public transport supply non-existence such as Bus, Railway or Subway.
-Not attractive, poor management
-No subsidy</td></tr>
<tr><td>5-Traffic Management and Control</td><td>6-Motor Vehicle Growth</td></tr>
<tr><td>-Lack of effective traffic signal system
-Parking deficiency, on street parking
-Loose control and traffic enforcement
-Existing facilities not served
-No proper law and regulation enforcement</td><td>-MCs, 300 units/1000 pop.
-Cars, 55-70 units/1000 pop.
-Motor vehicle population still growing
-Advantage and Disadvantage for people, city</td></tr>
</table>

| -Disordered and Mixed traffic flow | and environment |
| | -Second-hand imported motor vehicles |

As mentioned above, Problem no.6 will be further identified as following;

```
                        ┌──────────────────────┐
                        │    Motor Vehicle      │
                        └──────────────────────┘
              ┌──────────────────┐        ┌──────────────────┐
              │       Car        │        │       MC         │
              └──────────────────┘        └──────────────────┘
```

- 50-70 units/1000 pop.

- Congestion, Pollution

- Growth on limited road space

- Not respect the traffic regulation

```
              ┌──────────────────┐        ┌──────────────────┐
              │    Motorbike     │        │       MT         │
              └──────────────────┘        └──────────────────┘
```

- Congestion, Pollution

- 300 units/1000 pop.

- Still growing

- Not respect the traffic regulation

-

-

A- For

-door-to-door service

-Responsive mode

-79%city residents used

-52% said "Good"

-Home-based market

-Home-based work

-Good for public bridging

-See table 5-22.1b

B-Against

-Supply>Demand

-30%accident, Congestion

-Pollution, No education

-23% said "Bad"

-Undisciplineddrivermanner

-See table 5-22.1b

Fig.7-2 Problem Encountered For MT

□ Accident	▦ Robbery	■ bad pavement
□ traffic congestion	■ many regulation	□ many drivers
▨ no passenger	□ costly	□ health problem

7% 6% 12% 4% 19% 23% 3% 16% 10%

Source: JICA Master Plan 2001

Reference to the figure 7-2, there are nine problems encountered during the survey done by JICA. Among the nine, the supply side shares much higher than other issues. This means that there are a lot of drivers in the city and followed by 19% robbery. Then traffic congestion ranks number three, which shares 16%.

Origin, Destination and Purpose of Person Trips
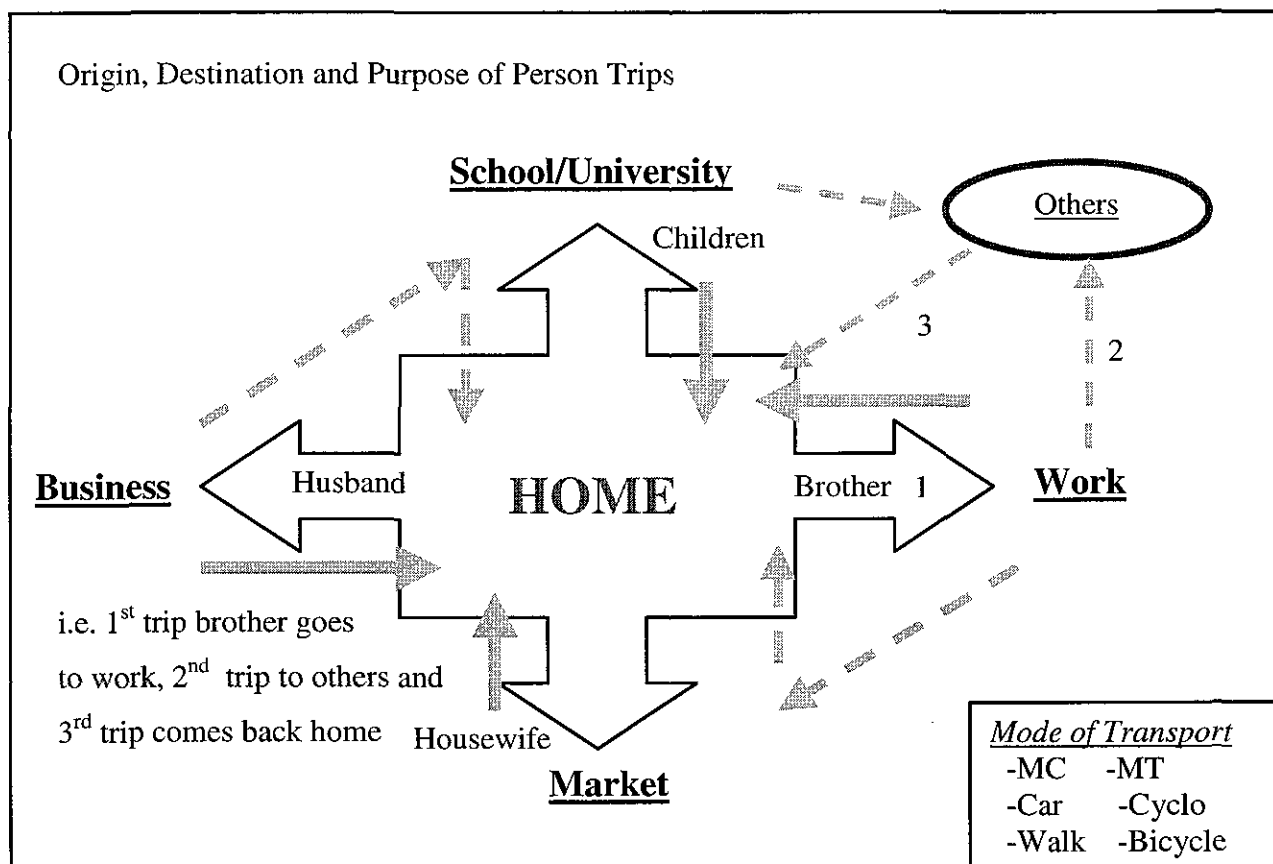
In the box shows about the trip's movement in the City of Phnom Penh during the survey

Fig.7-3 Changes in Modal Choice in Tokyo, 1968-1998
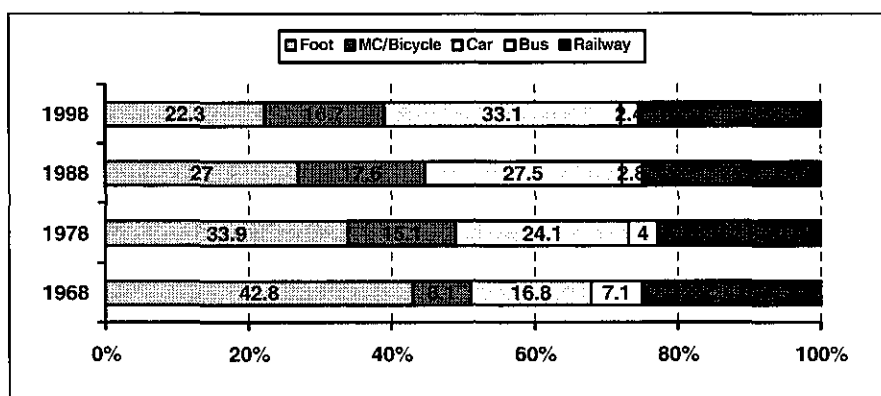
Source: Ministry of Land, Infrastructure and Transport

7-3   Summary of the Results

❖ Female passengers used the motorbike-taxi more than male passengers, which share 57.45% and 42.55% respectively.

❖ This mode is not attracted among the age up to 17 years old and age over 40.

❖ The major trip purposes were

1.	To Univ/School	24%
2.	To Work	20%
3.	To Home	17%
4.	To Market	16%
5.	To Business	11%
6.	To Others	12%

❖ 54% of all motorbike-taxi passengers employed this mode for round trip but different driver while 40.44% used this mode for one-way trip and in case of round trip but same driver share only 5.56%.

❖ Almost 90% of all travels spent less than 20 minutes

❖ People preferred to use this mode during morning and evening peak hour, which morning peak shares 47.96% and evening peak shares 21.16%.

❖ People can access this mode with less than 3 minutes, which shares 73% while within 3-5 minutes shares 25%. This two-combination make up 94% of all passengers can access the mode with less than 5 minutes.

❖ 43.63% of all respondents used this mode because they do not have their own motorcycle while 15.8% said "No alternative".

❖ 12.9% said they use the motorbike-taxi as it is fast and in case of door-to-door, cheap and easy to reach share 5.3%, 2.7% and 7.45%, respectively.

❖ For all age group, 23.22% of all respondents employed the motorbike-taxi for two times in a day. One time per day shares 17.46% and three or more times per day shares 3.83%.

❖ 52% of all respondents said that the presenting of motorbike-taxi in the city is "Good" while 25% said "Bad" and 23% said "No Comment".

❖ Transport Modes share by distance

1. Walking decreases through the distance
2. Motorcycle use increases through the distance
3. Motorbike-taxi shares the highest rates, 20.25% for the distance 1-2 km while car increases through the distance.

❖ 79% of all respondents used the motorbike-taxi while 21% said "Never Use".

❖ Motorbike-Taxi shares by purposes

1. To Work   81.56%
2. To Uni./School   62.43%
3. To Market   97.91%

❖ Modal shares by purposes

1. To Work Car 6.94%   Own Motorcycle 45.14% Motorbike-Taxi 2.62%.
2. To Uni/School Car 7.33% Own Motorcycle 30.36% Motorbike-Taxi 2.62%.
3. To Market   Car n.a   Own Motorcycle 6.38%   Motorbike-Taxi 31.92%.
4. To Go back home Car n.a Own Motorcycle 23.10% Motorbike-Taxi 46.15%.

❖ Modal Shares

1. Car   6%
2. Motorcycle   38%
3. Motorbike-Taxi 12%
4. Walk   24%
5. Bicycle   19%

6. Cyclo   1%

❖ Motorcar and motorcycle ownership per household

86.66% and 18.66% of household is not able to access to car and motorcycle, respectively.

44%, 26%, 6.60% and 4.68% of household has owned 1,2,3,and 4 units of motorcycle, respectively.

11.33% of household owned 1 unit of car and 2.01% of household owned 2 units of car.

❖ 88% of respondents said they would use the bus system if the system provided while 12% said "No".

❖ 17% of all drivers have regular customers while 83% said "No regular customer"

❖ Driver age is between 25 and 40 years old.

❖ 62% of all drivers can be found easily near the market while 18.1% "No fixed location".

❖ 67% of all drivers said they do not get complaint from the passengers.

❖ 30% of all drivers said they had accident while 70% said "No accident".

❖ 87% of all drivers said this job is permanent job while only 13% said this is just the part-time job but most drivers are willing to quit the job if they would find a better job than the present job as motorbike-taxi drivers.

CHAPTER VIII

CONCLUSION

It is clear from the above discussion that motorbike-taxi mode of transport is an integral part of the transport system for low and medium income passengers in/out of the City of Phnom Penh because of its high level of service in terms of cheaper fare, frequencies, door to door trips and it is also the most important financial source for low-income people who can not find other job position besides the driver of this mode, mostly for those having moved to the city. There are very high numbers of entrants into the motorbike-taxi business, primarily because of the following three reasons: 1) There is no need to get a license. 2) It is easiest way to earn money to support families of low-income group and 3) the current drivers have shifted from the cyclo drivers. The drivers of the mode can operate anywhere throughout the city without fixed route, timetable and areas of operation. It is a responsive transport mode and is well recognized as feeder transport mode for those who want to travel to other provincial cities or within the intra-city.

Moreover, the absence of public transport system contributes to more opportunities to more informal growth of these motorbike-taxi drivers in the city. However, there is no basis to consider that this transport mode can play a central or leading role in a modern urban environment, i.e. Bangkok and other Developing Cities. However, it can play a role as a feeder mode for other public transportation services. Increasing the motorbike-taxi units in operation are one of the most serious factors leading to traffic congestion and other unexpected issues in the city. Therefore, it is necessary to control the entry into this business by adopting some measures such as requiring registration of motorbike-taxi, wearing uniform and the helmet's wearing compulsory to reduce the number and accidents and policies such as area of operation, loading capacity, motorcycle performance and basic skills or knowledge prior to permitting the operation to the public.

According to the survey, female passengers are more favoring this mode than male passengers and seventy nine percent of city residents used to ride it. They use the mode mainly for the Market purpose or home-based market within short distance and time. There are other informal transport modes within the Phnom Penh City but none of them can compete with the comfort motorbike-taxi service. Even though, its comfortableness and responsiveness this transport mode contributes much problem to the city such as traffic

congestion, accidents, lower other vehicle traffic flow, social concerns and city image as well, especially hindering the city development and social-economic growth.

The recent expansion of motorbike-taxi in the city provides people with a chance to make a viable living. However, drivers want support rather than more control from authorities. Most of them became drivers because they had no other means to earning a living. Many drivers thought the business needs proper governing policies and want the government sets measures to curb the inflation of currency especially the petrol and gasoline's prices. Labor experts suggest that the government should help motorbike-taxi drivers stabilize their lives by giving them access to bank loans and tax relief. The government should also have specific regulations on allowing the drivers to use certain sections of streets to do their business. In particular, the circular require that people wishing to engage in the motorbike-taxi business must have resident books or temporary resident certificates and have labor uniforms.

Mixture of various transport modes sharing the same road space, inappropriate driving behaviors and shortage of transportation knowledge are also observed in the city which leading take time for planning and educating people to understand all about the consequences and benefits of transportation. One big concern from the research is that the future growth of motorcycles and cars ownership causing further dilemma as obvious seen in city of neighboring developing countries such as Bangkok, Ho Chi Minh City.

Overall, the key understanding from this study is the complementary and transitional nature of motorbike taxi transportation. If the policies are based on this understanding, the benefits will be greater and cost will be lower in designing not only urban transportation policies but also the policies for overall socio-economic development of urban areas of the country, which is still experiencing the process of economic development. The city government and relevant bodies need to draw up feasible policies for motorbike-taxi drivers to control their activities without affecting their business and lives. But in order to achieve those mentioned above, education for all residents and drivers have been put in first priority before other else measure for a long-term strategy and planning. Therefore, the following recommendation focuses mainly on education and the role of predominant transportation mode in the City of Phnom Penh.

RECOMMENDATIONS

The existing transport situation is a complex mixture of varieties of activities that arise in a different form in different situation and location of the city, which cannot be identified or solved by a single measure. However, to educate, to reduce and to provide effective, comfort and attractive transport system it requires appropriate policies and measures.

The followings are recommendations that drawn from the study:

Motorbike-Taxi Operation and Its Role

There is a need to introduce a registration system and a designated operational area for the motorbike-taxi drivers. Further, it is necessary to restructure the motorbike-taxi as a feeder mode to buses or other public transport system, which is expected to introduce in the future. As this measure will reduce the number of motorbike-taxi units in operation, it will be necessary to prepare measures for those motorbike-drivers who lose their jobs.

Traffic Management Measures

Traffic problems have been complicated year after year and to give remedial measures is an urgent issue. Especially, to satisfy 3-E policy (Traffic Engineering, Education and Enforcement) is the most urgent task. To accomplish the objective of traffic management plan, the following recommendations are suggested.

1.Traffic Engineering

- ❖ Improvement of Intersection and Road
- ❖ Improvement of traffic signal
- ❖ Setting up traffic accidents data managing system

For decreasing traffic accidents efficiently, it is quite important to plan traffic improvement remedial measure based on traffic accident data analysis. Setting up traffic accidents data managing system is a vital requirement.

2. Traffic Education

One of the reasons why traffic accidents have been increased extremely is citizen's ill behavior toward traffic in daily life. Thus promotion of traffic safety and traffic education is essential issue since they are basic for traffic safety.

3. Traffic Enforcement

At present, drivers' obedience and manner to traffic regulation are extremely bad. Strengthening of traffic enforcement is necessary.

If the city bus service reappears in the city, make it more attractive

Any policy aims at discouraging car and motorbike use must be supported by a noticeable improvement in the quality of public transport service. To offer a genuine alternative to the car, and other motorized vehicles, the first requirement is that travel time, door-to-door be competitive. This is the function of segregated right of way, which enables public transport to double its speed compared to when public transport vehicles are mixed in with general traffic and held up by traffic jams. Segregated right of way also guarantees that travel time stays regular and timetables are respected. Given a constant level of resources in terms of vehicle fleet and driving time, segregated right of way also makes it possible to schedule more stops, since it takes less time to make one circuit.

Comfort must also be noticeably improved if public transport is to compete with the cars and motorcycles. Steady progress is being made in equipment design, accessibility (for people with limited mobility, the elderly and people carrying bags or accompanying young children), and environmental performance (quietness of the ride, limitation on emissions of pollutants).

Comfort and the feeling of safety are also related to connections between modes at interchange points (connections to private cars, motorbike-taxi, park and ride facilities and between modes of public transport).

Many car and motorcycle drivers do not even consider public transport as an alternative mode of travel because they are familiar with it. Providing travelers with information at

home (on routes, timetables and so forth) and individual marketing are a part of promoting a modern public transport that is not restricted to its role of providing a social service for those without a car.

Traffic safety Education

- ❖ Implementing Regular Traffic Safety Campaign
- ❖ Training Instructors For Traffic Safety Education at Schools
- ❖ Establishing Traffic Safety Patrol Instruction Institution
- ❖ Introducing Traffic Safety Education to School Education Curriculum
- ❖ Construction of Traffic Park for Traffic Safety Education

Traffic safety education must be taught to all residents in the city. All drivers are also pedestrians at certain time of the day. Such education would benefit all persons throughout the entire lives.

General Public Education

- ❖ Traffic safety education or campaign targeting at all the city residents by means of mass media such as newspaper, radio, television and public notice board are rare.
- ❖ News reports on the traffic accidents and related issues are occasionally given in these media, but their frequency is not high.
- ❖ Traffic safety education has just been taught in school last year to all primary school and secondary school children and students.
- ❖ Currently, there are no suitable teaching materials containing statistics and data on accidents and actual cases for the general public.
- ❖ Similarly, suitable teaching materials for school children and students are still lacking.
- ❖ MPP is the only public institution actively involved in traffic safety education. Traffic safety is something that cannot be handled by just one public institution. For better results, it requires the cooperation and participation of other public agencies and schools as well as other resident organizations and informal groups.

Human Resource Development and Commitments

Urban Transport and City Planning education centers are not available in anywhere in the city for the purpose to educate those interested in the field so human resource development is urgently needed for city planning professional by mean of sending those abroad and then put them in the right place upon return.

Commitment brings success to any project implementation; therefore all relevant bodies should take into consideration all laws and regulations, good governance and good coordination.

Since the purpose of the study is for credit of master degree evaluation and during the survey phase of this thesis several gaps in local knowledge became apparent. Therefore, further detail study is strongly recommended.

REFERENCES

The study on the transport master plan of the Phnom Penh Metropolitan Area in the
 Kingdom   of Cambodia, *JICA 2001*

Vietnam Investment Review, *No.550/April 29-May 5, 2002*

http://www.unescap.org/

http://www.unchs.org/

ESCAP and Asian Development Bank, 2000.Op.cit.
United Nations Center for Human Settlements (Habitat), 2001. The state of the World's
Cities, *2001 (Nairobi)*

TDM Encyclopedia, Victoria Transport Policy Institute

Center for Social Development, *Cambodia*

National Transportation Library, *US Department of Transportation*

The Role of Informal Transportation for Social Economic Development of Urban Areas
in the Developing Countries, *A.T.M Nurul Amin, AIT Thailand*

Urban Transport Planning, Second edition, *Michael D. Meyer, Eric J. Miller*

Transportation Engineering and Planning, *Second Edition, Prentice Hall International*

Joint Seminar: 6 Asean-Japan Workshop-Cum-Seminar on Urban Transportation and 11th
International Seminar on Land Readjustment and Urban Development

Steven Schwartz. Research Officer, Smogbuters Brisbane. *March 2000*

The World Bank, *"World Development Indicators 2000"*

Asian City Development Strategies, *Fukuoka Conference 2000*

Council for the Development of Cambodia, *CDC*

SUSTRAN Resource Center

UNESCAP, United Nations Economic and Social Commission for Asia and Pacific,
Transport and Tourism Division

APPENDIX

QUESTIONNAIRE
PASSENGERS INTERVIEW SURVEY,
P-PENH CITY, 1st Survey for trips by MT

Interview's name: Age: Sex: Male ☐ Female ☐
Occupation:
District: Location:
Date: Start Time: End:

Would you please answer the following questions and tick at your appropriate choice?
(*Please ask for explanation if any doubts)

1- Where is your origin?
   ◊   Home   ☐   School/University   ☐
   ◊   Market/Market   ☐   Office's Work   ☐
   ◊   Others   ☐
2- Where is your destination?
   ◊   Home   ☐   School/University   ☐
   ◊   Market/Market   ☐   Work   ☐
   ◊   Others   ☐   Business   ☐
3- Did you make any stop or change mode before reaching your destination?
   ◊   Yes   ☐   No   ☐
       If Yes, Where is it? And which mode you use to transit?

4- How much is the fare for this trip? And how long from here to your destination?
   ◊   ...Riels   Less than 5 min   ☐
   ◊   5-10 min   ☐   10-20 min   ☐
   ◊   20- 30min   ☐   More than 30 min   ☐
5- What make you decide to take the Motorbike-Taxi?
   ◊   No alternative   ☐   Door-to-Door   ☐
   ◊   Not own motorcycle   ☐   Easy to reach   ☐
   ◊   Cheap and Good   ☐   Faster   ☐
   ◊   Others   ☐
6- How often do you make the trip (taking the Motorbike-Taxi)?
   ◊   Once a day   ☐   Twice a day   ☐   3 or more a day ☐
   ◊   Once a week   ☐   2-4 times a week☐   Once in a month☐
   ◊   More than once a month   ☐
7- When do you usually ride the Motorbike-Taxi?
   ◊   6am-9am   ☐   9am-noon   ☐   noon to 1pm   ☐
   ◊   1pm-4pm   ☐   4pm-6pm   ☐   After 6pm   ☐
   ◊   Irregularly(no time set) ☐
8- Do you use the Motorbike-Taxi for one-way trips or round trips)
   ◊   One-way trips   ☐   Round trips, same driver☐
   ◊   Round trip different driver☐   Others   ☐
9- How long have you been walking or waiting for the Motorbike-Taxi to your destination?
   ◊   Less than 3 min   ☐   3-5 min   ☐
   ◊   5-10 min   ☐   over 5 min   ☐
10- What do you think about the current Motorbike-Taxi presenting in the city?
   ◊   Good   ☐   Bad   ☐
   ◊   No comment   ☐   Others   ☐

If Good, Why?

If Bad, Why?

11- Have you experienced the accident?   Yes   ☐   No   ☐
    If yes, how many times and what causes the accident?

12- Have you ever thought that if they provide city bus system will you use the bus?
    ◊   Yes   ☐   No   ☐
        If Yes, Why?
    ◊   Safety, no dust   ☐   Convenient, AC   ☐

        If No, Why? (Tick at appropriate box below)
    ◊   Expensive   ☐   Long waiting   ☐   Less convenient ☐
    ◊   Slowly   ☐   Far away   ☐   Others   ☐

13- Do you mind if I ask your daily incomes or monthly incomes?   ....US$/month
14- Your idea, what is your opinion to improve the current situation for city development?

End: Your answers are very useful. Thank you very much for your time and cooperation.

QUESTIONNAIRE
INFORMAL TRANSPORT DRIVERS
(THE MOTORBIKE-TAXI) INTERVIEW SURVEY
P-PENH CITY, 1st Survey

:::

Interview's name: **Age:**   **Sex: Male** ☐ **Female** ☐
District: **Location:**
Date: **Start Time:**   **End:**

<u>Would you please answer the following questions and tick at your appropriate choice?</u>
(*Please ask for explanation if any doubts)

1- How long have you been in operation?
   ◊   Less than 1 year   ☐   3-5 years   ☐
   ◊   1-2 years   ☐   5-10 years   ☐
   ◊   Over 10 years   ☐

2- How many one-way passenger trips do you usually catch each day?
   …per day

3- What are hours of operation?
   ◊   Start   …a.m   …p.m
   ◊   End   …a.m   …p.m

4- Do you operate on weekends?
   ◊   Yes   ☐   No   ☐

5- How many passengers have you carried for one time operation?
   ◊   1 person   ☐   2 persons   ☐   3 persons   ☐
   ◊   Depend on passengers   ☐

6- Do you provide "curb to curb service" or" door to door" or both?
   ◊   Curb to curb   ☐   door to door   ☐
   ◊   Both   ☐

7- When do you gain customers during the day?
   ◊   Peak Time   ☐   Off-Peak Time   ☐

8- Who is usually taking the Motorbike-Taxi by your perspective?
   ◊   Civil Servants   ☐   Students/Pupils   ☐
   ◊   Housewives   ☐   Workers   ☐
   ◊   Police/Soldiers   ☐   Mixes   ☐

9- Did you get any complaint from your passengers so far?
   ◊   Yes   ☐   No   ☐
       If Yes, what are they?...

10- Have you met any accidents/crash since you start business? Yes ☐ No ☐
   ◊   High Speed   ☐   Drunk   ☐
   ◊   Visual problem   ☐   Bad Road Condition ☐
   ◊   Unawareness   ☐   Vehicle Condition ☐
   ◊   Others   ☐

11- Do you have regular customers?
   ◊   Yes   ☐   No   ☐

12- Where do you choose (location) to expect customers?
   ◊   Special Street Corner   ☐   Near Market   ☐
   ◊   Market Center Areas   ☐   Near Hospital   ☐
   ◊   Around Public House   ☐   No Fixed Terminal   ☐
   ◊   Others   ☐

13- Is this your part-time job?
   ◊   Yes   ☐   No (permanent job)   ☐
       If Yes, What was your previous or current job?...........................

14- Do you have license?   Yes   ☐   No   ☐

15- How much do you earn per day? ..../day

16- What is your suggestion to improve your business or quality of living?

End: Your answers are very useful. Thank you very much for your time and cooperation.

QUESTIONNAIRE
PASSENGERS INTERVIEW SURVEY,
P-PENH CITY, 2nd Survey for Government Officials

Interview's name: **Sex: Male ☐ Female ☐**
Occupation: **Date:**

<u>Would you please answer the following questions? (Please tick only one best answer)</u>

1-How do you mostly travel to Work Place?

◊   Car   ☐   Own motorcycle   ☐   Motodop   ☐
◊   Bicycle   ☐   Cyclo   ☐   Walk   ☐
◊   Tricycle-Taxi ☐   Drop-Off   ☐   Others   ☐

2-How far do you travel to Work Place?

◊   Less than 1Km ☐   1-2Km   ☐   2-3 Km   ☐
◊   3-5 Km   ☐   5-10 Km ☐   Over 10 Km ☐

3-How long does it take currently take you to get to Work Place?

◊   Less than 5 min ☐   5-10 min   ☐   10-20 min ☐
◊   20-30 min   ☐   Over 30 min ☐

4-Where is your home address?

St.   Commune   District

5-Where is your Work Place address?

St.   Commune   District

6-What is your monthly income?

◊   Less than 50US$☐   50-80US$ ☐   80-100US$ ☐
◊   100-150US$ ☐   150-200US$ ☐   200-300US$ ☐
◊   300-500US$ ☐   More than 500US$☐

7-What is your age?

◊   17 &Under ☐   18-24 ☐   25-29 ☐
◊   30-39   ☐   40-49 ☐   50+   ☐

8-Do you own any automobiles and motorbikes?   Yes   ☐   No   ☐

If Yes, How many per household?

Automobiles:
Motorbikes:

9-Have you ever used the Motorbike-Taxi from home to your Work Place?

◊   Yes   ☐   No   ☐

IF Yes, Would you please answer the following questions?

a) How much you usually pay from home to your Work Place?.......Riels

b) How much you are willing to pay for this distance if fix fare system introduced according to the distance through out the nationwide?............Riels

(Distance from home to your work place is very important, please estimate as accurately as possible, question 2)

c) How often do you use the Motorbike-Taxi?

◊   Daily   ☐   once per week   ☐
◊   2-3 times per week   ☐   1-2 times per month   ☐

d) Have you any ideas or comments on the improvement of the current motorbike-taxi service concerning to the traffic management, regulation, environment, fare and other useful concept you may think it help the city? Please list your ideas below:

-

-

-

End: Your answers are very useful. Thank you very for your time and cooperation.

QUESTIONNAIRE
PASSENGERS INTERVIEW SURVEY,
P-PENH CITY, 2nd Survey for sellers
....

Interview's name: **Sex: Male ☐ Female ☐**
Occupation: **Date:**

<u>Would you please answer the following questions? (Please tick only one best answer)</u>

1-What kind of modes do you use to go back your home?

◊	Car	☐	Own motorcycle	☐	Motodop	☐
◊	Bicycle	☐	Cyclo	☐	Walk	☐
◊	Tricycle-Taxi	☐	Drop-Off	☐	Others	☐

2-How far is it from market to your home?

◊	Less than 1Km	☐	1-2Km	☐	2-3 Km	☐
◊	3-5 Km	☐	5-10 Km	☐	Over 10 Km	☐

3-How long do you spend from market to your home?

◊	Less than 5 min	☐	5-10 min	☐	10-20 min	☐
◊	20-30 min	☐	Over 30 min	☐		

4-Where is your home address?

St.   Commune   District

5-What is your monthly income?

◊	Less than 50US$	☐	50-80US$	☐	80-100US$	☐
◊	100-150US$	☐	150-200US$	☐	200-300US$	☐
◊	300-500US$	☐	More than 500US$	☐		

6-What is your age?

◊	17 &Under	☐	18-24	☐	25-29	☐	30-39	☐
◊	40-49	☐	50+	☐				

7-Have you ever used the Motorbike-Taxi from home to your work place?

◊	Yes	☐	No	☐

IF Yes, Would you please answer the following questions?

a) How much you usually pay from home to your work place? ....Riels

b) How much you are willing to pay for this distance if fix fare system introduced according to the distance through out the nationwide?..........Riels

(Distance from home to your work place is very important, please estimate as accurately as possible, question 2)

c) How often do you use the Motorbike-Taxi?

◊   Daily   ☐   once per week   ☐

◊   2-3 times per week   ☐   1-2 times per month   ☐

d) Have you any ideas or comments on the improvement of the current motorbike-taxi service concerning to the traffic management, regulation, environment, fare and other useful concept you may think it help the city? Please list your ideas below:

\-

\-

\-

End: Your answers are very useful. Thank you very for your time and cooperation.

QUESTIONNAIRE
PASSENGERS INTERVIEW SURVEY,
P-PENH CITY, 2nd Survey for Students

Interview's name: **Sex: Male ☐ Female ☐**
Occupation: **Date:**

<u>Would you please answer the following questions? (Please tick only one best answer)</u>

1-How do you mostly travel to school or university?

◊	Car	☐	Own motorcycle	☐	Motodop	☐
◊	Bicycle	☐	Cyclo	☐	Walk	☐
◊	Tricycle-Taxi	☐	Drop-Off	☐	Others	☐

2-How far do you travel to school or university?

◊	Less than 1Km	☐	1-2Km	☐	2-3 Km	☐
◊	3-5 Km	☐	5-10 Km	☐	Over 10 Km	☐

3-How long does it take currently take you to get to school or university?

◊	Less than 5 min	☐	5-10 min	☐	10-20 min	☐
◊	20-30 min	☐	Over 30 min	☐		

4-Where is your home address?

St.   Commune   District

5-Where is your school or university address?

St.   Commune   District

6-What is your monthly income?

◊	Less than 50US$	☐	50-80US$	☐	80-100US$	☐
◊	100-150US$	☐	150-200US$	☐	200-300US$	☐
◊	300-500US$	☐	More than 500US$	☐		

7-What is your age?

◊	17 &Under	☐	18-24	☐	25-29	☐
◊	30-39	☐	40-49	☐	50+	☐

8-Do you own any automobiles and motorbikes?   Yes   ☐   No   ☐

If Yes, How many per household?

Automobiles:
Motorbikes:

9-Have you ever used the Motorbike-Taxi from home to your school or university?

◊	Yes	☐	No	☐

IF Yes, Would you please answer the following questions?

a) How much you usually pay from home to your school or university?.......Riels

b) How much you are willing to pay for this distance if fix fare system introduced according to the distance through out the nationwide?............Riels

(Distance from home to your work place is very important, please estimate as accurately as possible, question 2)

c) How often do you use the Motorbike-Taxi?

◊ Daily   ☐   once per week   ☐
◊ 2-3 times per week   ☐   1-2 times per month   ☐

d) Have you any ideas or comments on the improvement of the current motorbike-taxi service concerning to the traffic management, regulation, environment, fare and other useful concept you may think it help the city? Please list your ideas below:

-

-

-

End: Your answers are very useful. Thank you very for your time and cooperation.

II-6　プノンペンのバイクタクシーに関する

修士論文発表用資料

THE ROLE OF MOTORBIKE-TAXI IN PHNOM PENH CITY, CAMBODIA

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2001-2003

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STRUCTURE OFTHE THESIS

Acknowledgements
Abstract
I-Introduction
II-Literature Review
III-Current Condition
IV-Case Studies
V-Characteristics of Trips by Motorbike Taxi
VI-Characteristics of Motorbike Taxi Drivers
VII-Problem Structures
VIII-Conclusions and Recommendations
References
Appendix

For Today Presentation

I-INTRODUCTION

■ **General of Phnom Penh City**

■ **Definition**

■ **Purposes of Study**

PHNOM PENH CITY

✦ Area: 439sq.km, 7 districts
✦ Pop.:Exceed 1millions.
   ✦ 1.4 times increase in 1991-2000
✦ GNP: 270 $US
✦ All national roads Connect to the city
✦ Served by various transport modes,esp.**Popular Motorbike-Taxi (Motodop)**

Mixed-Traffic Flow in P-Penh

DISTRICT BOUNDARY, P-PENH

❖ 7 districts, four districts form urbanized area (Inner Ring Road) and the rest form suburban area(Outer Ring Road)

❖ **Present Land Use**   Unit:Km²

Land Use	Urbanized Area	Suburban Area
Residential	13.14	83.07
Commercial	7.92	6.49
Industrial	0.80	20.59
Institution	1.92	6.36
Agriculture	0.14	186.27
Parks&Open Space	0.36	7.12
Swamp Area	-	56.57
Water	2.80	45.36
Total	27.08	411.83

PHNOM PENH
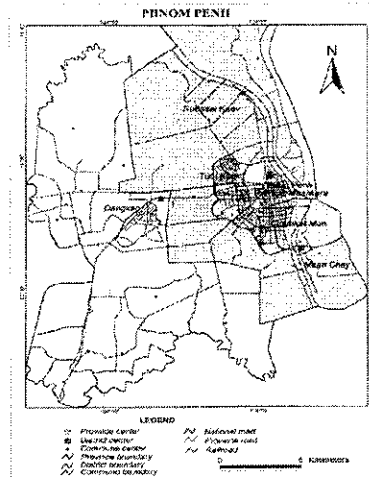
Population and Area in Seven Districts

No.	Districts		Area (Km2)		Population	Density on Land (Pop./Km2)
			Total	Land		
1	Chamcar Mon	Urbanized Area	9.59	9.26	187,082	20,203
2	Tuol Kork	Urbanized Area	7.95	7.82	154,968	19,817
3	Daun Penh	Urbanized Area	7.34	5.39	131,913	24,474
4	Prampi Makara	Urbanized Area	2.20	2.14	96,192	44,950
5	Dang Kao	Suburban Area	187.91	181.69	92,461	509
6	Russey Keo	Suburban Area	107.88	88.33	180,076	2,039
7	Mean Chey	Suburban Area	50.86	40.18	157,112	3,910
	Total		373.73	334.81	999,804	2,986

Source: National Institute of Statistics, MoP, General Population Census of Cambodia, 1998

Area	No.of HH	Average HH Size	% of one person HH	% of HH with 7 or more	% of female Headed HH	% of Female Headed below 35
Cambodia	2,165,000	5.3	0.6	27.1	19.6	9.0
P-Penh	174,000	5.5	1.2	29.7	25.8	15.5

Source:MoP, Cambodia Socio Economic Survey 1999

Note: HH-Household, MoP-Ministry of Planning

TRANSPORTATION SYSTEMS
(Informal Modes)

- Public Transport Modes comprise
  - Bus,Shared Taxi-bus
  - Airport Taxi
  - Informal Modes(Motorbike-Taxi,Cyclo,Motorumok,etc),
    only motorbike-taxi is popular and facilitate the urban movements
  - Railway, River Transport and Air Transport
- Motor vehicles show remarkable increase, <u>2.6 times</u> in 1991-2000,registered vehicles, app.<u>295,000</u> motorized vehicles, of which about <u>247,000</u> are motorcycles and <u>48,000</u> pass. cars
- No intra public transport system such as Bus,Taxi, ,Railway or Subway,etc.
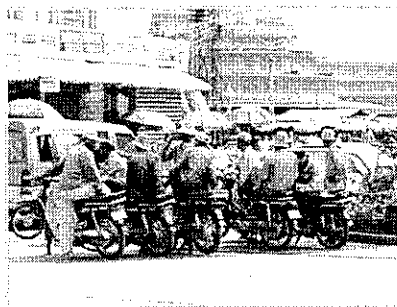
Motorbike-Taxi Drivers are expecting passengers near the Central Market

POPULATION AND EMPLOYMENT

		2000	2005	2010	2015
GDP per capita US$		215	267	350	447
Population	- Total (000)	1,152	1,373	1,611	1,820
	- Urban	591	655	718	750
	- Suburban	561	718	893	1,070
Employment	- Total (000)	586	706	830	1,006
	- Urban	254	285	315	330
	- Suburban	332	421	515	676

Source: *JICA Master Plan, 2001*

DEFINITION OF MOTORBIKE-TAXI

※ *__What is Motorbike-Taxi?__*

- A taxi which can be hailed by passengers anytime, anywhere or be called by drivers, especially for foreigners I.e visitors, tourists and run by private individual
- Dominant mode in terms of cheaper fare,frequency,convenience, and door-to-door service
- Carry passengers up to 3, sometime ,sitting on the back seat extending up to 45 cm
- Service is available almost 24 hours
- Its engine capacity ranges from 50-100cc(Used motorcycles imported)

PHOTOS OF MOTORBIKE TAXI AND ITS SERVICES
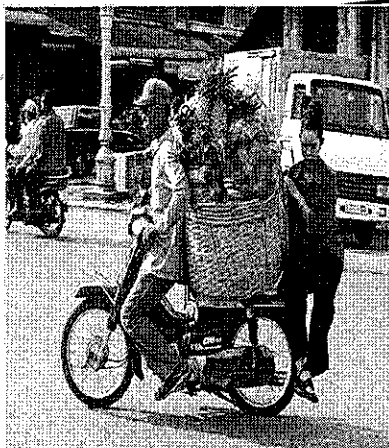
Motorbike-Taxi transport goods and passenger

Motorbike-taxi and its passengers
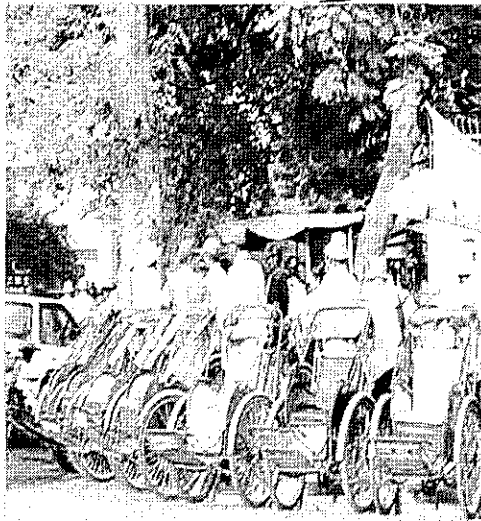
Cyclos (Tricycles)   Motorbike-Taxi and its
                                            Passenger

PURPOSES OF THE STUDY

This research aims:

- To study the present characteristics of passengers and drivers of this mode and to accumulate the transport's document for city
- To analysis the current Motorbike-Taxi systems and its services provided and to investigate the current situation in capital city
- To analyze how it is used and how it is viewed by the users.
- To look ahead and determine the proper course for the future role of this mode following the results collected and recommend for future betterment and improvement in terms of behavior, morality of those related to transportation usage
- If we understand how and why people choose the modes to their destination, we better understand and plan for our future transportation needs

SURVEY METHODOLOGY

- Two times survey, first in March-April,550 interviewees and second in July,391 interviewees
- The first survey was about passengers used motorbike-taxi only and the second was about passengers used all transport modes and shares of those modes
- En-route interview(Passengers and Drivers,P&D) at selected location such as markets,in university campus, employment areas and some strategic corners.
- Some cases, QF distributed to selected P&D,then collected back to meet the required number of sample.
- QF including trip information and household information(QF: Questionnaire Form).

SUMMARY OF SURVEY

Number of Sample				Function of Interviewees	Location of Survey
1st Survey for trips by motorbike taxi&its drivers, (Mid.Marc-Apr.2002)		2nd Survey for trips by all transport modes, (July 2002)		-Govt. Officials -Sellers -Students -Housewife -Workers -Polices	-Market -University Campus -Employment areas -Home -Near hospital, hotel and corners -En-routes
Passengers	Drivers	Passengers	Total (P&D)		
Male 234	129	192	555		
Female 316	n.a	199	515		
Total 550	129	391	1070		

Note: P&D-Passengers & Drivers

PHOTOS OF SURVEY

❖ QF explanation to
   Drivers
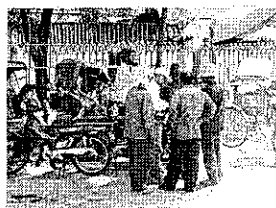
❖ Passenger filled
   the QF

II-LITERATURE REVIEW

◼ National Issues Forum Report
   ↳ Traffic Regulation:Implementation&Practice
   ↳ Recommendations from public and relevant institutions&authorities

◼ Driving Behavior of Motor Vehicles
   ↳ No concept of "Give Way" to pedestrians
   ↳ Lack of respect for the right of way
   ↳ Ignoring traffic signals and left turning prohibition

◼ Conclusion of Transport Master Plan
   ↳ Transport System
   ↳ Road Development
   ↳ Public Transport
   ↳ Traffic Management
   ↳ Institutional and Capacity Building

II-LITERATURE REVIEW,CON'T

■ Three training sessions held under the MPP, DPWT and Handicap International Belgium titled *"Road safety for motorbike taxi driver"*

- ⚓ Driving on the road (keeping right,Dividing lines,lanes, overtaking,driving on footpaths,parking)
- ⚓ Driving signal (indicator to turn right,left,braking using hand signal)
- ⚓ Turning points
- ⚓ Road Signs
- ⚓ Traffic signals
- ⚓ Crossings
- ⚓ When to give
- ⚓ Knowledge of first aid
- ⚓ Practice

■ All trainees provided 2 helmets and 1 vast to identify themselves as motorbike taxi driver

Characteristics of Feeder Trip Modes

Tra. Modes / Feeder Modes	River Boat		Railway		Airport		Buses, Taxi Buses	
	%	Reasons	%	Reasons	%	Reasons	%	Reasons
Motorbike Taxi	48	Fast(32.3%), Convenient(24.2%), Safety(24.2%)	30	Fast(29.1%), Convenient(15.7%), Cheaper(35.8%)	-	Fast(10.7%), Convenient(17.9%), Safety(51.3%)	76.2	Fast(32.3%), Convenient(24.2%), Safety(20.3%)
Own Motorbike	19		-		-		-	
Passenger Cars&Pickups (taxis,Taxi-buses)	26		21		80		-	

Source: JICA Master Plan 2001

Feeder Transport Modes of Railway, Passenger Trips in TMA, 1978-1988

Feeder Modes		Car	Bus	2-wheeled	Walk	Others	Total
No. of Trips, 1000trips	1978	1,322 (4.3%)	4,322 (14.2%)	1,690 (5,5%)	23,152 (75.8%)	48 (0.2%)	30,534 (100%)
	1988	1,734 (4.7%)	4,214 (11.3%)	3,592 (9.6%)	27,649 (74.3%)	22 (0.1%)	37,211 (100%)
	1988/1978	1.31	0.98	2.25	1.19	1.97	1.22

Source: Urban Transportation Planning Commission of TMA

Note: TMA-Tokyo Metropolitan Area

PHOTO OF DRIVER IN UNIFORM

- Blue helmet with motorcycle-taxi written on it and number
- The number identified as district No.(6) and the vast number(0010)

Uniform given to trainee after safety training course for trial

III-CURRENT CONDITION

- Too many Motorbike-Taxis and poor education in terms of transportation points of view, Mixed traffic, no need license and registration form for entrants, Traffic congestion due to the growth of entrants, No safety measure such as helmet, No uniform or training prior to operation.
- Poor and undisciplined driving behavior, sudden lane changing, entry to the opposite directional lane
- Pedestrian behavior enter carriageway and walk along road when muddy or occupied by parked vehicles
- On street/on sidewalk parking, no respect the rules and regulations causing many accidents.
- Ambiguous role of transportation modes, services and operation zones
- Traffic management and control are very weak

IV-CASE STUDY CITIES

- **Introduction**
- **Ho Chi Minh and Ha Noi Cities,Vietnam**
- **Bangkok City, Thailand**

INTRODUCTION

- Vietnam and Thailand are the member of ASEAN Countries and neighboring of Cambodia
- Various types of transport modes, formal and informal modes but common one called *motorbike taxi*
- Urban sector accounts for at least 50% of GNP
- 5-10% of urban household income is spent on transport— and more than 25% for the poor
- Both countries faced similar problems: population growth, motorization, congestion, pollution, traffic safety and personal security

HA NOI CITY, Vietnam

❖ Political, cultural, scientific and technical center
❖ Economic hub and major international transaction center for the whole country
❖ Pop.2.8 millions in 2002, Area: 927 Sq.km
❖ Urban population set to increase to 45% by 2020
❖ Cities are the country's engines growth, account for 70% of GDP

URBAN ISSUES, HANOI

❖ Mixed traffic on scare road space
❖ Number of motorbike increased 5-10% annually
❖ Number of motorbikes has rapidly increased, up to 30% in 2001.
❖ Some 85% of motorcycles are second-hand imported from Japan,mostly have highly polluted two-stroke engine
❖ Public transport in Hanoi accounted for 2-6% of total trips
❖ Two major problems: <u>traffic congestion</u> and <u>accidents</u>

Motorcycle taxi&passenger

Traffic Accidents in Hanoi,1990-2001

Year	Cases	No.of Fatalities	No.of injured
1990	633	247	547
1991	617	260	512
1992	678	279	634
1993	672	247	567
1994	656	297	447
1995	2094	325	2114
1996	3517	353	3727
1997	2917	284	3201
1998	2496	283	2976
1999	2494	291	2856
2000	2444	385	2670
2001	2187	476	2238

Source: 6th ASEAN-Japan Workshop-Cum-Seminar on Urban Transportation

Some Restraints in both cities, Vietnam

❖ Vietnam's transport industry has proposed to put a temporary halt to motorbike ownership licenses in the country's capital Hanoi and Ho Chi Minh City from Novemebr1, 2002 in a bid to curb soaring road accidents

❖ Motorbike restriction is only a stop-gap measure as the local public transport system has not yet developed and Vietnamese's traditional means of transport has been motorbikes for a long time

❖ There are 37000 cyclo drivers alone in Ho Chi Minh City

❖ The routes of cyclo being restricted by the gov. because causing traffic congestion, use for short trip

Development of Transport Modes, Ha Noi, 1990-2001

Year	No. of Motor Vehicles	Increase rate from previous year (%)	No.of Motorbikes	Increase rate from previous year (%)	Total
1990	34,222		195,447		229,669
1991	42,318	23.6	247,225	26.4	289,543
1992	45,634	7.8	273,633	10.6	319,267
1993	49,006	7.3	346,977	26.8	395,267
1994	52,536	7.2	420,357	21.1	472,893
1995	60,231	14.6	498,468	18.5	558,699
1996	70,880	17.6	570,544	14.4	641,424
1997	86,436	21.9	626,565	9.8	713,001
1998	89,513	3.5	602,615	-3.9	692,128
1999	92,355	3.1	666,672	10.6	759,027
2000	96,697	4	785,969	17.0	882,666
2001	103,748	7.3	951,103	21.0	1,054,851

POLICY MEASURES FOR ISSUES,VIETNAM

❖ Upgrade a number of traffic nodes where traffic problems occur most

❖ Installing traffic signs and traffic light to limit speed

❖ Continuously clearing road sections/lanes and walkways occupied by vendors

❖ Strengthening controls and penalizing violators in line with traffic laws to limit certain transport modes' operation or to ban them from operating in some areas

❖ Reinforcing patrol activities of city policemen and the investigation board of the public works in line with the public laws

POLICY MEASURES, CON'T

❖ Designating roads for cars, motorbikes and bikes

❖ Further disseminating information and educating people on traffic law, updating information dissemination, closely coordinating with the city's mass organizations to insure effective education of the law for all people in residential areas and schools

❖ Increasing number of signalized intersections and providing more one-way roads

❖ Further studying proposals to limit certain transport means to operate in certain inner-city roads at daytime, to control car and motorbike use

POLICY MEASURE, CON'T

❖ Applying road safety auditing
❖ Introducing more public bus transport services and
  service routes
❖ Study on construction of MRT/LRT in the city

BANGKOK METROPOLITAN,
THAILAND

▮ Capital City of Thailand,national,manufacturing,
  administrative and service center
▮ Area: 1,565.2 sq.km
▮ Pop.:5.8 millions

URBAN ISSUES,THAILAND

■ Traffic and Transport Condition

  ❖ Traffic congestion, Pollution and Accidents
  ❖ Rapid Population Growth
  ❖ Decrease the usage of public transport and increase in car ownership

■ 41,658 motorcycle taxi operators servicing 1,777 areas and motor vehicles are still growing

■ Downtown weekday traffic speeds are reported 10kph or less, more times spent to reach destination such as to work,etc

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Motor Vehicles&Population, Thailand

Year	Privately Owned Cars	Privately Owned Motorcycles	Total
2001	2,353,637	1,853,788	4,207,425
2000	2,276,540	1,964,850	4,241,390
1999	2,272,526	1,660,119	3,932,645
1998	2,146,035	1,646,738	3,792,773

Bangkok —■— BMR

Projected Bangkok Population

16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0

1995   2000   2006   2011
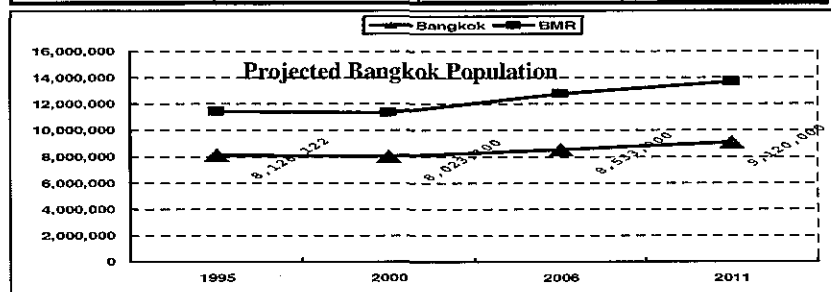
PHOTOS OF MOTORBIKE TAXI

- Drivers hang around in groups by department stores, tourist spots,etc.
- *Drivers are easy to recognize by the red jacket., the vest gives the driver the right to operate on a given corner, two helmets required by law*
- Fares are up to negotiation, but similar to popular TUK-TUK
- Quickest mode if road congested. For car-less resident, popular alternative form of transit in Bangkok for more than 15 years
- You can find them everywhere in Bangkok, but the fare must be negotiated,easy to recognize with the use of colorful vest and the number on the back

---

Motorcycle Taxi Issues, Thailand

- The notion to regulate the motorcycle taxi operations has been intermittent for over a decade dependent upon various administrations' policies
- Lack of supporting legislation
- MTC deems this mode necessary to strictly regulate motorcycle operation to protect the users and to offer service equity, convenience and safety

Transport Modes In Both Cities

Traffic, Vietnam

Urban Activities → Trip Generation

Travel Demand Forecasting Process

Roads& Streets

Trip Distribution

Mode Usage

Road Assignment   Transit Assignment
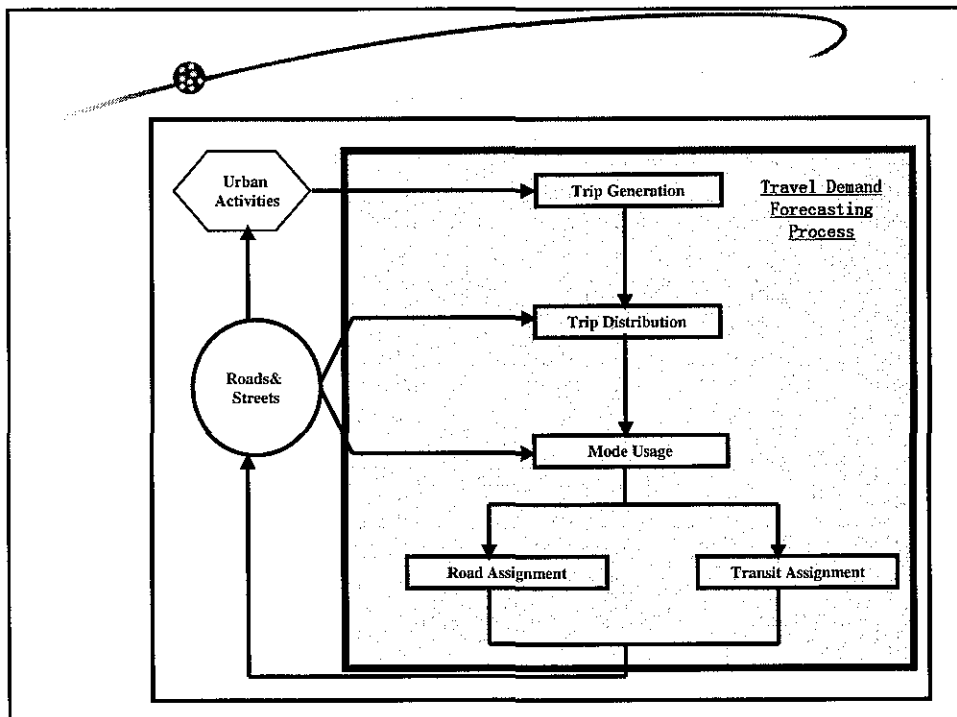
V-CHARACTERISTICS OF TRIPS BY MOTORBIKE TAXI

+ **79% of city residents have used the Motorbike-Taxi**

+ **The Figure shows this mode is extremely important for urban population and activities.**

Q:Have you ever used the Motorbike-Taxi?

No
21%

Yes
79%
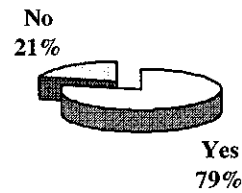
V-CHARACTERISTICS OF TRIPS BY MOTORBIKE TAXI

Sex Age(Yrs)	Male (%)	Female (%)	Total (%)
Up to 17	2.36 (13)*	5.80 (32)	8.16 (45)
18-24	23.1 (127)	33.8 (186)	56.9 (313)
25-29	6.70(37)	7.10 (39)	13.8 (76)
30-39	7.80 (43)	4.20 (23)	12.0 (66)
40-49	2.00 (11)	5.10 (28)	7.10 (39)
50 +	0.59 (3)	1.45 (8)	2.04 (11)
Total	42.55 (234)	57.45 (316)	100 (550)

*No. of passengers interviewed

Composition of Motorbike Taxis' passenger trip by both sex and age

-Female passengers use this mode more than male passengers, which share 57.45% and 42.55%, respectively. They used this mode for home-based market

-The greatest use of the mode is between age 18 and 24, which shares 56.9%

-Male passengers age between 30-39 used more because for home-based work

V-TRIP ORIGIN

-Most trips made from home and followed by from market which shares 63% and 11%, respectively and other origins as shown in the pie chart

□ Home □ Market □ Uni./Sch. □ Work ■ Others

10%   6%
10%
11%   63%
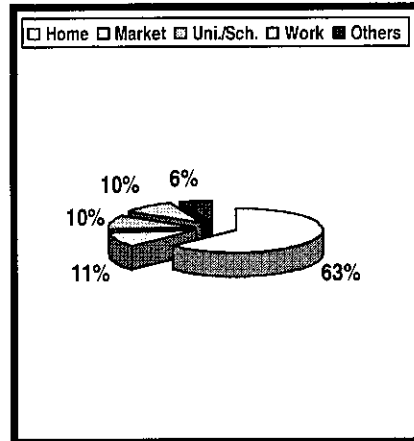
V-TRIP PURPOSES

■ Major trip's purpose
- University 24%
- Work   20%
- Home   17% ⎫
- Market   16% ⎬ 88.0%
- Business 11% ⎭

Trip pattern

others ◄ •Uni./Sch

Business ◄ **Home** ► Work

Market ◄   others

Others
12%   Home
           17%
Busiess
11%
                    Market
                    16%
Work
20%
           Uni./Sch.
           24%

Source: 1st Survey, 2002
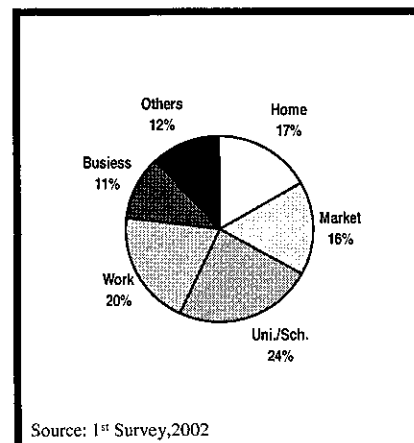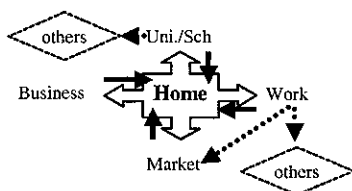
V-TRIP FREQUENCIES
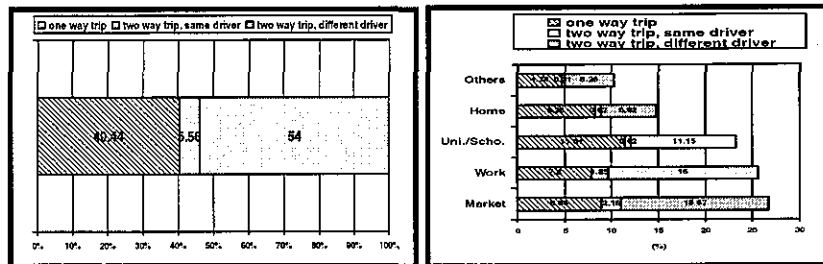
-54% of trips used this mode for two way trips but different drivers and trips mostly used for work and market trips. As for two way trips and same driver shares 5.56% but this shares, market's share is dominance and followed by work. The same driver provides a number of convenient such as saving time, fare negotiation non existence, especially trustworthy.

V-MODE USAGE BY DISTANCES, PURPOSES
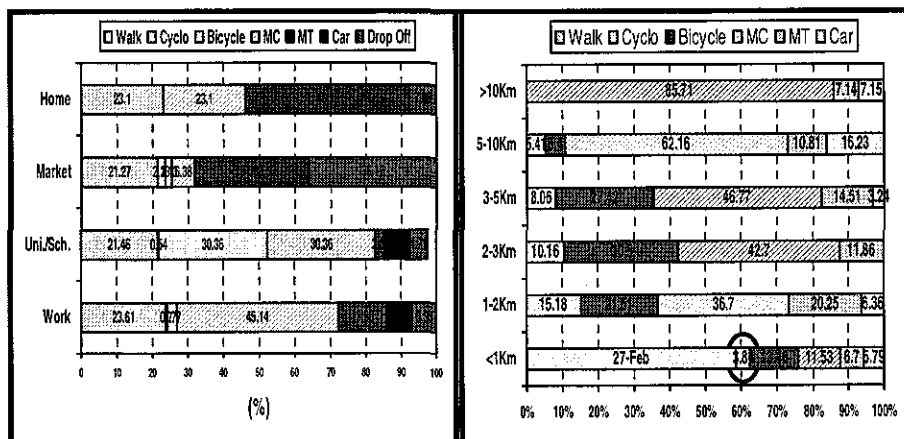
Note: MC-Motorcycle, MT-Motorbike Taxi

V-MODAL SPLIT BY INCOME

Legend: ☐ Walk ☐ Cyclo ☐ Bicycle ☐ MC ■ MT ■ Car ▨ Drop Off

Y-axis (Income,US$): 300-500, 200-300, 150-200, 100-150, 80-100, 50-80, <50

X-axis (%): 0 to 160

Values visible: 300-500: 28.57, 28.57; 200-300: 50; 150-200: 16.13, 38.71; 100-150: 9.54, 33.33; 80-100: 13.04, 60.87; 50-80: 34.28, 44.3; <50: 21.4, 29.25, 27.51
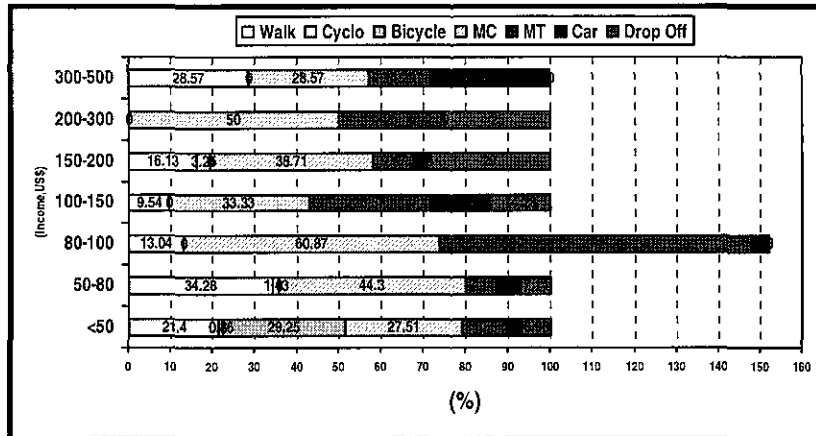
V-CHARACTERISTICS OF TRIPS BY MOTORBIKE TAXI

- Motorbike-Taxi shares 12% of other modes, the third ranking after Own motorcycle,walking and bicycle,which share 38%,24%and 19% respectively.
- NMVs show a big shares
- Car illustrates 6% shares

MODAL SHARES

Walk 24%
Cyclo 1%
Bicycle 19%
Car 6%
Own Motorcycle 38%
Motorbike-taxi 12%
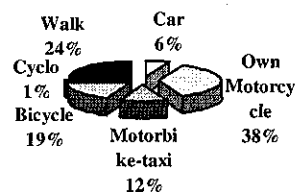
Source: 2nd Survey

V-CHARACTERISTICS OF TRIPS BY MOTORBIKE TAXI

⊁ The figure illustrates that 97.91% of passengers employ this mode to go shopping,81.56% to go to work while 62.43% to go to school and university.

Motorbike-Taxi Shares by Purposes
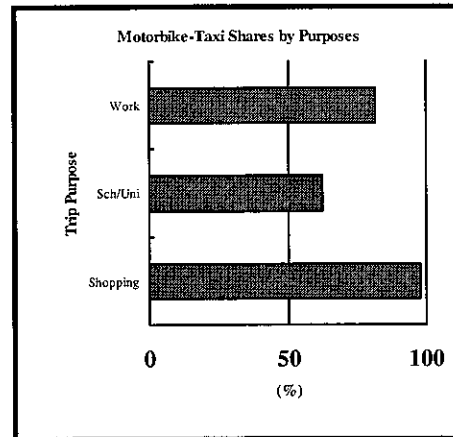
V-CHARACTERISTICS OF TRIPS BY MOTORBIKE TAXI

❖ The bar chart tells that both sexes employ this mode because they do not own motorcycle,43,63% and followed by "No alternative),15.8%

❖ This shows a future growth of motor vehicle's ownership if income increase or they are afford to buy one
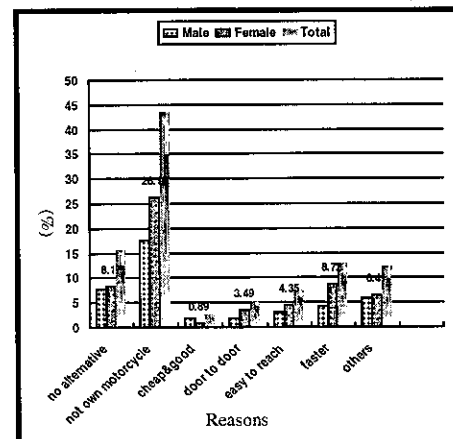
V-ESTIMATED PERSON TRIP
O-D PATTERN

Unit: 1000 per trip/day

	D	Urban Area				Suburban Area		
O		CM	DP	PM	TK	DK	MC	RK
Urban	CM	255.2	50.4	33.4	46.6	8.6	59.9	18.2
	DP	60.3	135.7	41.1	55.4	12.3	35.5	44.0
	PM	42.7	41.8	109.5	71.2	5.4	11.9	15.2
	TK	54.3	55.1	40.5	172.3	24.5	28.4	21.6
Suburb an	DK	11.5	14.8	12.9	26.6	247.8	17.6	22.4
	MC	57.9	28.6	11.0	19.2	14.9	328.1	15.3
	RK	20.2	38.0	31.0	23.7	13.5	6.1	532.7

Source: JICA Master Plan, 2001
Note: CM-Chamca Mon, DP-Daun Penh, PM-Prampimakara, TK-Toul Kork, DK, Dangkao, MC-Mean
Chey,RK-Russey Keo

V-FARES PAID FOR THE RIDE BY
DISTANCES
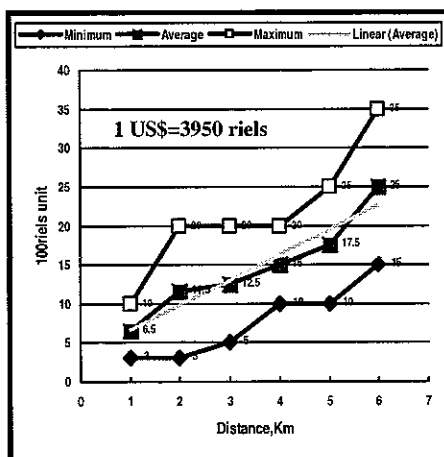
Current Prices by Distance
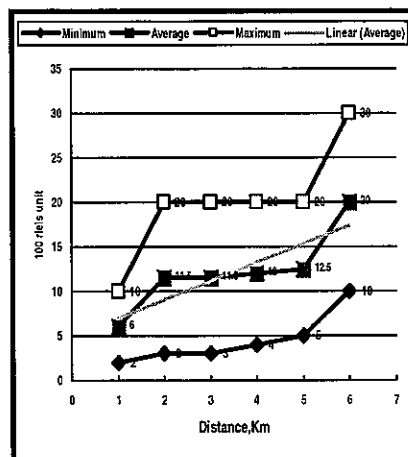
Prices willing to pay by distances

V-TRAVEL TIME BY MT

- The chart tells that 90% of all travels spent less than 20 minutes and 10% spent more than 20 minutes
- This mode uses for the short distance purpose, intra-city trip such as to go shopping,etc.

Travel Time

more than 30min 2%

20-30min 8%

10-20min 23%

Less than 5 min 19%

5-10min 48%

MT-Motorbike Taxi
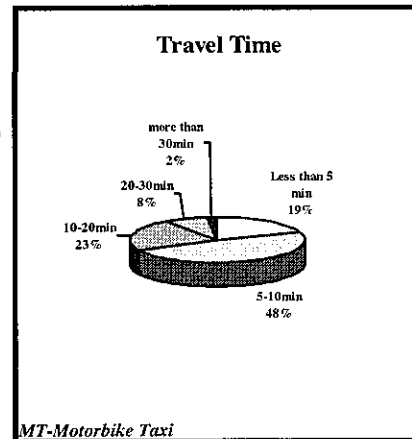
V-MC AND CARS OWNERSHIP/HH

- 44% of city residents own one MC per HH, while 26% possess two MC. In case of Car's ownership 87% of residents have no access to car yet but 11% own one and 2.0 own two per HH

□ 0 □ 1 □ 2 □ 3 ■ 4

Cars   86.66   1.3291

MC   18.66   44   26   6.66   8

0%   20%   40%   60%   80%   100%
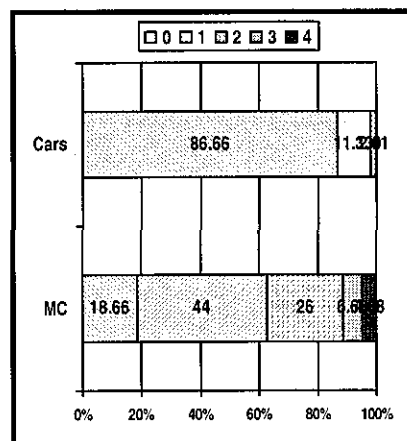
Note: MC-Motorcycle, HH-Household

(26)

V-PUBLIC ATTITUDE

Public Attitude toward MT

No Comment
23%

Bad
25%

Good
52%

Source: 1ª survey

□ Good □ Bad

Others	18.73 / 6.99
Home	13.29 / 7.61
Business	10.46 / 2.08
Market	15.05 / 15
Sch./Uni.	5.71 / 11.52
Work	7.25 / 8.23

0 2 4 6 8 10 12 14 16 18
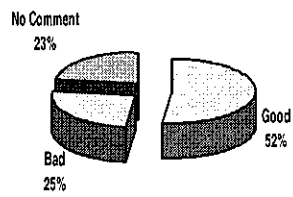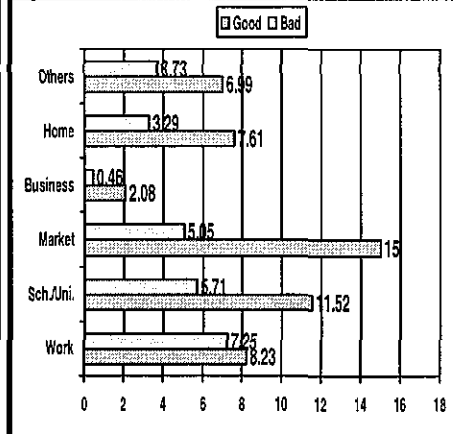
VI-CHARACTERISTICS OF MOTORBIKE TAXI DRIVERS

Motor Vehicle Driver Behavior

Drivers

Bad Behavior

Right Flow of Movement

Illegal Parking MV

Motor Vehicle Drivers

Driver

Education and Traffic Enforcement Needed
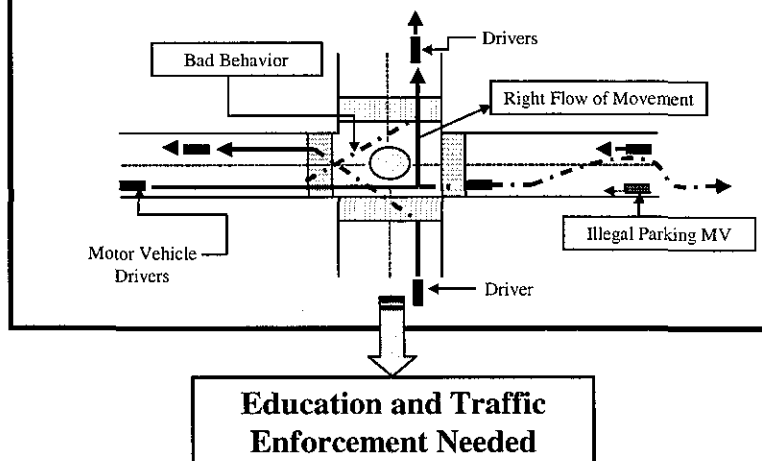
VI-CHARACTERISTICS OF MOTORBIKE TAXI DRIVERS

+ Most drivers of this mode age between 25-40 share 80.72% of other ages and followed by 41-50,which share 12.2%.

Is it your part-time or permanent job?

Part time job
13%

Permanent
87%

Driver's Age

80.72

9.9

12.2

5.48

<25   25-40   41-50   51-60

Age Group

(%)
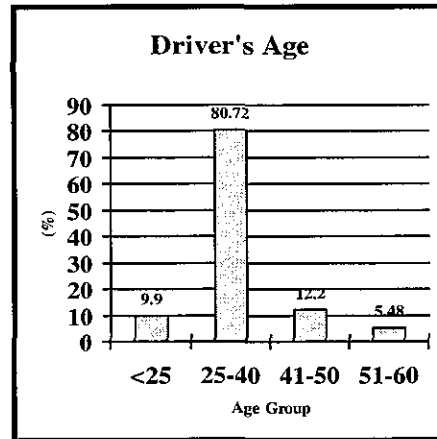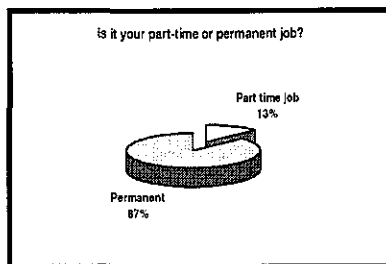
VI-CHARACTERISTICS OF MOTORBIKE TAXI DRIVERS

Q:Did you get any complaint from your passengers?

No
33%

Yes
67%
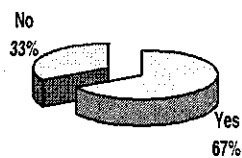
Q: Did you have accident so far?

Yes
30%

No
70%
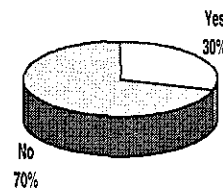
SUMMARY

■ Female passengers used motorbike taxi more than male passengers,57.45% and 42.55% respectively

■ Major trip purposes   Modal Shares

Trip Purpose	Shares(%)
University/School	24
Work	20
Home	17
Shopping	16
Business	11
Others	12

Modes	Shares(%)
Car	6
Motorcycle	38
Motorbike Taxi	12
Walk	24
Bicycle	19
Cyclo	1

■ 79% all respondents used the motorbike taxi while 21% said "Never use"

SUMMARY

■ Modal shares by purposes, 2nd Survey

Purpose	Car	Own Motorbike	Motorbike Taxi
Work	6.94%	45.14%	2.62%
Uni./School	7.33%	30.36%	2.62%
Shopping	n.a	6.38%	31.29%
Back home	n.a	23.10%	46.15%

■ Trip Frequencies of Passengers

Trip Frequencies	Shares
One Way Trip	40.44%
Round Trip, same driver	5.56%
Round Trip, different driver	54.0%

■ Public Attitude Toward the Mode,51.43% said "Good",25.49% "Bad" the rest "No comment"

SUMMARY

Mode	Cambodia					Thailand					Vietnam				
	Routes	Price	Pas. Capacity*	Ser.Niche**	Uniform&helmet	Routes	Price	Pas. Capacity	Ser.Niche	Uniform&helmet	Routes	Price	Pas. Capacity	Ser.Niche	Uniform&helmet
Motorbike taxi	Variable	Negotiation	1-4	Short trip, feeder	No	Variable/Semi fixed	Negotiation	1-2	Feeder, some long distances	Yes	Variable	Negotiation	1-3	Short trip, feeder	No

Note:*passenger capacity, ** Service Niche

VII-CONCLUSIONS

- Motorbike-Taxi Dominant mode,door-to-door,frequency and cheaper but contribute to congestion and accidents
- Too many entrants, freely entering into business
- Lack of education,training,bad behavior, ignorance of traffic law and safety of others, low morality and respectful
- Female uses this mode more than male,mostly for shopping and use for short distance purposes but tend to own motor vehicle if afford to get one, both male and female
- Motor vehicles show a potential growth in the near future as economic grows, political stability and income increases
- Traffic congestion and accidents due to the growth of motor vehicle in Thailand & Vietnam

VIII-RECOMMENDATIONS

- The motorbike-taxi should be integrated as a feeder mode with public transport modes especially the public bus system
- Set policies for the operation, introduce the registration system for the entrants and conduct training test prior to operation
- All drivers should wear uniform and equip with the safety measure such as helmets for either passenger or driver same case as in Thailand
- Strengthening and enforcement the traffic rules and regulations and management and review the past failure of project implementation, WHY?
- Traffic Management: 4 E policies "traffic engineering,traffic education,traffic enforcement, emergency service"
- Make more city bus attractive if re-introduced
- General Public Education
- Human Resource Development and Commitments
- Review successful measures of neighboring countries to meet local condition and needs

THANKS FOR YOUR ATTENTION

II-7 バンコクのソイバイク利用アンケート調査票

Questionnaire
Yokohama National University   Transportation laboratory

We are researching on a bus stop and a BTS station. Please answer the following questions.

__Please tell me about today's trip.__

Q1, Which did you get on a bus or a BTS for coming here today?

1,Bus→go to Q2   2,BTS→go to Q4

Q2, What number of the bus did you get on?

(   )

Q3, Where did you get on the bus?

(   )→go to Q5

Q4, Which station did you get on the BTS?

(   )

Q5, What time did you depart the bus stop/BTS station which you got off?

(   ) h (   ) min

Q6, What was your purpose for coming here ?

1,Commuting   2,Going to school   3,Shopping   4,Business   5,Others(   )

Q7, What means of transportation did you take from your home to the bus stop/BTS station?

1,Motorbike taxi→go to Q8   2, Walking→go to Q10   3, Others(   )→go to Q8

Q8, How long did it take from getting on this mode to the bus stop/BTS station, and how much did it cost ?

(   ) min   (   )Baht

Q9, How long did it take after leaving your home until you caught it?

(   ) min→go to Q11

Q10, How long did it take from your home to the bus stop or the BTS station?

(   ) min

Q11, How often do you take it for this purpose?

1,always   2,three times a week   3,once a week   4,the first time

Q12, Why did you take it? Please select "Yes" or "No".

· Cost is saved.	Yes	No
· Speedy.	Yes	No
· Safety from danger.	Yes	No
· Easy to go (Not tired).	Yes	No
· The bus stop or the station is close to your home.	Yes	No
· The other reason.	(	)

Please tell me about yesterday's trip.

Q13, When you went back to your home yesterday, which did you take a bus or a BTS?

1,Bus→go to Q14   2,BTS→go to Q16

Q14, What number of the bus did you ride?

(   )

Q15, Where did you get off the bus?

(   )→go to Q17

Q16, Where did you get off the BTS?

(   )

Q17, What time did you depart the bus stop/BTS station which you got off?

(   ) h (   ) min

Q18, What was your trip purpose yesterday ?

1, Commuting   2, Going to school   3,Shopping   4,Business   5,Others(   )

Q19, What means of transportation did you take from the bus stop or the BTS station to your home?

1,Motorcycle taxi→go to Q20   2,walking→go to Q22   3,others(   )→go to Q20

Q20, How long did it take from getting this mode to arriving at your home, and how much did it cost ?

(   ) min   (   )Baht

Q21, How long did it take after getting off the bus or the BTS until you caught this mode?

(   ) min

Q22, How long did it take from getting off the bus or the BTS to your home?

(   ) min

Q23, How often do you use it for this purpose?

1,always   2,three times a week   3,once a week   4,the first time

Q24, Why did you take it? Please select "Yes" or "No".

· Cost is saved.	Yes	No
· Speedy	Yes	No
· Safety from danger.	Yes	No
· Easy to go (Not tired).	Yes	No
· The bus stop or the station is close to your home.	Yes	No
· The other reason	(	)

Please let me know your profile.

Q25, How old are you?

(   )

Q26, Your occupation

1,Government official worker   2,Private company worker   3,Business owner   4,Housewife

5,Univ.student   6,Student(expect no,5)   7.Unempoloyed   8, Others(   )

Q27, The address of your house

(   )

Q28, Type of the house

1,detached house   2,Town houses   3,Condominium   4,Apartment   5,Others(   )

Q29, Number of the rooms in your house

(   )rooms

Q30, How much is a monthly income?   (The student who does not have income is splendid.)

(   ) Baht

Q31, Please let me know family composition.

~6age(   ), 7~17age(   ), 18~59age(   ), 60age~(   )

Q32, Does your household have a car, a motorbike, and a bicycle, and do you have a mode exclusive to you?

Car   1,Yes   2,No   exclusive to you: 1,Yes   2,No

Motorcycle   1,Yes   2,No   exclusive to you: 1,Yes   2,No

Bicycle   1,Yes   2,No   exclusive to you: 1,Yes   2,No

Q33, Do you have a car license or a motorcycle license?

Car   1,Yes   2,No

Motorbike   1,Yes   2,No

Thank you very much for your kindness!!

Sex   (   )

Time   (   )h(   )min

II-8　バンコク・プノンペン・ハノイにおける

交差点調査概要とその結果

参考資料：バンコク・プノンペン・ハノイにおける交差点調査概要とその結果

1 バンコク・プノンペン・ハノイにおける調査結果の比較

1.1 車種別交通量割合
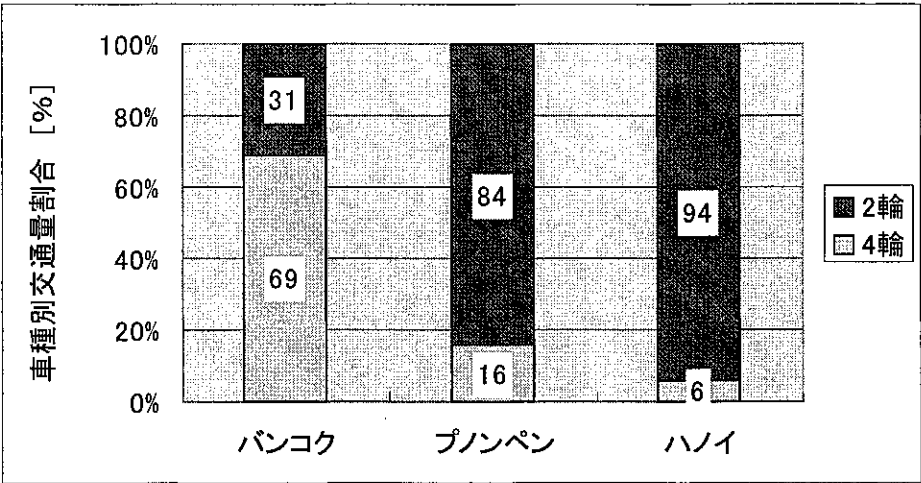
図 1.1　３都市の観測交差点における車種別交通量割合

1.2 飽和交通流率

バンコク

表 1.1　直進レーンの近似曲線式一覧

	青開始後	近似曲線式	サンプル数	R^2値
アプローチA	0-20秒	y = −0.11 x + 20.92	54	0.114
	20秒以降	y = −0.26 x + 26.66	126	0.048
アプローチB	0-20秒	y = −0.27 x + 24.16	44	0.198
	20秒以降	y = −0.15 x + 23.68	78	0.034

ハノイ

表 1.2　各アプローチ別平均通過台数（直進＋左折）

	アプローチA	アプローチB	アプローチC	アプローチD
4輪	3	6	5	9
2輪	67	101	116	95

単位　[台／スプリット]

ただしスプリットタイムは，アプローチ A, C は 30 秒，アプローチ B, D は 35 秒であった.

1.3 オートバイの平均乗車人員

表1.3 平均乗車人員 バンコク

時間帯	アプローチA	アプローチB	合計
8	1.1		1.1
11	1.1	1.1	1.1
12	1.1	1.1	1.1
16	1.1	1.2	1.2
17	1.3	1.2	1.2
合計	1.2	1.1	1.2

表1.4 平均乗車人員 プノンペン

	オートバイの交通量 [台／時間]				乗車人員合計	平均乗車人員
	1人乗り	2人乗り	3人乗り	合計	[人／時間]	[人／台]
アプローチA	1185	930	105	2220	3360	1.5
アプローチB	1113	647	87	1847	2667	1.4
アプローチC	1520	1000	107	2627	3840	1.5
アプローチD	1480	1000	260	2740	4260	1.6
全アプローチ	5298	3577	558	9433	14127	1.5

表1・2より，オートバイの平均乗車人員はバンコクでは1.2人，プノンペンでは1.5人であることがわかる．

1.4 オートバイの乗車人員割合
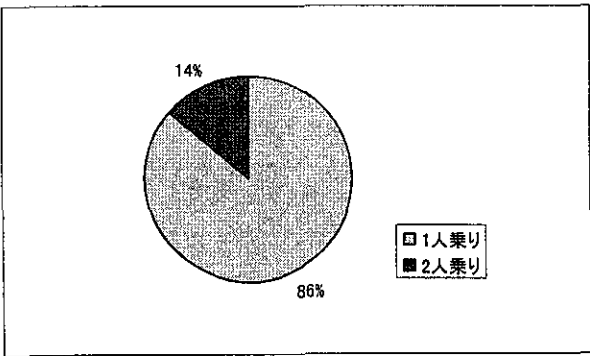
図1.2 乗車人員割合 バンコク
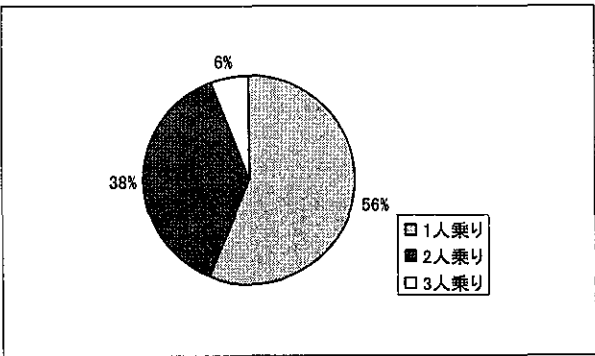
図1.3 乗車人員割合 プノンペン

図より，プノンペンでは2人乗り以上の割合が44％であるのに対し，バンコクでは1人乗りの割合が圧倒的に高く，2人乗りの割合は14％であることがわかる．

2.1　バンコクにおける交差点調査（観測結果　表 B-1～B-4 参照）

調査日時：10 月 7 日（月）7：00-9：00，11：00-13：00，16：00-18：00
　　　　　（7：00-9：00 は雨のため，16：00-16：30 は来賓車両通過のため一部調査中断）

調査場所：SIAM 交差点（Rama I Rd. & Phaya Thai Rd.）
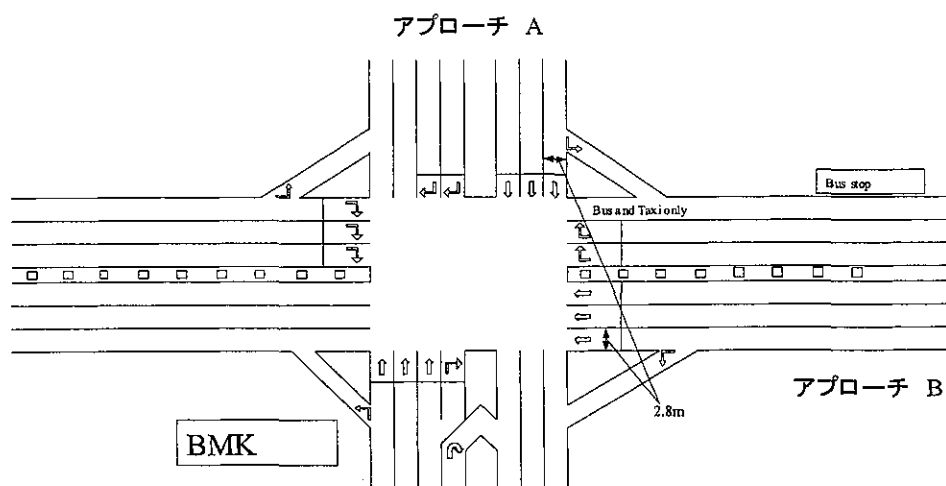
アプローチ A

図 2.1.1　交差点詳細図

調査方法：ビデオ撮影，バス利用実態調査

調査項目：
1) 車種別時間帯別交通量
　　オートバイ，乗用車，タクシー，バス
2) 車種別交通量割合
　　4 輪・2 輪
3) 飽和交通流率
4) 平均乗車人員
5) オートバイの乗車人員割合
6) 総通過人員

2.1.1 車種別時間帯別交通量

アプローチ A
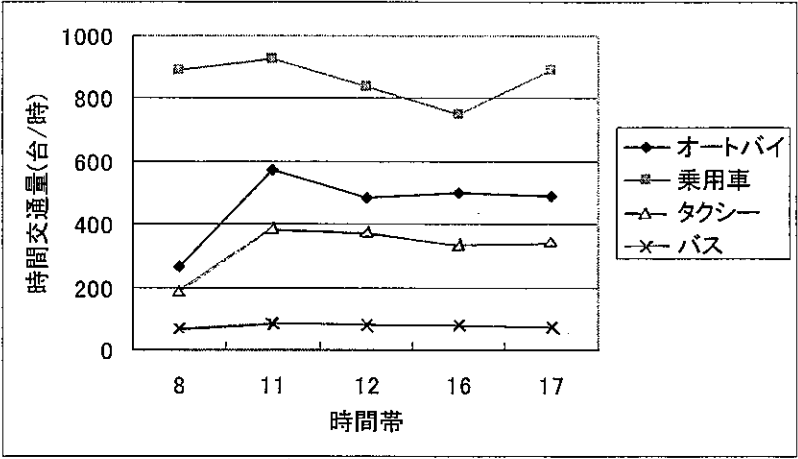
図 2.1.2　車種別交通量　アプローチ A（直進 3 レーン）
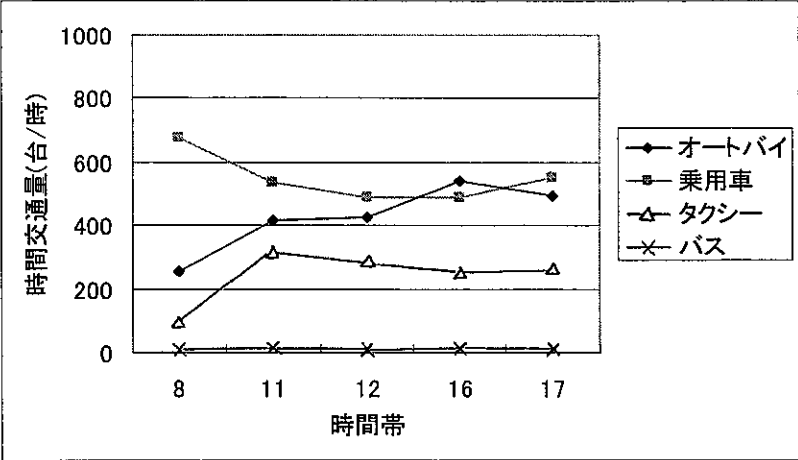
図 2.1.3　車種別交通量　アプローチ A（右折 2 レーン）

アプローチ B
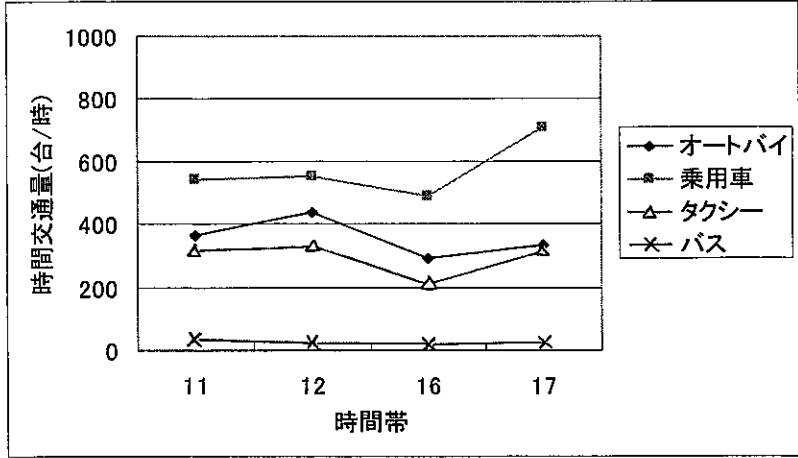
図 2.1.4　車種別交通量　アプローチ B（直進 3 レーン）
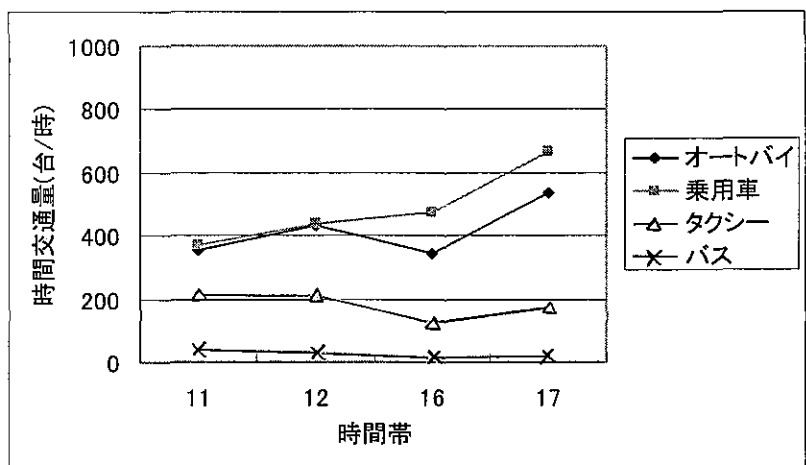
図 2.1.5　車種別交通量　アプローチ B（右折 2 レーン）

2.1.2 車種別交通量割合
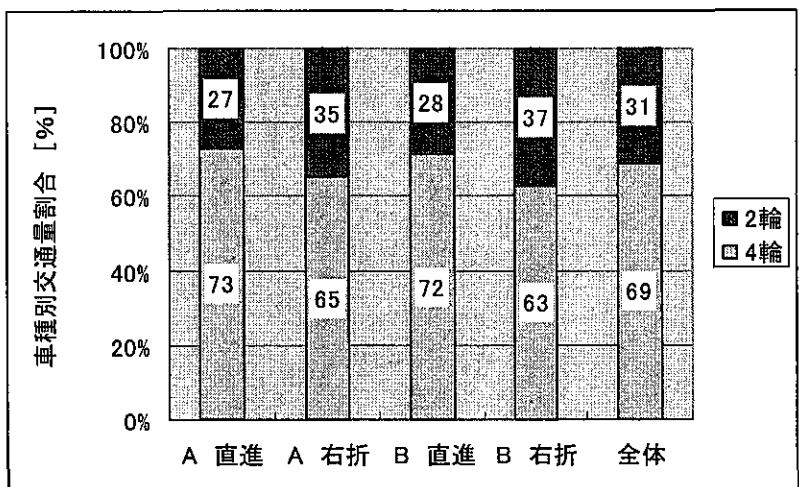
図 2.1.6　車種別交通量割合　全アプローチ
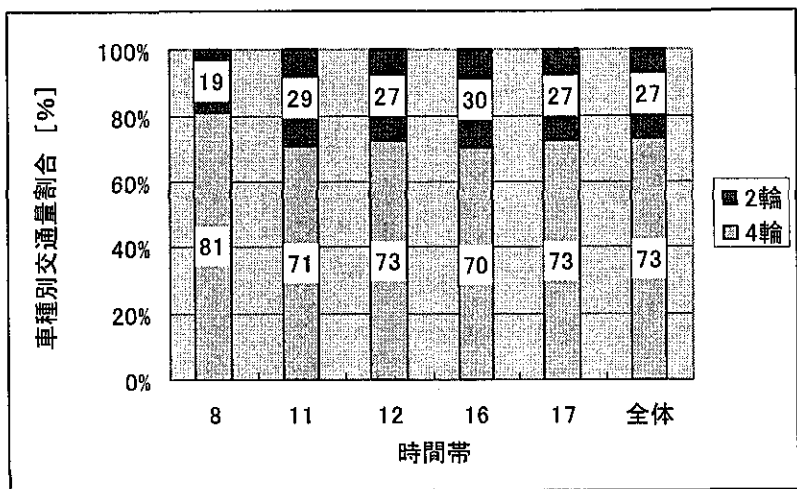
図 2.1.7　車種別交通量割合　アプローチ A（直進 3 レーン）
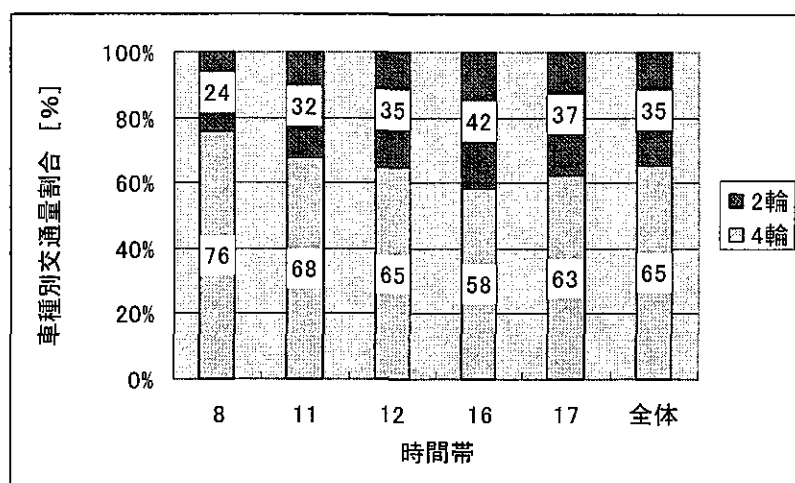
図 2.1.8　車種別交通量割合　アプローチ A（右折 2 レーン）
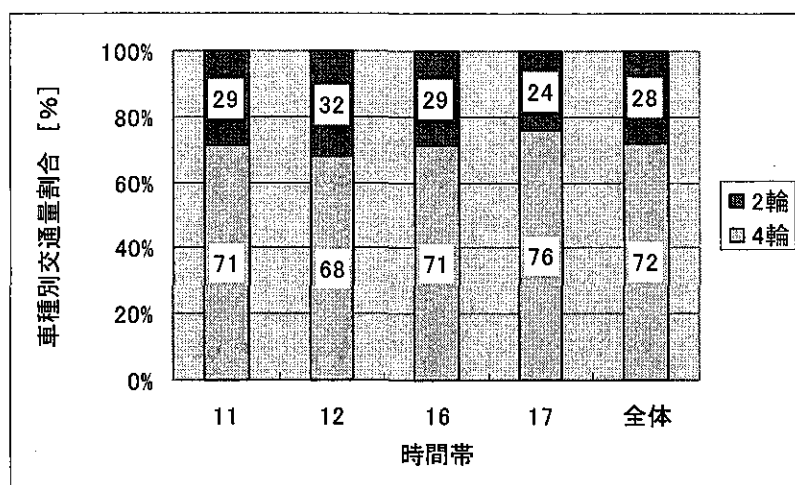
図 2.1.9　車種別交通量割合　アプローチ B（直進 3 レーン）
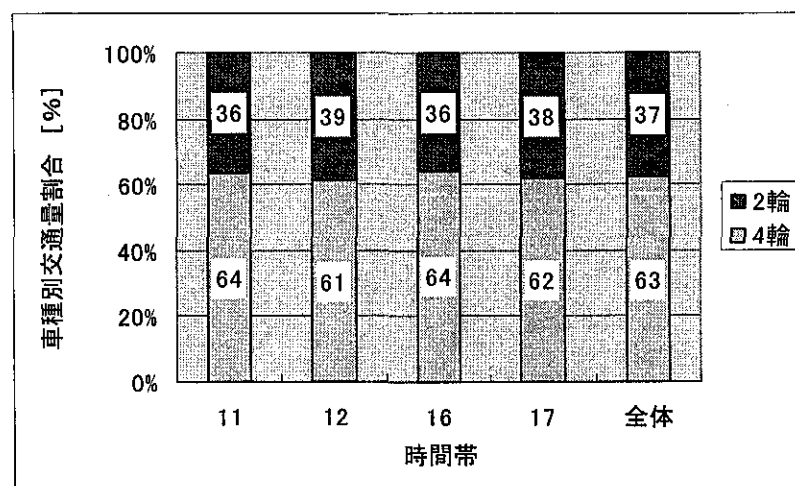
図 2.1.10　車種別交通量割合　アプローチ B（右折 2 レーン）

2.1.3 飽和交通流率

各アプローチ別・方向別に飽和交通量の基準を設け，飽和交通流率を求めた.

飽和交通流の判断の基準は以下のとおりである.

アプローチ A(直進 3 レーン)，アプローチ B(直進 3 レーン)の場合

pcu 台数≧20，もしくは pcu 台数＋オートバイ台数≧30

アプローチ A(右折 2 レーン)，アプローチ B(右折 2 レーン) の場合

pcu 台数≧16，もしくは pcu 台数＋オートバイ台数≧24

ただし，乗用車・タクシー・3 輪：1pcu，バス（中型・大型）：1.7pcu とする.

近似曲線式・サンプル数・R^2 値

表 2.1.1　直進レーンの近似曲線式一覧

	青開始後	近似曲線式	サンプル数	R^2値
アプローチA	0-20秒	y = -0.11 x + 20.92	54	0.114
	20秒以降	y = -0.26 x + 26.66	126	0.048
アプローチB	0-20秒	y = -0.27 x + 24.16	44	0.198
	20秒以降	y = -0.15 x + 23.68	78	0.034

表 2.1.2　右折レーンの近似曲線式一覧

	青開始後	近似曲線式	サンプル数	R^2値
アプローチA	0-20秒	y = -0.08 x + 13.90	57	0.111
	20秒以降	y = 0.08 x + 20.97	130	0.005
アプローチB	0-20秒	y = -0.03 x + 12.33	25	0.028
	20秒以降	y = -0.15 x + 19.35	84	0.097

アプローチ A(直進 3 レーン)
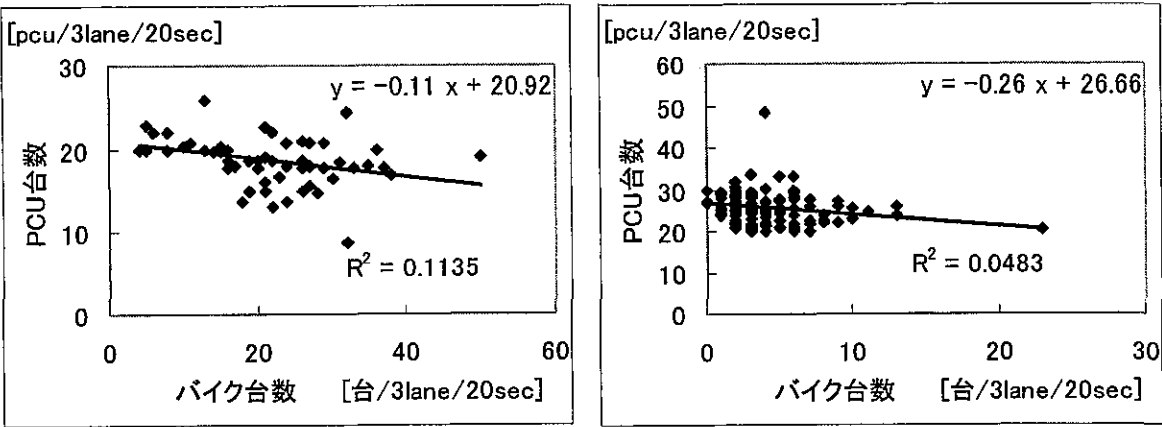
図 2.1.11　20 秒間(左：青開始後 0－20 秒　右：青開始後 20 秒以降)の停止線通過台数

サンプル数　左：54　右：126

アプローチ B(直進 3 レーン)

[pcu/3lane/20sec]

y = −0.27 x + 24.16

R² = 0.1983

PCU台数

バイク台数　[台/3lane/20sec]

[pcu/3lane/20sec]

y = −0.15 x + 23.68

R² = 0.0335

PCU台数

バイク台数　[台/3lane/20sec]
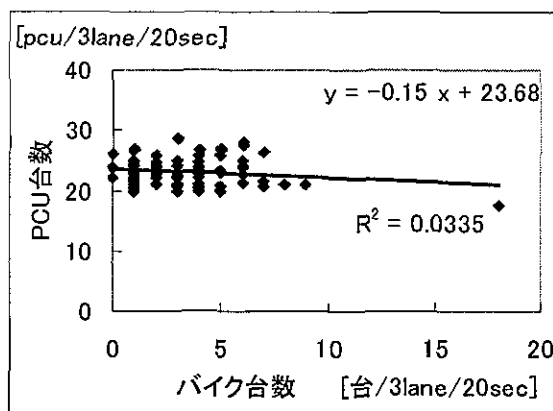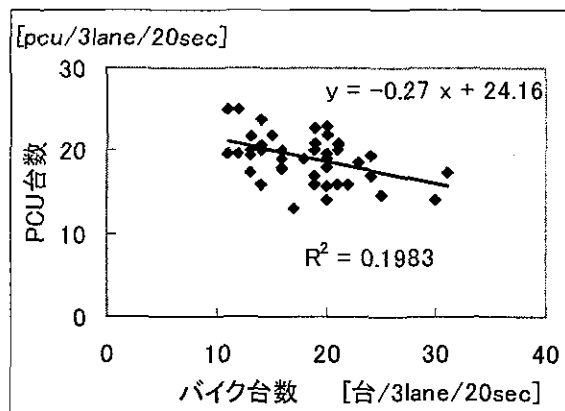
図 2.1.12　20 秒間(左：青開始後 0－20 秒　右：青開始後 20 秒以降)の停止線通過台数

サンプル数　左：44　右：78

アプローチ A(右折 2 レーン)

[pcu/2lane/20sec]

y = −0.08 x + 13.90

R² = 0.1111

PCU台数

バイク台数　[台/2lane/20sec]

[pcu/2lane/20sec]

y = 0.08 x + 20.97

R² = 0.0048

PCU台数

バイク台数　[台/2lane/20sec]
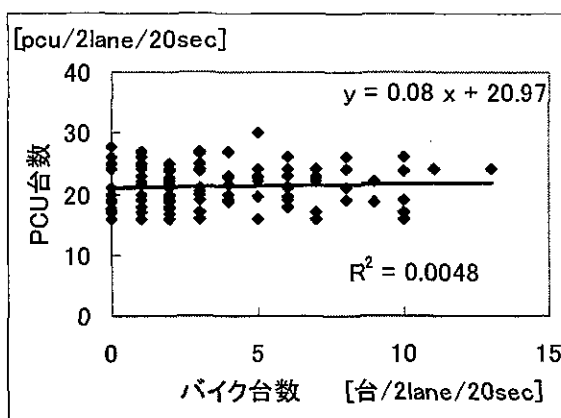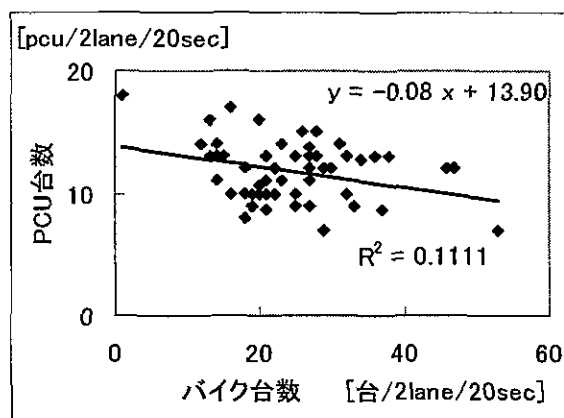
図 2.1.13　20 秒間(左：青開始後 0－20 秒　右：青開始後 20 秒以降)の停止線通過台数

サンプル数　左：57　右：130

アプローチ B(右折 2 レーン)

[pcu/2lane/20sec]

y = −0.03 x + 12.33

R² = 0.0281

PCU台数

バイク台数　[台/2lane/20sec]

[pcu/2lane/20sec]

y = −0.15 x + 19.35

R² = 0.097

PCU台数

バイク台数　[台/2lane/20sec]
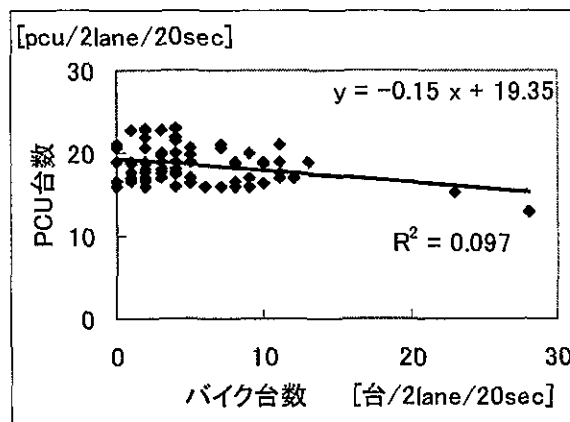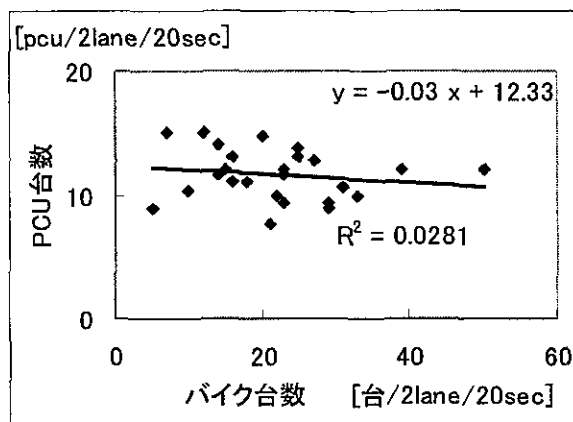
図 2.1.14　20 秒間(左：青開始後 0－20 秒　右：青開始後 20 秒以降)の停止線通過台数

サンプル数　左：25　右：84

2.1.4 平均乗車人員

表 2.1.3　平均乗車人員　アプローチ A（直進 3 レーン）

時間帯	オートバイ	乗用車	タクシー	大型バス	中型バス
7		1.3	1.8	30.0	10.6
8	1.1	1.5	2.0	26.4	13.0
11	1.1	1.5	2.1	30.3	10.7
12	1.1	1.7	2.1	30.8	10.0
16	1.1	1.5	1.9	21.7	15.0
17	1.3	1.5	1.6	31.4	15.4

単位［人/台］

表 2.1.4　平均乗車人員　アプローチ B（直進 3 レーン）

時間帯	オートバイ	乗用車	タクシー	大型バス	中型バス
7		1.3	1.4	21.2	10.0
8		1.4	2.1	28.7	10.0
11	1.1	1.6	2.2	18.5	10.0
12	1.1	1.6	2.1	35.5	11.7
16	1.2	1.7	2.2	32.8	10.0
17	1.2	1.5	2.0	41.0	10.0

単位［人/台］

ただし，バスについては，Congested, Full seats, Vacant の 3 段階で観測し，それぞれ以下の乗車人員として計算した

大型：Congested＝60　Full seats＝30　Vacant≒10

中型：Congested＝40　Full seats＝20　Vacant≒10

単位［人］

図 2.1.15　大型バス（左）と中型バス（右）

2.1.5 オートバイの乗車人員割合
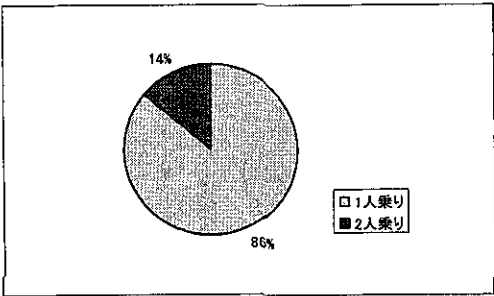
図 2.1.16　オートバイの乗車人員割合

2.1.6 総通過人員

1.4 で求めた平均乗車人員に 1.1 で求めた車種別交通量を乗じて，各アプローチ別に総通過人員を求めた．

表 2.1.5　総通過人員　アプローチ A（直進 3 レーン）

時間帯	オートバイ	乗用車	タクシー	大型バス	中型バス	合計
8	307	1317	371	1345	195	3534
11	643	1360	807	2244	139	5192
12	552	1427	772	2064	100	4915
16	572	1099	638	1411	195	3914
17	618	1310	559	2106	123	4715
合計	2692	6513	3146	9169	752	22271

単位［人］

表 2.1.6　総通過人員　アプローチ B（直進 3 レーン）

時間帯	オートバイ	乗用車	タクシー	大型バス	中型バス	合計
11	393	877	702	445	150	2567
12	491	862	699	675	93	2820
16	346	809	477	721	10	2363
17	394	1032	623	983	0	3032
合計	1624	3580	2500	2825	253	10782

単位［人］

2.2 プノンペンにおける交差点調査（観測結果　表 P-1〜P-4 参照）

調査場所：交差点詳細図および観測地点詳細図を以下に示す.
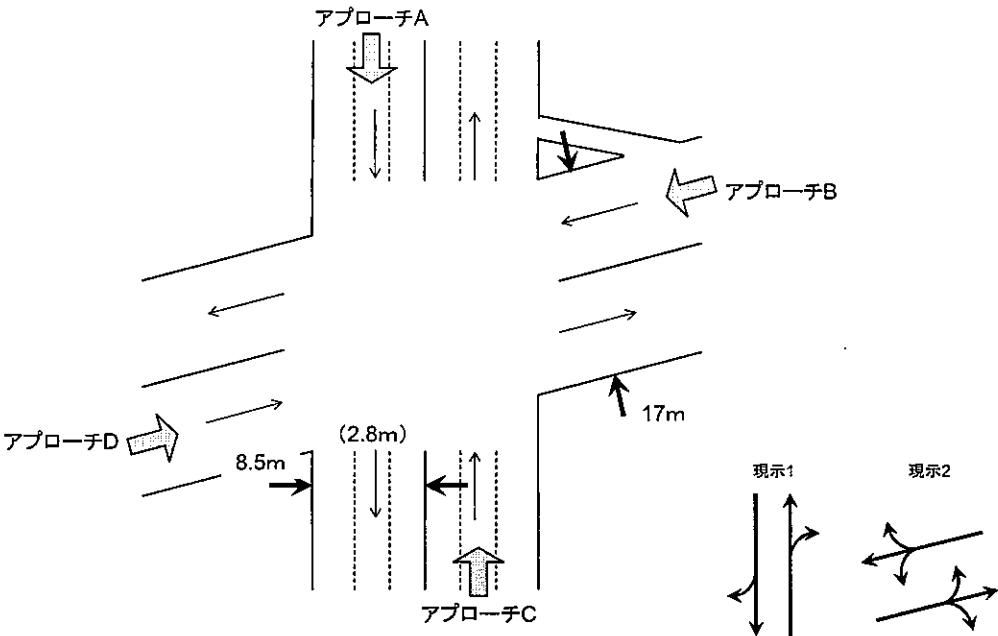
図 2.2.1　交差点詳細図
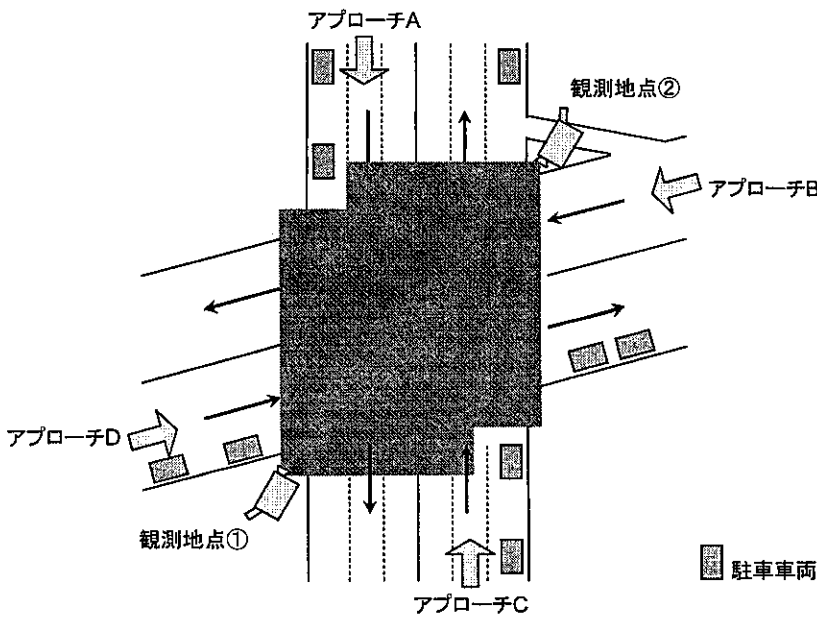
図 2.2.2　観測地点詳細図

調査方法：ビデオ撮影による各アプローチ別の交通量調査

（4アプローチ×3方向＝12方向）

観測地点①：アプローチA及びアプローチD

観測地点②：アプローチB及びアプローチCのそれぞれ3方向ずつを計測．

ただし，1台のビデオカメラで撮影しているため多少の時間差があり，観測地点によって撮影時間も異なっている．

また，ビデオの撮影角度によりアプローチA及びアプローチCの左折（赤い一点鎖線）は計測不可能であったため，アプローチAの左折は観測地点②からアプローチCの左折は観測地点①から計測している．（図3参照）

計測結果は参考資料として最後に載せている．

サイクル長は60秒（30秒ずつ）である．（黄色・全赤時間含む）
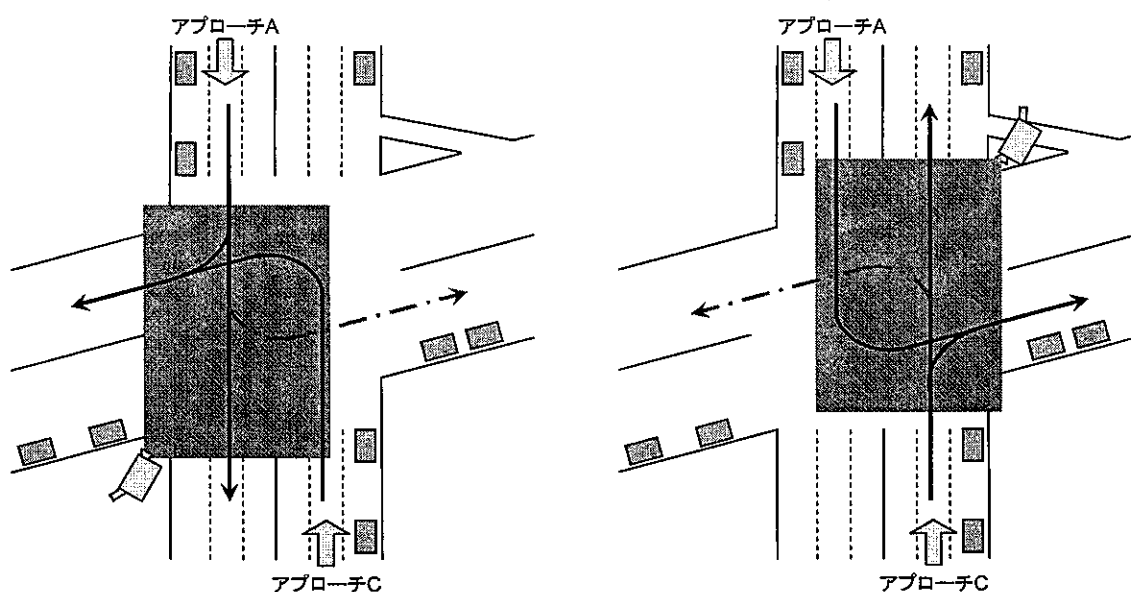
図2.2.3　計測方法の変更箇所

調査項目：

1) 車種別交通量

　　4輪車・2輪車・軽車両

2) 車種別交通量割合

　　4輪車・2輪車・軽車両

3) オートバイの平均乗車人員

4) オートバイの乗車人員割合

2.2.1 車種別交通量

アプローチ B の右折は撮影場所の後ろ側に右折専用レーンがあるため正確なデータが得られていない．また，アプローチ A とアプローチ C の左折は極端に交通量が少ないため，左折禁止であると考えられる．したがって，これら 3 アプローチは解析しないものとする．
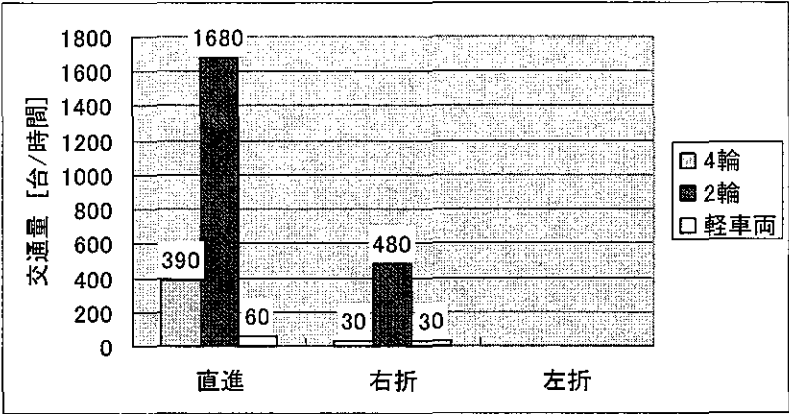
図 2.2.4　車種別交通量　アプローチ A
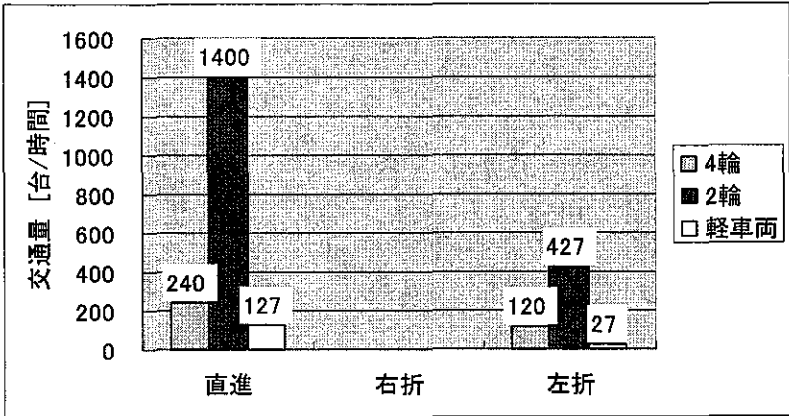
図 2.2.5　車種別交通量　アプローチ B
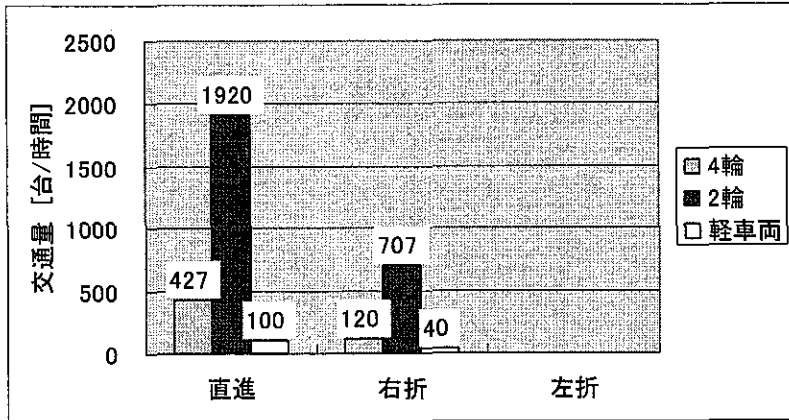
図 2.2.6　車種別交通量　アプローチ C
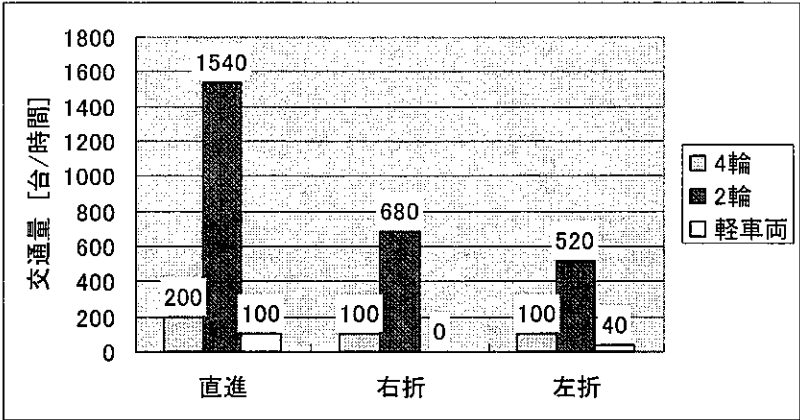
図 2.2.7　車種別交通量　アプローチ D
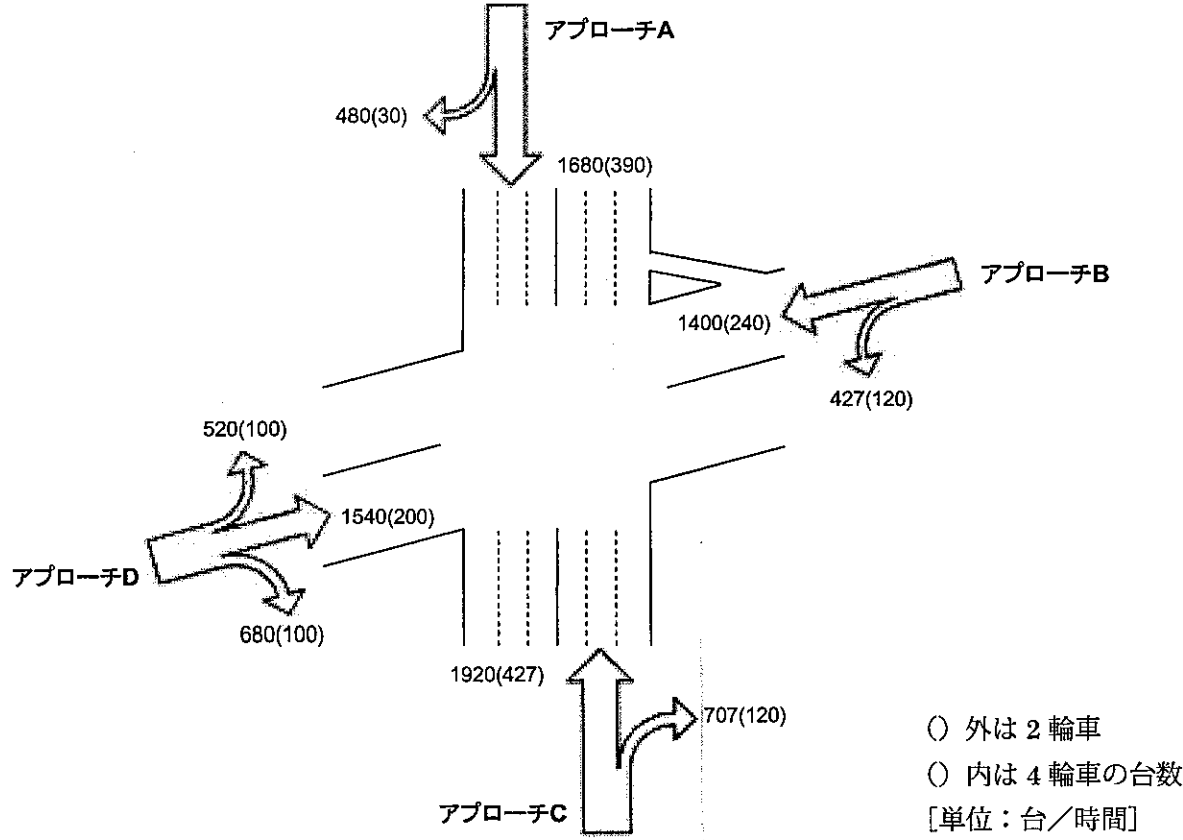
図 2.2.8　車種別交通量

2.2.2 車種別交通量割合

アプローチ別車種別交通量をもとに，左折・右折・直進の区別なくアプローチ別での交通量の比較を行った．
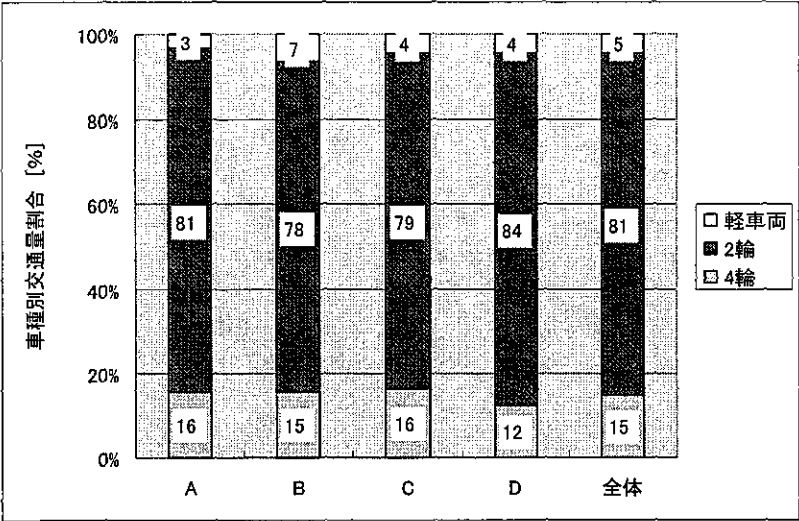
図 2.2.9　車種別交通量割合　全アプローチ
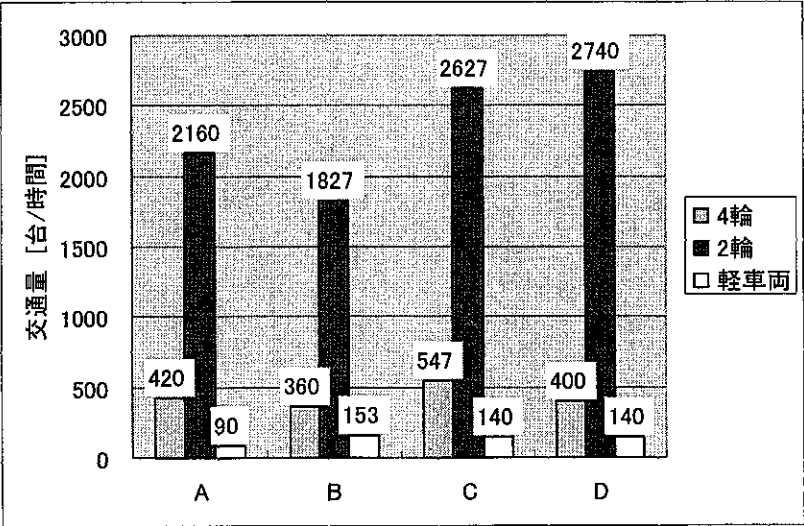
図 2.2.10　車種別交通量　全アプローチ

2.2.3 オートバイの平均乗車人員

表 2.2.1　オートバイの台数と乗車人員

	オートバイの交通量 ［台／時間］				乗車人員合計	平均乗車人員
	1人乗り	2人乗り	3人乗り	合計	［人／時間］	［人／台］
アプローチA	1185	930	105	2220	3360	1.5
アプローチB	1113	647	87	1847	2667	1.4
アプローチC	1520	1000	107	2627	3840	1.5
アプローチD	1480	1000	260	2740	4260	1.6
全アプローチ	5298	3577	558	9433	14127	1.5

2.2.4 オートバイの乗車人員割合
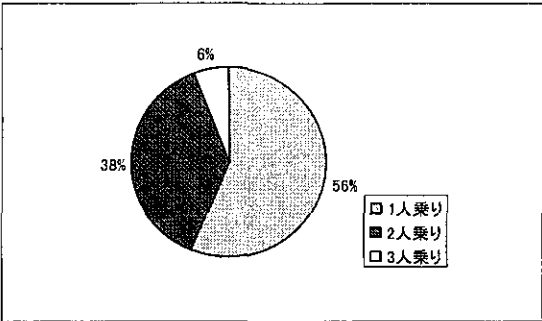
図 2.2.11　乗車人員割合

2.3 ハノイにおける交差点調査（観測結果　表H-1〜H-6参照）

調査日時：8月7日（水）5：45−8：00

調査場所：交差点詳細図および観測地点詳細図を以下に示す.
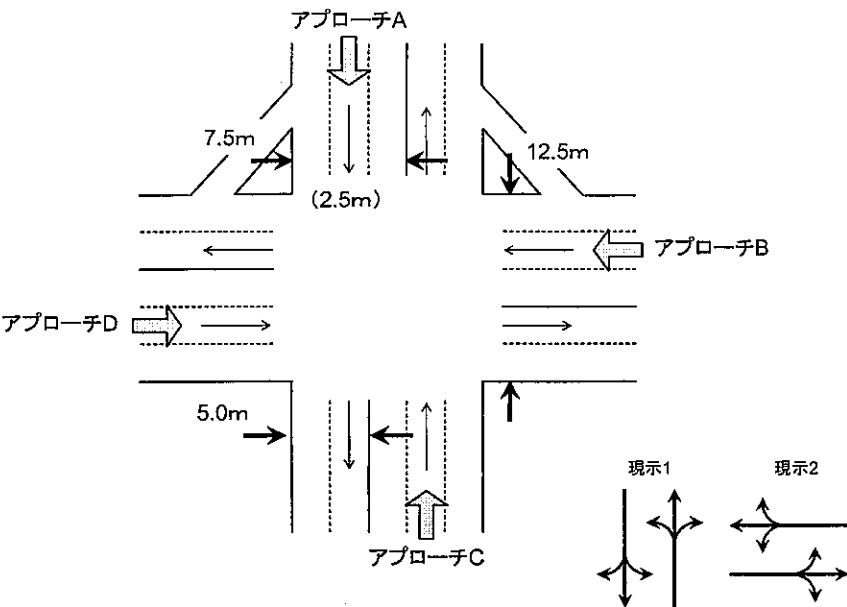
図 2.3.1　交差点詳細図
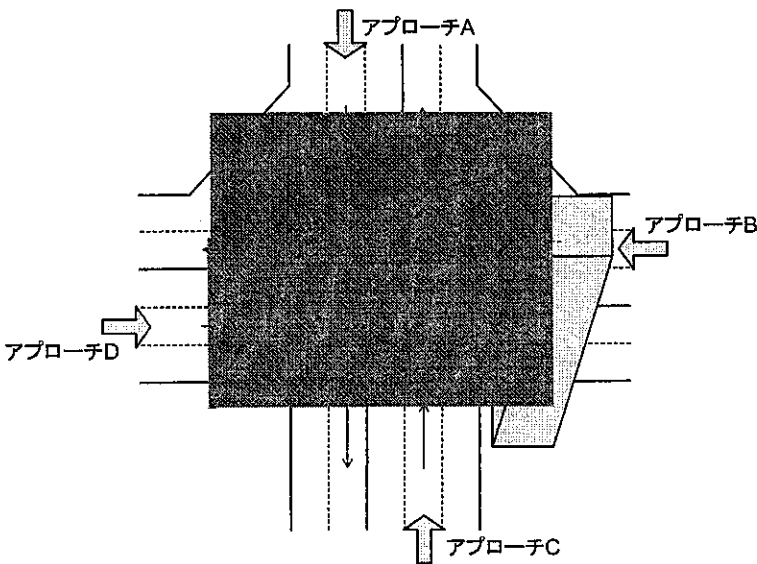
図 2.3.2　観測地点詳細図

調査方法：ビデオ撮影

ただし，アプローチ B および C の右折は撮影範囲外であるため計測不可．

また，アプローチ A の右折には専用レーンがあるため信号に関係なく，常時バイクや車が流れている．そのためアプローチ A の右折のみ 1 サイクル(約 65 秒)に流れたすべての台数を計測している．

サイクル長は約 65 秒（アプローチ A・C　30 秒，アプローチ B・D　35 秒）

調査項目：

1) 車種別交通量

4 輪・2 輪

2) 車種別交通量割合

3) 車種別平均通過台数

2.3.1 車種別交通量
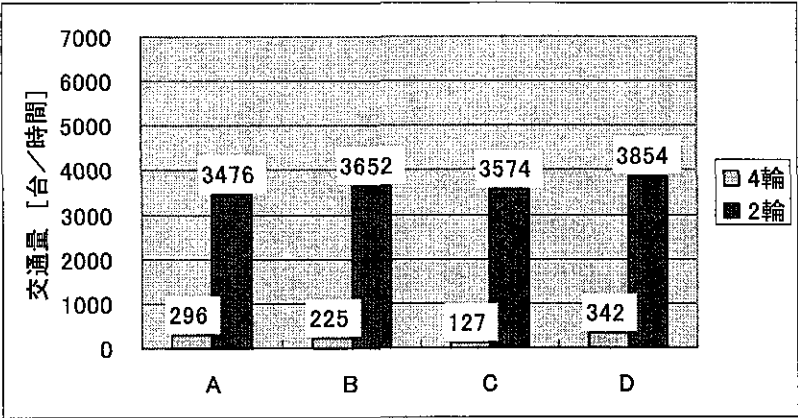
図 2.3.3　車種別交通量（6 時台）

図 2.3.4　車種別交通量（7 時台）

アプローチA

1736(114)　　　365(68)

1375(114)

782(65)

アプローチD　　　2473(205)

3372(205)　　アプローチB

599(72)　　　　　　　　　　280(20)

1831(42)

1743(85)

アプローチC

（） 外は 2 輪車
（） 内は 4 輪車の台数

図 2.3.5　方向別交通量（6 時台）　　[単位：台／時間]

アプローチA

2900(174)　　　833(79)

2255(85)

1254(136)

アプローチD　　　3240(208)

4526(281)　　アプローチB

1369(71)　　　　　　　　　　405(26)

2900(77)

2554(119)

アプローチC

（） 外は 2 輪車
（） 内は 4 輪車の台数
[単位：台／時間]
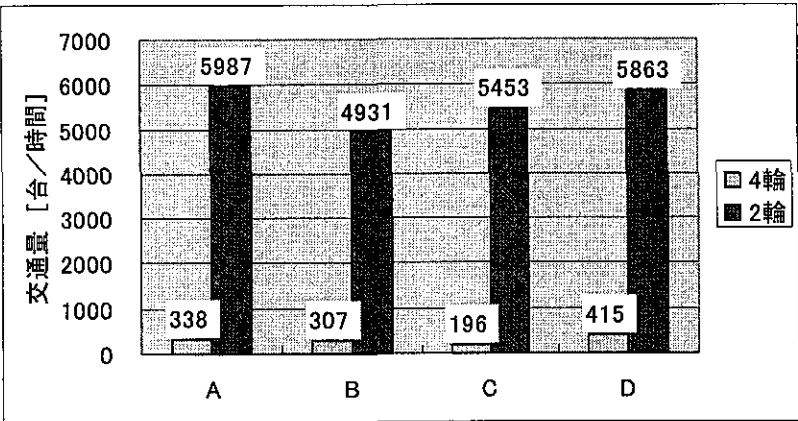
図 2.3.6　方向別交通量（7 時台）
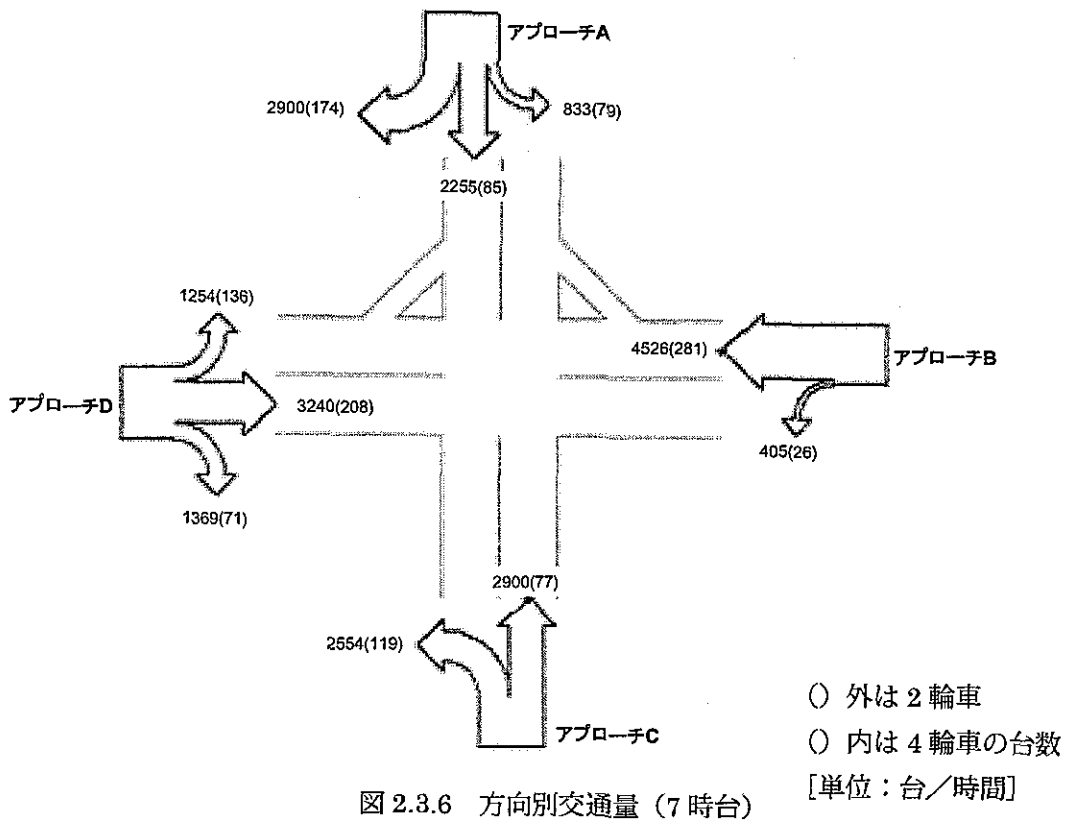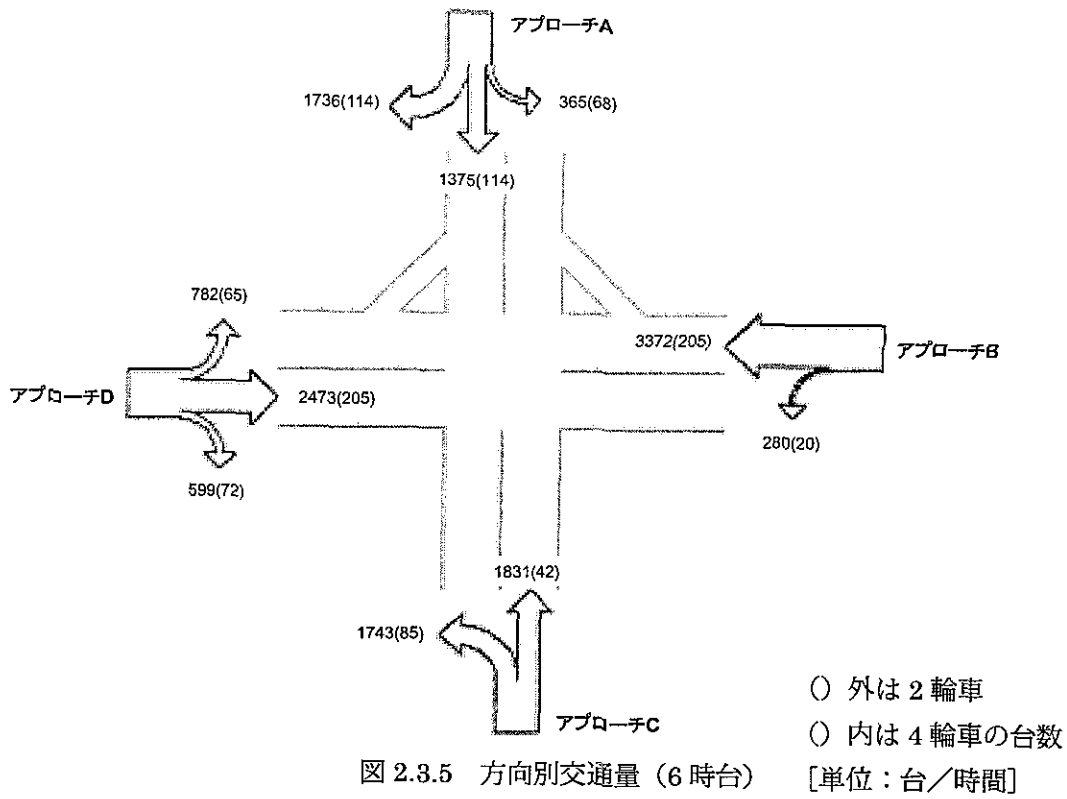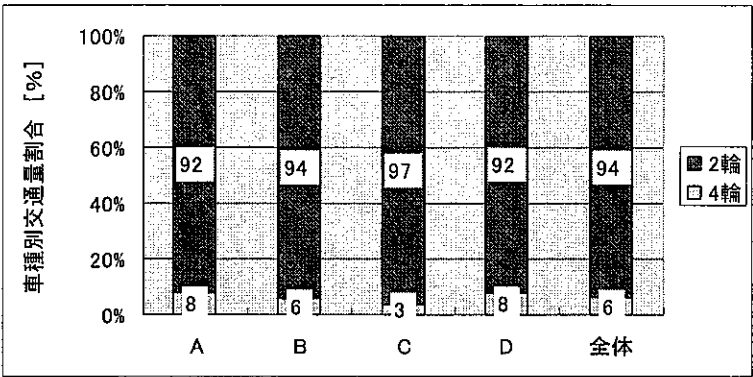
2.3.2 車種別交通量割合

図 2.3.7　車種別交通量割合（6 時台）
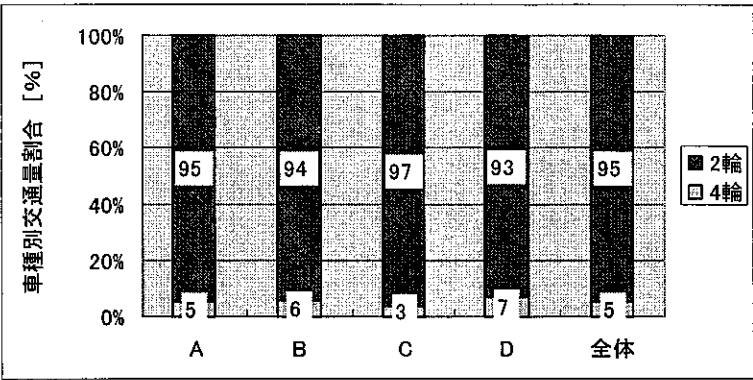
図 2.3.8　車種別交通量割合（7 時台）

2.3.3 車種別平均通過台数（参考資料　表 2.3.1～表 2.3.6 参照）

　各アプローチ別に最も混雑している 10 サイクル（2 輪車＋4 輪車の合計台数上位 10 サイクル）を飽和しているものとみなし，4 輪及び 2 輪の平均通過台数を求めた．

表 2.3.1　各アプローチ・方向別平均通過台数

	アプローチA			アプローチB		アプローチC		アプローチD		
	直進	右折	左折	直進	左折	直進	左折	直進	右折	左折
4輪	1	3	2	5	1	2	3	5	2	4
2輪	48	59	19	91	10	59	57	65	28	30

単位　[台／スプリット]

　ただしスプリットタイムは，アプローチ A（右折以外），C は 30 秒，アプローチ B，D は 35 秒，アプローチ A（右折）は 65 秒であった．

表 2.3.2　各アプローチ別平均通過台数（直進＋左折）

	アプローチA	アプローチB	アプローチC	アプローチD
4輪	3	6	5	9
2輪	67	101	116	95

単位　[台／スプリット]

　ただしスプリットタイムは，アプローチ A，C は 30 秒，アプローチ B，D は 35 秒であった．

参考資料：観測結果

表 B-1　時間帯別交通量　アプローチ A（直進 3 レーン）

	オートバイ(1人)	オートバイ(2人)	乗用車	タクシー	バス（大型）	バス（中型）	3輪
8	229	39	891	188	51	15	10
11	505	69	925	383	74	13	22
12	418	67	837	376	67	10	22
16	430	71	749	333	65	13	30
17	366	126	890	343	67	8	46

表 B-2　時間帯別交通量　アプローチ A（右折 2 レーン）

	オートバイ(1人)	オートバイ(2人)	乗用車	タクシー	バス（大型）	バス（中型）	3輪
8	209	47	678	100	10	3	24
11	354	61	538	318	17	0	85
12	350	76	487	287	7	2	73
16	460	81	489	251	16	0	85
17	413	81	550	265	9	0	86

表 B-3　時間帯別交通量　アプローチ B（直進 3 レーン）

	オートバイ(1人)	オートバイ(2人)	乗用車	タクシー	バス（大型）	バス（中型）	3輪
11	333	30	542	317	24	15	63
12	383	54	554	331	19	8	61
16	234	56	487	216	22	1	65
17	276	59	706	319	24	0	87

表 B-4　時間帯別交通量　アプローチ B（右折 2 レーン）

	オートバイ(1人)	オートバイ(2人)	乗用車	タクシー	バス（大型）	バス（中型）	3輪
11	322	33	371	212	30	11	15
12	376	57	435	211	23	8	13
16	305	37	472	125	15	2	20
17	452	83	669	178	17	3	37

表 P-1 アプローチ A の計測結果

直進	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
1	8	17	13	0	1
3	7	16	10	3	2
5	4	18	11	3	1
7	7	11	10	0	0
右折	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
1	0	6	5	0	0
3	0	3	4	0	1
5	2	2	6	1	0
7	0	4	1	0	1
左折(アプローチC)	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
1	0	1	0	0	0
3	0	1	1	0	0
5	0	0	0	0	0
7	0	0	1	0	0

表 P-2 アプローチ B の計測結果

直進	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
2	3	17	8	4	1
4	1	11	3	1	2
6	2	14	7	0	3
8	7	17	12	0	4
10	1	12	7	2	3
12	10	18	11	1	1
14	4	19	5	1	2
16	4	15	9	1	3
18	4	8	6	1	0
右折	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
2	0	0	0	0	0
4	0	0	0	0	0
6	0	0	0	0	0
8	0	1	0	0	0
10	1	0	0	0	0
12	0	0	0	0	0
14	0	0	0	0	0
16	0	0	1	0	0
18	0	1	0	0	0
左折	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
2	2	1	2	0	0
4	2	1	3	1	0
6	2	6	3	0	1
8	2	5	2	0	0
10	2	6	5	0	1
12	2	2	3	0	0
14	3	6	4	0	0
16	2	3	5	0	1
18	1	4	1	1	1

表 P-3　アプローチ C の計測結果

直進	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
1	10	22	11	1	0
3	8	16	11	1	1
5	10	16	13	0	2
7	6	21	11	0	2
9	8	19	13	2	1
11	8	26	11	3	2
13	6	16	12	2	1
15	3	20	14	1	3
17	5	11	13	2	3
右折	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
1	2	7	6	0	0
3	3	11	4	1	1
5	1	4	2	0	0
7	3	9	5	1	1
9	2	5	5	0	2
11	1	14	5	1	0
13	4	1	3	0	1
15	0	4	5	1	0
17	2	6	6	0	1
左折(アプローチA	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
1	0	0	0	0	0
3	0	0	0	0	0
5	0	0	0	0	0
7	0	0	0	0	0
9	0	0	0	0	0
11	0	0	0	0	0
13	0	0	0	0	0
15	0	0	0	0	0
17	0	0	0	0	0

表 P-4　アプローチ D の計測結果

直進	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
2	5	9	7	5	3
4	2	15	10	1	0
6	3	14	15	1	2

右折	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
2	1	6	3	0	0
4	0	4	1	2	0
6	4	13	4	1	0

左折	4輪	2輪(1人)	2輪(2人)	2輪(3人)	軽車両
2	3	4	3	2	0
4	1	6	4	1	0
6	1	3	3	0	2

表H-1　アプローチAおよびCの計測結果

青開始時刻 時	分	秒	青終了時刻 時	分	秒	A	右折専用レーン 4輪	2輪	直進 4輪	2輪	左折 4輪	2輪	C	左折 4輪	2輪	直進 4輪	2輪
6	42	0	6	42	30	1	2	18	1	22	1	0	1	0	16	0	25
	43	5		43	35	2	3	36	3	22	1	2	2	1	22	0	47
	44	10		44	40	3	1	20	2	20	2	4	3	2	18	0	17
	45	15		45	45	4	1	20	3	22	1	7	4	1	29	2	29
	46	20		46	50	5	4	30	5	27	1	4	5	1	25	0	36
	47	25		47	55	6	5	26	2	21	2	6	6	1	27	1	23
	48	30		49	0	7	1	29	1	29	0	8	7	1	40	1	30
	49	35		50	5	8	3	41	4	21	0	3	8	1	39	1	47
	50	40		51	10	9	3	26	2	20	1	3	9	0	32	3	27
	51	45		52	15	10	4	37	1	25	0	9	10	2	36	0	39
	52	50		53	20	11	0	32	0	24	0	6	11	3	31	1	17
	53	55		54	25	12	2	30	0	26	2	4	12	2	34	1	28
	55	0		55	30	13	0	31	1	15	0	14	13	2	45	0	43
	56	5		56	35	14	2	39	2	21	3	10	14	3	46	1	23
	57	10		57	40	15	1	33	1	35	2	9	15	1	33	0	42
	58	15		58	45	16	0	45	5	38	1	12	16	3	31	1	44
	59	20		59	50	17	3	40	2	34	4	11	17	2	31	1	45
7	0	25	7	0	55	1	3	43	2	39	2	10	1	2	37	4	39
	1	30		2	0	2	3	41	3	32	2	3	2	1	32	4	30
	2	35		3	5	3	4	50	0	31	2	9	3	0	35	1	48
	3	40		4	10	4	4	44	2	26	2	10	4	0	41	0	54
	4	45		5	15	5	3	39	2	33	2	8	5	1	34	1	46
	5	50		6	20	6	2	37	2	34	0	5	6	1	30	1	46
	6	55		7	25	7	6	48	2	32	0	13	7	2	39	0	47
	23	10		23	40	8	3	62	1	37	0	12	8	4	47	1	43
	24	15		24	45	9	2	56	2	42	0	15	9	2	44	1	55
	25	20		25	50	10	4	49	1	45	2	14	10	2	44	1	56
	26	25		26	55	11	4	55	1	39	2	12	11	1	46	2	52
	27	30		28	0	12	0	55	2	44	1	17	12	1	32	1	54
	28	35		29	5	13	2	56	1	41	1	12	13	3	43	4	58
	29	40		30	10	14	2	34	2	43	0	21	14	2	39	0	52
	30	45		31	15	15	4	58	1	42	0	16	15	3	46	1	47
	31	50		32	20	16	4	48	1	37	2	15	16	4	53	1	61
	32	55		33	25	17	3	59	3	34	3	17	17	3	42	1	51
	34	0		34	30	18	3	64	1	48	3	20	18	2	47	2	68
	35	5		35	35	19	3	52	0	33	1	21	19	1	74	2	55
	36	10		36	40	20	1	61	2	50	1	18	20	2	51	3	49
	37	15		37	45	21	7	60	0	60	3	11	21	3	42	2	53
	38	20		38	50	22	0	60	0	44	1	16	22	4	49	1	50
	39	25		39	55	23	1	58	3	40	3	21	23	0	46	1	53
	40	30		41	0	24	5	47	2	40	1	16	24	6	58	0	53
	41	35		42	5	25	3	59	1	50	0	16	25	3	59	2	62
	42	40		43	10	26	5	57	3	48	1	23	26	3	63	1	67
	43	45		44	15	27	3	71	2	52	3	22	27	1	62	0	60
	44	50		45	20	28	4	43	1	44	2	28	28	3	56	1	57

表 H-2　アプローチ B および D の計測結果

青開始時刻 時	分	秒	青終了時刻 時	分	秒	D	右折 4輪	2輪	直進 4輪	2輪	左折 4輪	2輪	B	左折 4輪	2輪	直進 4輪	2輪
6	42	30	6	43	5	1	1	8	0	38	0	14	1	0	3	7	61
	43	35		44	10	2	4	9	2	37	2	12	2	0	4	3	52
	44	40		45	15	3	1	9	3	29	0	14	3	0	7	4	65
	45	45		46	20	4	2	7	4	31	3	13	4	0	1	4	50
	46	50		47	25	5	2	10	7	52	2	11	5	0	3	2	53
	47	55		48	30	6	0	8	5	39	1	17	6	1	5	6	70
	49	0		49	35	7	1	11	4	40	0	16	7	0	2	5	54
	50	5		50	40	8	0	7	2	62	1	15	8	1	7	4	60
	51	10		51	45	9	1	15	2	50	0	17	9	0	9	2	54
	52	15		52	50	10	0	12	2	41	2	13	10	0	6	3	55
	53	20		53	55	11	1	10	2	48	1	14	11	0	6	2	50
	54	25		55	0	12	2	8	3	59	1	19	12	2	4	1	63
	55	30		56	5	13	2	12	6	39	2	11	13	0	5	5	59
	56	35		57	10	14	4	16	5	64	3	13	14	1	8	7	75
	57	40		58	15	15	1	13	6	44	2	12	15	1	3	4	80
	58	45		59	20	16	0	17	6	49	0	14	16	0	7	1	66
	59	50	7	0	25	17	0	12	4	37	0	15	17	0	6	3	68
7	0	55	7	1	30	1	0	12	4	52	8	17	1	1	2	7	64
	2	0		2	35	2	4	19	1	53	2	13	2	1	9	6	88
	3	5		3	40	3	0	13	3	59	1	17	3	0	5	5	82
	4	10		4	45	4	0	24	4	45	1	14	4	0	1	3	68
	5	15		5	50	5	2	26	2	56	1	17	5	0	9	4	63
	6	20		6	55	6	0	21	3	63	0	9	6	0	5	10	73
	22	35		23	10	7	0	28	3	80	0	28	7	0	4	2	84
	23	40		24	15	8	1	25	6	56	1	18	8	0	9	5	90
	24	45		25	20	9	3	22	0	55	3	19	9	0	4	1	93
	25	50		26	25	10	2	26	3	52	0	29	10	0	3	2	91
	26	55		27	30	11	0	30	2	47	1	16	11	0	10	7	88
	28	0		28	35	12	2	26	12	55	3	30	12	0	14	7	75
	29	5		29	40	13	2	19	5	50	2	27	13	0	5	5	69
	30	10		30	45	14	3	20	1	58	3	25	14	1	10	9	74
	31	15		31	50	15	2	29	1	50	0	12	15	2	11	7	83
	32	20		32	55	16	1	22	3	60	4	20	16	2	7	5	90
	33	25		34	0	17	0	17	5	51	5	24	17	0	13	2	97
	34	30		35	5	18	1	35	6	52	2	15	18	0	8	7	95
	35	35		36	10	19	3	20	3	58	6	32	19	1	15	3	90
	36	40		37	15	20	1	25	4	67	1	37	20	0	1	2	88
	37	45		38	20	21	2	30	1	69	5	16	21	0	6	7	94
	38	50		39	25	22	0	21	2	51	0	22	22	0	4	4	81
	39	55		40	30	23	2	22	4	69	4	37	23	0	10	5	82
	41	0		41	35	24	3	28	4	76	4	31	24	3	8	3	92
	42	5		42	40	25	0	25	8	58	5	26	25	0	12	4	77
	43	10		43	45	26	1	40	7	68	1	35	26	0	11	4	74
	44	15		44	50	27	0	30	6	59	3	20	27	2	6	8	78
	45	20		45	55	28	1	37	2	69	3	28	28	0	3	8	65

表 H-3　飽和交通量　アプローチ A

A	直進 4輪	2輪	右折 4輪	2輪	左折 4輪	2輪
15	1	42	4	58	0	16
18	1	48	3	64	3	20
20	2	50	1	61	1	18
21	0	60	7	60	3	11
22	0	44	0	60	1	16
23	3	40	1	58	3	21
25	1	50	3	59	0	16
26	3	48	5	57	1	23
27	2	52	3	71	3	22
28	1	44	4	43	2	28
平均	1	48	3	59	2	19

表 H-4　飽和交通量　アプローチ B

B	直進		左折	
	4輪	2輪	4輪	2輪
2	6	88	1	9
8	5	90	0	9
11	7	88	0	10
15	7	83	2	11
16	5	90	2	7
17	2	97	0	13
18	7	95	0	8
19	3	90	1	15
21	7	94	0	6
24	3	92	3	8
平均	5	91	1	10

表 H-5　飽和交通量　アプローチ C

C	直進		左折	
	4輪	2輪	4輪	2輪
13	4	58	3	43
16	1	61	4	53
18	2	68	2	47
19	2	55	1	74
20	3	49	2	51
24	0	53	6	58
25	2	62	3	59
26	1	67	3	63
27	0	60	1	62
28	1	57	3	56
平均	2	59	3	57

表 H-6　飽和交通量　アプローチ D

D	直進		右折		左折	
	4輪	2輪	4輪	2輪	4輪	2輪
7	3	80	0	28	0	28
12	12	55	2	26	3	30
19	3	58	3	20	6	32
20	4	67	1	25	1	37
21	1	69	2	30	5	16
23	4	69	2	22	4	37
24	4	76	3	28	4	31
25	8	58	0	25	5	26
26	7	68	1	40	1	35
28	2	69	1	37	3	28
平均	5	65	2	28	4	30

第III編

平成 14 年度研究調査報告会発表用資料

開発途上国におけるオートバイの都市交通手段としての役割と限界に関する研究

PL　　　　福田　敦　　日本大学理工学部
メンバー　竹内 健蔵　東京女子大学文理学部
　　　　　中村 文彦　横浜国立大学大学院環境情報研究院
　　　　　吉井 稔雄　京都大学大学院工学研究科
　　　　　関根 太郎　日本大学理工学部

研究の背景

- 東南アジア地域でのオートバイ
  - 手軽な乗り物として普及
  - 都市生活における重要な交通手段としての役割
  - 市街地の発展や環境問題への影響も大きい

ハノイ市内では道路を占領

バンコクでは外国
ビジネスマンも利用

研究の背景（つづき）

しかし、
  - 都市交通体系の中での位置づけが不明確
  - 道路設計や交通管理において殆ど考慮されていない
  - 日本などからの中古のオートバイの流入
  - 交通安全の面でも、多くの問題
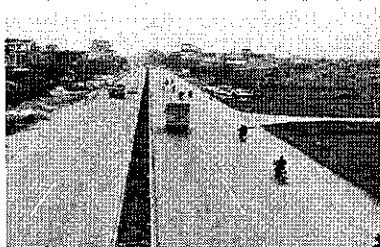
ハノイでは道路横断も大変
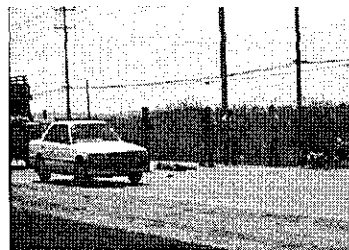
バンコクでは二輪車の事故が多発

大連における交通需要推計フロー

■ モーターバイクOD交通量推計
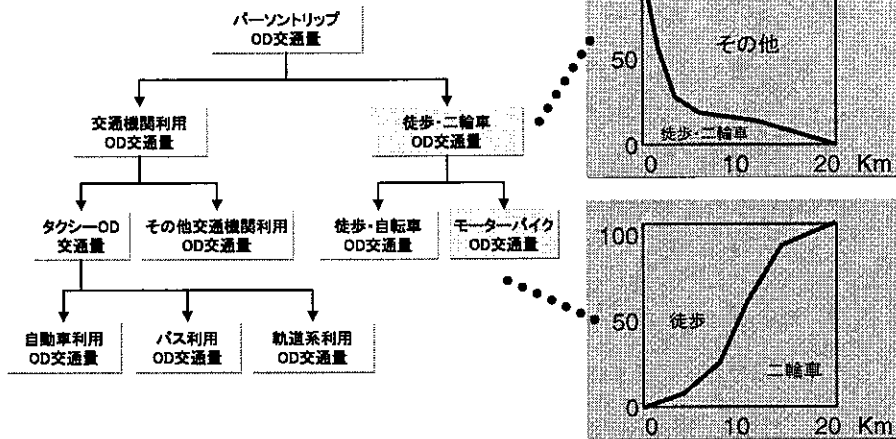
大連における交通需要推計フロー

■ 道路ネットワークへの交通量配分の場合

1.1人/台

乗用車　2.0
タクシー　1.5

0.5 pcu/台

JICA（チェンマイ）0.3
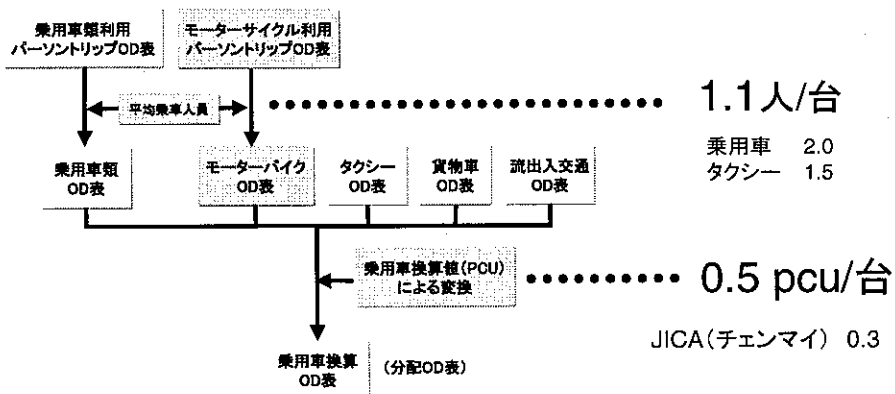
研究の背景（つづき）

それでは、オートバイの
　現在、将来の役割、
　可能性、
　限界は？

研究の目的

- 東南アジア地域を対象
- オートバイが、現在、都市交通としてどのような役割を担っているのか、
- 経済発展、都市開発、安全、環境面を踏まえて、将来、どういう役割があるのか、
- その限界がどこにあるのか、
- マクロとミクロの2つの視点から考察
- わが国の貢献のあり方について具体的に提言することが最終目標

本年度の研究構成

		マクロ的アプローチ	ミクロ的アプローチ
A 保有構造		社会経済指標	アンケート調査 （バンコク＋地方都市）
B 交通安全		ヒアリング （バンコク、プノンペン） ＋AP HONDA	アンケート調査 （バンコク＋地方都市）
C 利用	営業用	―	アンケート調査 （バンコク、プノンペン）
	自家用	―	アンケート調査 （バンコク、プノンペン、ハノイ）
D 都市交通		―	ビデオ解析 （バンコク、プノンペン、ハノイ）
E 都市開発、環境			

調査対象国の交通状況概観

	二輪車保有台数	GDP（為替レート換算・10億ドル）	人口（人）	幹線道路長(km)	幹線道路の舗装率(%)	保有台数/人	GDP(ドル)/人	保有台数/幹線道路km
日本	13,719,898	4610.6	126,974,628	1,152,207	75	0.11	36,311	12
台湾	11,733,202	321.0	22,548,009	34,901	90	0.52	14,236	336
タイ	14,500,000	129.7	62,354,402	64,600	98	0.23	2,080	224
ベトナム	5,500,000	27.3	81,098,416	93,300	25	0.07	337	59
カンボジア	407,954	3.2	12,775,324	35,769	12	0.03	250	11
出典	世界二輪車概況・HONDA（2001）	IMF,ODCE（2000）	CIA The World Factbook (2002)	CIA The World Factbook (1999)				

オートバイと経済発展

■ クロスセクションで見ると... 2000年

保有に関する分析
（マクロ的アプローチ）

ハノイ都心でのオートバイ駐車場
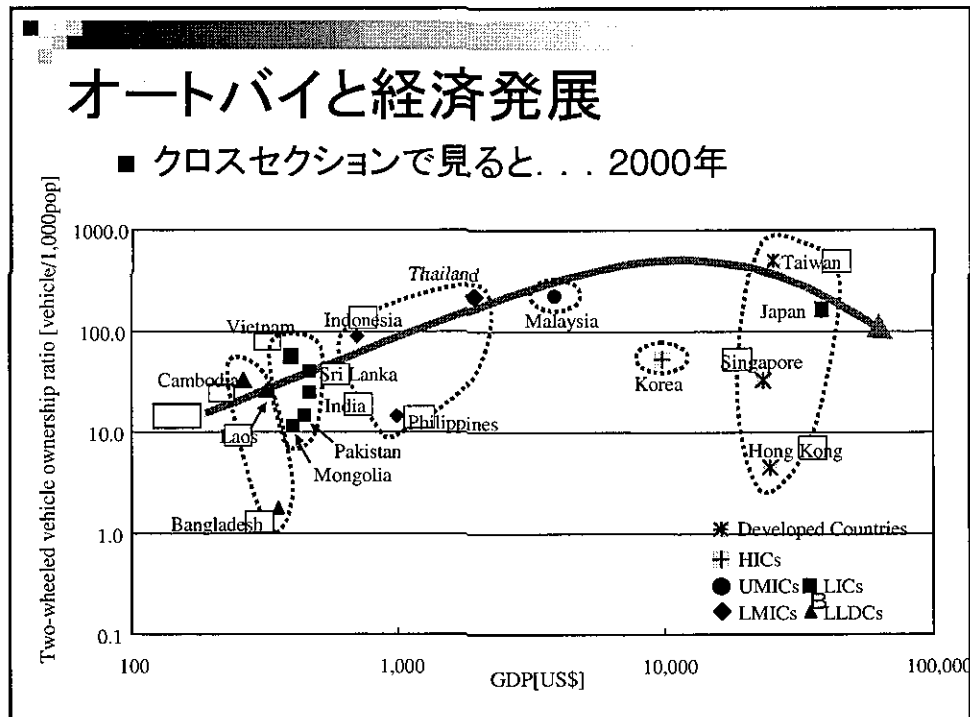
オートバイ保有の変化

問題意識

- オートバイの保有状況と経済環境はどのような関連性を持っているのか。
- 乗用車とオートバイの保有に関連性はあるか。
- 日本の状況と比較して何らかの知見を得ることができるか。

バンコクの県内総生産と保有台数

$y=0.001131x+34.08443$
$(R^2=0.965853)$

$y=0.000996x+10.18647$
$(R^2=0.96416)$
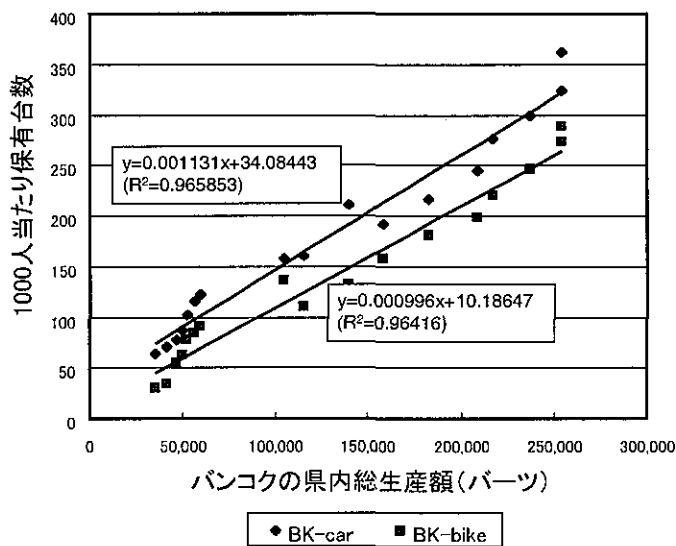
注)バンコクにおける自動車台数には、ピックアップを含めている。

日本の実質GDPと保有台数

縦軸: 1000人当たり保有台数

$y=0.000838x-52.5563$
$(R^2=0.926104)$

$y=0.00029x+260.1193$
$(R^2=0.90174)$

$y=0.000894x-146.949$
$(R^2=0.923646)$

横軸: 日本の実質国内総生産額(総額、単位10億円、H2価格)

◆ JPN-car　■ JPN-bike(1979-1985)　△ JPN-bike(1985-1995)

乗用車とオートバイの保有台数の関係

縦軸: 1000人当たりオートバイ保有台数

$y=0.87221x-18.3286$
$(R^2=0.97963)$

$y=-0.2505x+211.3016$
$(R^2=0.997254)$

$y=1.612261x-212.202$
$(R^2=0.985757)$

横軸: 1000人当たり乗用車保有台数

◆ BK(1979-1995)　■ JPN(1979-1985)　△ JPN(1985-1995)
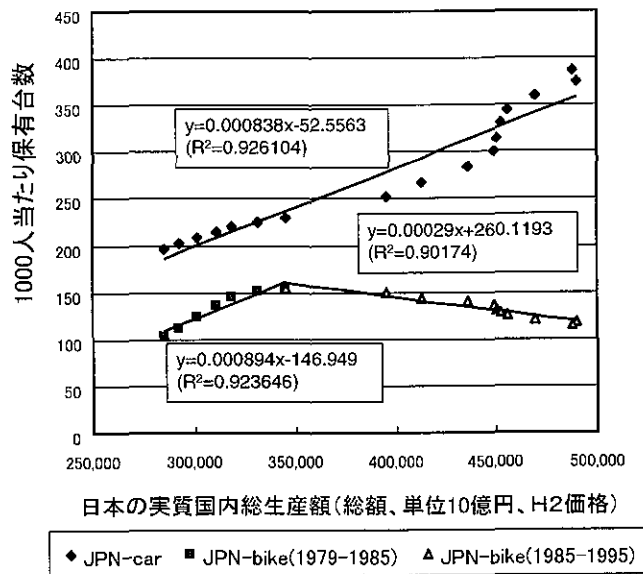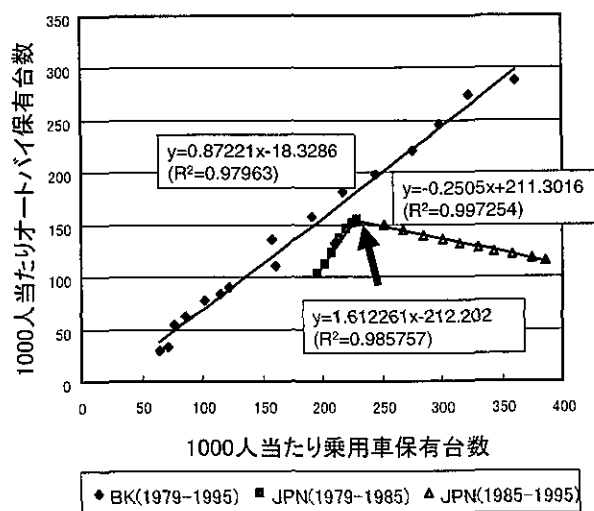
日本のターニング・ポイントは1985-1986年

GDP(GPP)の保有台数に関する弾性値

経済成長が1%進んだときに保有台数(1000人当たり)は何%増加するかを示す数値

バンコク・オートバイ(1979-1996)：　　1.5237
バンコク・乗用車 (1979-1996)：　　1.1575
日本・オートバイ (1979-1985)：　　2.1475
日本・オートバイ (1985-1997)：　　-1.9629
日本・乗用車 (1979-1997)：　　2.5736

保有に関する分析
（ミクロ的分析）

バンコクでのアンケートの様子

所得と取得・維持費用（タイでのアンケート結果）

	平均車両購入価格		世帯所得 [バーツ]
	二輪車 [バーツ]	四輪車 [バーツ]	
バンコク	32,191	479,829	43,538
チェンマイ	32,311	482,174	30,005
コンケン	36,643	495,238	28,523
平均	33,715	485,747	1バーツ＝2.8円

- 購入価格は、四輪車の1/15
- 地方の世帯所得1ヶ月分（四輪車は15ヶ月分）

所得と取得・維持費用（タイでのアンケート結果）

	月の維持費		世帯所得 [バーツ]
	二輪車維持費 [バーツ]	四輪車維持費 [バーツ]	
バンコク	634	3,598	43,538
チェンマイ	352	2,672	30,005
コンケン	485	2,331	28,523
平均	490	2,867	1バーツ＝2.8円

- 維持費は、四輪車の1/6

交通安全に関する分析
（アンケート調査）

B. 交通安全の実態

問題意識
- オートバイに起因する交通事故の原状はどうなっているのか。
- 安全に対する意識、取り組みの実態はどうなっているのか。
- 安全教育にかかわる制度、仕組みはどうなっているのか。

乗車定員
オーバー

ヘルメット
未着用

交通安全意識（タイでのアンケート結果）

■ ヘルメット着用率 v.s. シートベルト着用率

サンプル数	二輪車	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

二輪車ヘルメット着用率（バンコク）
A 45%
B 32%
E 17%

二輪車ヘルメット着用率（チェンマイ）
A 12%
D 29%
E 9%
C 3%
B 47%

二輪車ヘルメット着用率（コンケン）
A 8%
D 19%
E 6%
C 12%
B 55%

シートベルト着用率（バンコク）
A 61%
B 31%
C 2% D 4% E 2%

シートベルト着用率（チェンマイ）
A 43%
D 17%
E 0%
C 11%
B 29%

シートベルト着用率（コンケン）
A 44%
D 10%
E 3%
C 10%
B 33%
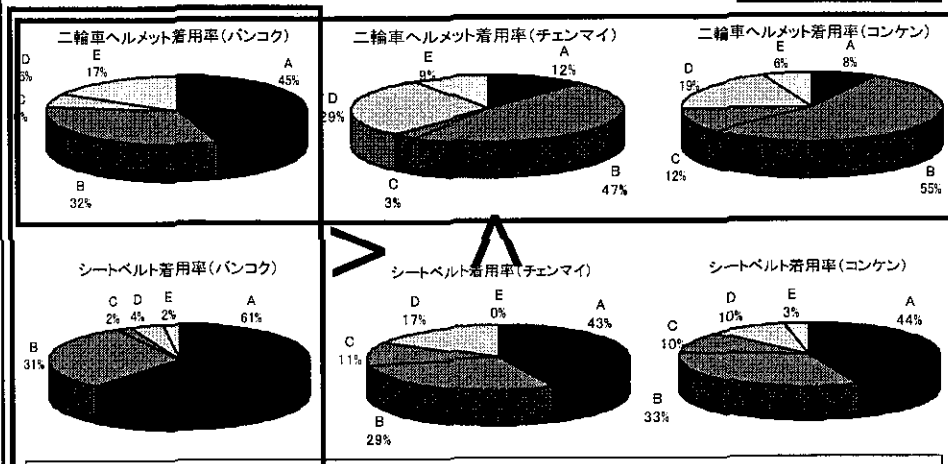
凡例
A：必ず着用する　B：だいたい着用する　C：時々着用する　D：ほとんど着用しない　E：いつも着用しない

交通安全意識（タイでのアンケート結果）

■ 乗車人員の比較

サンプル数	二輪車	自家用車
バンコク	22	14
チェンマイ	62	29
コンケン	119	30

二輪車の規定乗車人数を守っているか
（バンコク）
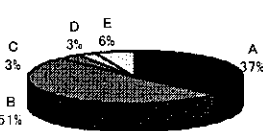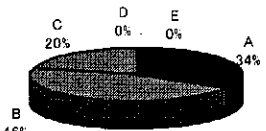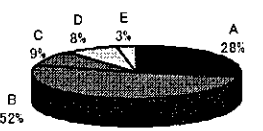
A 37%　B 51%　C 3%　D 3%　E 6%

二輪車の規定乗車人数を守っているか
（チェンマイ）

A 34%　B 46%　C 20%　D 0%　E 0%

二輪車の規定乗車人数を守っているか
（コンケン）

A 28%　B 52%　C 9%　D 8%　E 3%

自家用車の規定乗車人数を守っているか
（バンコク）

A 51%　B 23%　C 6%　D 0%　E 20%

自家用車の規定乗車人数を守っているか
（チェンマイ）

A 45%　B 41%　C 8%　D 3%　E 3%

自家用車の規定乗車人数を守っているか
（コンケン）

A 84%　B 10%　C 3%　D 3%　E 0%
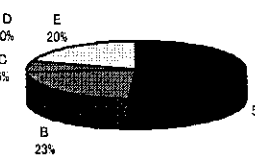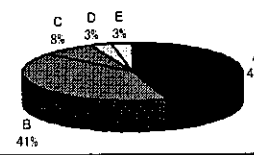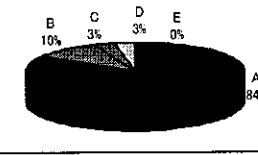
凡例
A：必ず守る　B：だいたい守る　C：時々守らない　D：ほとんど守らない　E：いつも守らない

交通安全教育（タイでのアンケート結果）

安全教育指導の有無（二輪車）

受けていない／受けた

バンコク 54.2／45.9　チェンマイ 13.8／86.2　コンケン 50.4／49.6

安全教育指導の有無（自家用車）

バンコク 33.3／66.7　チェンマイ 19.4／80.6　コンケン 33.3／66.7
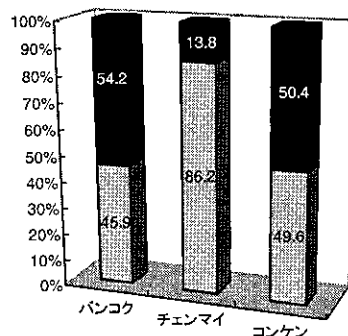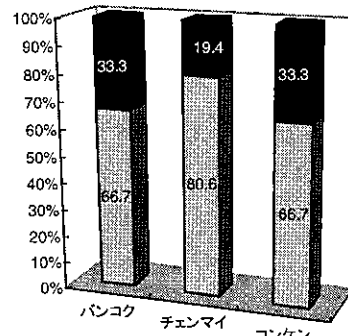
交通安全実態の整理（マクロ的視点）

	二輪車交通の特徴	交通事故について	免許制度		安全教育
			ヘルメット着用義務	最低年齢	
タイ	道路整備水準が高いため、2ストロークエンジン車が普及。地方部では、複数乗車が多い。	高速運転による事故が多い。観光地などでレンタルバイクによる事故も多い。	あり	18	地方では実技試験が無い。APホンダが安全運転普及活動を行っている。交通教育センターが1994年に設立
ベトナム	自転車から急速に転換。道路整備が悪く、4ストローク車が好まれる。複数乗車が多く、平均速度は低い。	都市部では速度が低いため大事故は少ない。郊外では速度が高く、死亡事故が発生。	なし	18（70%無免許?）	1999年に交通教育センターが設立されている。販売店での納車時に安全教育を行っている。
カンボジア	複数乗車が多く、平均速度は低い。利用距離が長い。	観光地でのレンタルバイクによる事故が発生	なし	なし	ドライビングスクールは存在するが任意。NPOレベルでの啓蒙活動。

安全運転教育の例

- HONDAによる安全運転普及活動しか見られない。
- 販売店における手渡しの安全活動
  納車時に15〜20分程度、安全のアドバイスをする。
  インストラクターの養成を行っている。
- 交通教育センターにおける参加体験型の実践教育

安全運転普及のための教材作成

■ 販売店のサブインストラクターを通じてユーザーから聞き取ったヒヤリハットの体験、交通警察官からの聞き取りに基づいて、集まった4,300件を分析。

■ ワースト30を選び出してテキストや、販売店が安全指導するときに最低限指導してほしい項目（約10ヶ）を載せたレファレンスカードを作成。

交通教育センター

■ タイでは、1994年、バンコク（サムロン）に設立。2001年に拡張。

■ 販売店のサブインストラクターを養成、バンコクの交通警察の白バイ隊の研修、教職員組合への研修、DHLやOCSなどの宅配便（バイクで配達している）のドライバーへの講習などを実施。出張講習も実施。

■ ライディングシミュレータも導入。

交通教育センター（つづき）

- ベトナムでも、1999年に交通教育センターを設立。
- 設立の目的は、販売店のスタッフの教育のためだけでなく、警察官や教員の指導など。
- 規模は小さいが、指導方法などを含めてタイとほぼ同じスタイルでやっている。
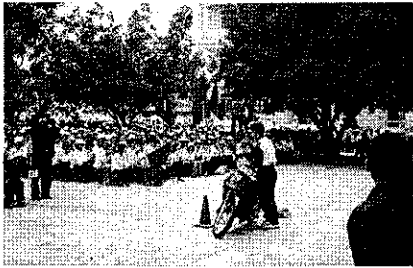
利用に関する分析
（アンケート調査）

C. オートバイの利用

問題意識

■ この地域特有のオートバイタクシーの実態はどうか。

■ オートバイタクシーの都市交通体系の中での役割、位置づけはどうなっているか。

バイクタクシーの利用実態の分析

都市	バンコク		プノンペン
区分	ソイバイク	幹線バイクタクシー	モトドップ
利用	横丁往復 500〜1000m バス・BTS端末 低運賃約30円	渋滞時最速手段 数キロの移動 代表交通手段 実勢価格200円	市内縦横 500〜6000m 最主要代表交通手段 (**市内路線バスなし**) 運賃約15円/km
運営	非公式組織	同左	無組織
安全	低速走行 ヘルメット義務	高速走行 ヘルメット義務	低速走行 ヘルメットなし

バンコクにおけるソイ
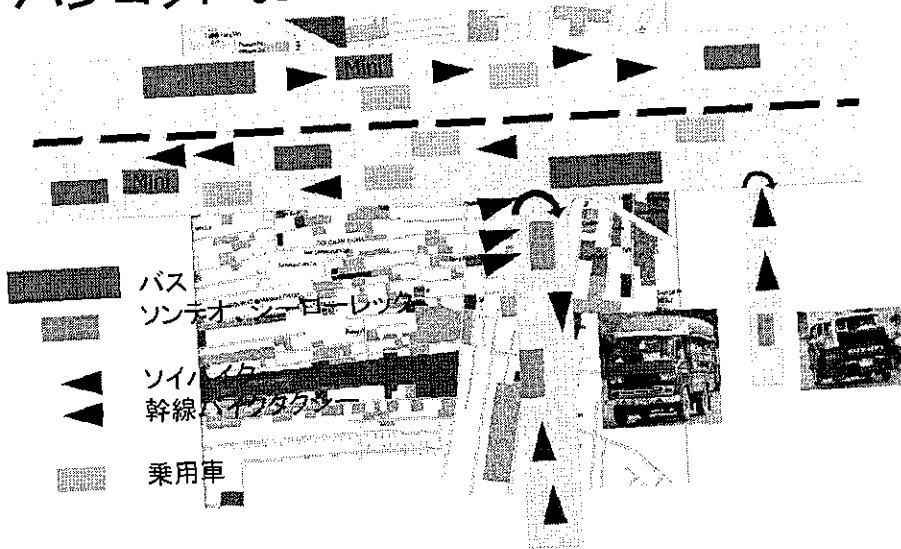
バンコクのソイバイク

幹線バイク
タクシー
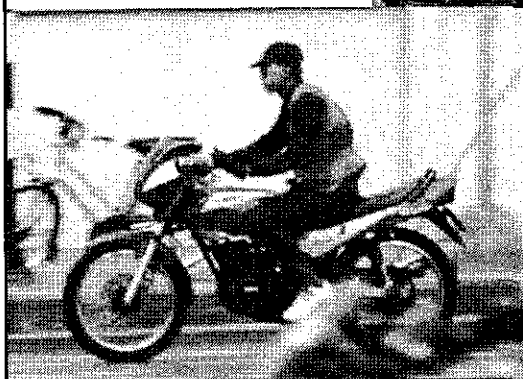
プノンペンのモトドップ

実施調査の概要

都市	バンコク	プノンペン
調査	・公共交通通勤者 通勤実態調査 （路上聞き取り） 501票有効	・モトドップ利用者調査 　調査1：着トリップ調査 　　550票有効 　調査2：企業等訪問調査 　　391票有効 ・モトドップ運転者調査 　調査3：路上運転者調査 　　129票有効

端末交通としてのソイバイクの利用特性

路線バスとBTS（高架電車）
による分担率の違い
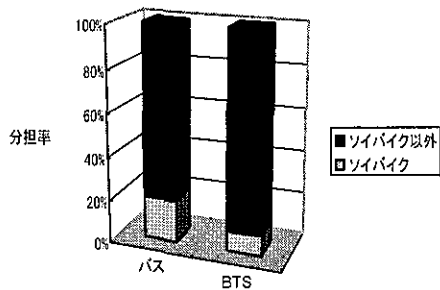
バス停・駅からの距離帯別の
利用者数分布
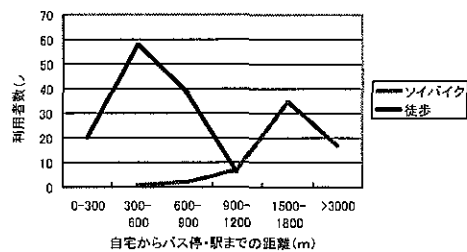
バンコクのソイバイク利用者属性

- 年齢階層分布（徒歩とバイク利用者の違い）
- 所得階層分布（徒歩とバイク利用者の違い）

構成率

■	50-59
□	40-49
□	30-39
■	20-29
□	<20

ソイバイク　徒歩

構成率

■	>30000
□	25000-30000
■	20000-24999
□	15000-19999
□	10000-14999
■	5000-9999
□	0-4999

ソイバイク　徒歩
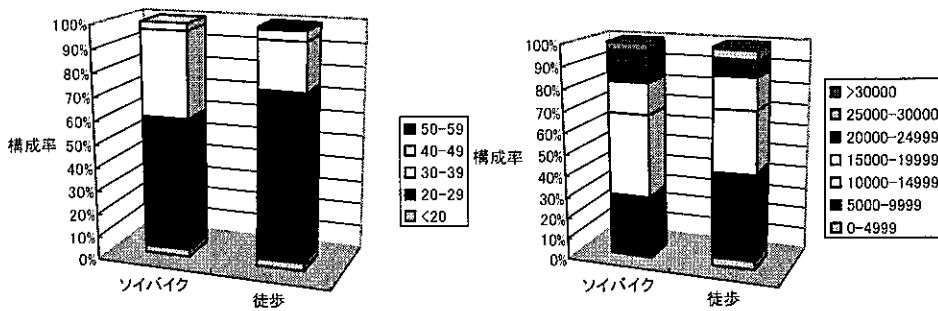
参考:所得階層別バイクタクシー分担率（95年調査より）

分担率

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

<10000　10000～15000　15000～30000　30000<　Total

所得

□	Others
■	Motorcycle Taxi
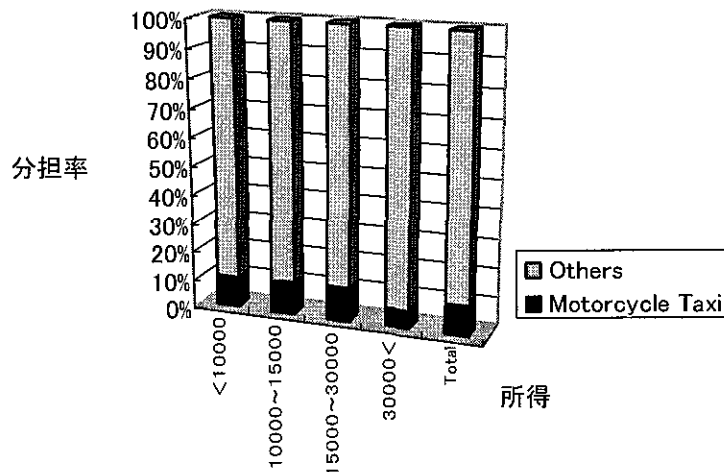
参考：バンコク市内のタクシー系
パラトランジット営業特性（1990調査より）

	タクシー	サムロー	シーロー	バイクタクシー
運転手の平均年齢	37.2	32.6	37.2	24.4
運転経験	6.8	7.0	5.4	2.0
1日あたりトリップ数	15.65	23.2	18.1	33.8
1日あたり利用者数	38.5	60.0	58.3	35.5

プノンペンのモトドップ

■ 手段分担(利用距離別）
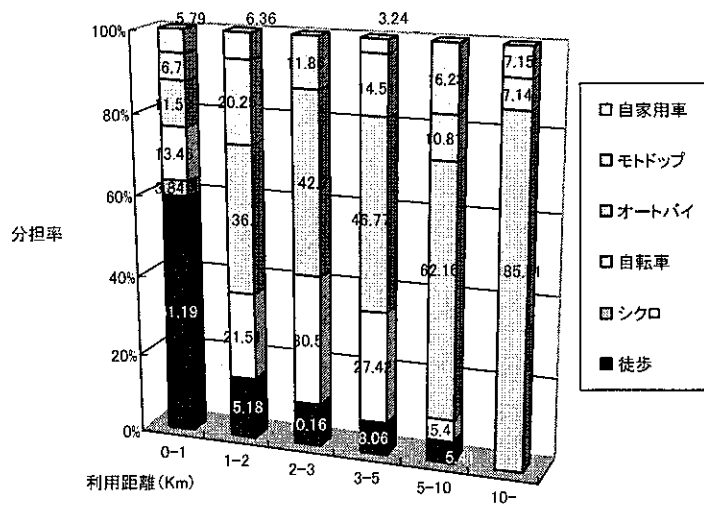
プノンペンのモトドップ

■ 利用頻度特性
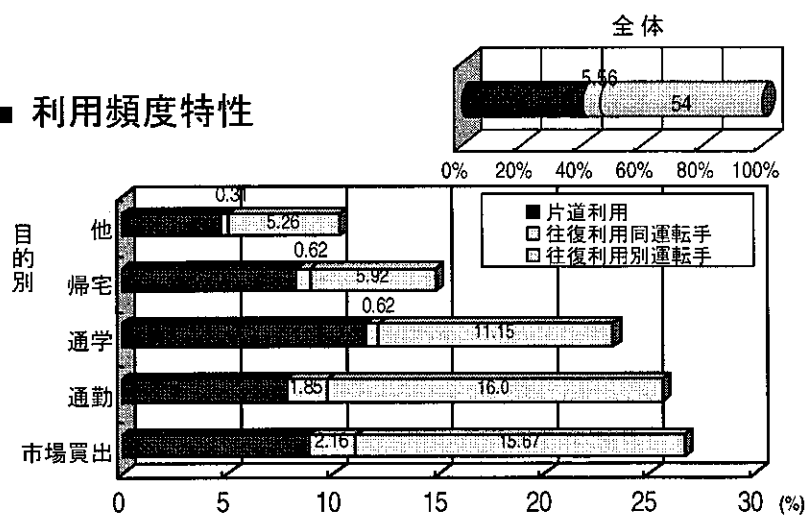
プノンペンのモトドップ
■ 所得と手段分担
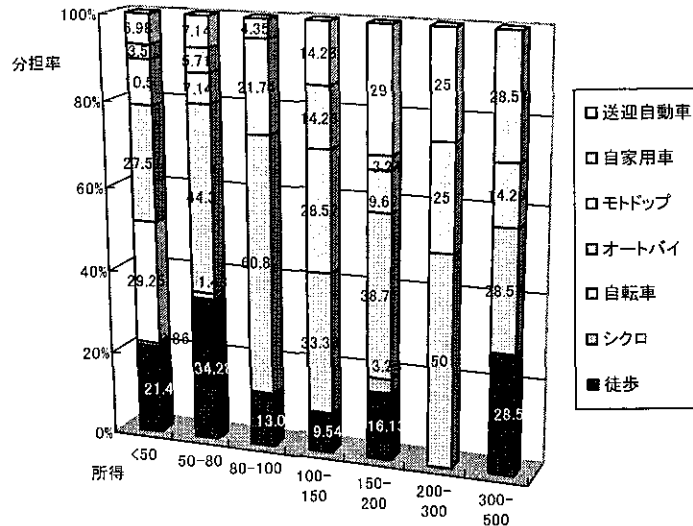
プノンペンのモトドップ
■ 実勢運賃と支払い許容額
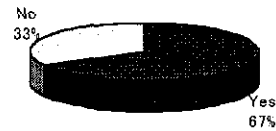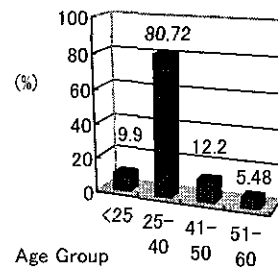
プノンペンのモトドップ

■ 運転者の特性

事故の経験有無

No 70%
Yes 30%

乗客から不平経験有無

No 33%
Yes 67%

専業or兼業

兼業 13%
専業 87%

(%)

100
80.72
80
60
40
9.9
12.2
20
5.48

Age Group: <25 25-40 41-50 51-60
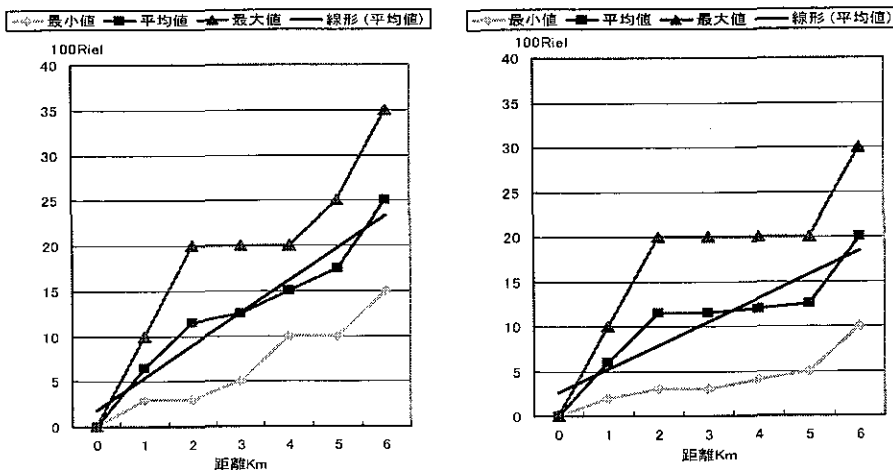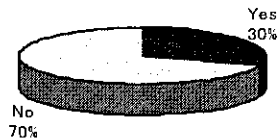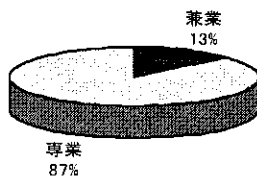
D. オートバイの利用

問題意識

■ オートバイは、どのくらいの輸送効率を持っているのか、

■ 乗用車や公共交通に換算すると、どの程度なのか。

オートバイの乗用車換算係数の推計

調査日時：平成14年10月7日(月)

　　　　　　　7:00-9:00, 11:00-13:00, 16:00-18:00

調査場所：バンコク市内中心部（Rama I Rd. & Phaya Thai Rd.）

調査方法：ビデオ撮影, バス利用実態調査

調査項目：

　1) 車種別交通量(オートバイ, 乗用車, タクシー, バス)

　2) 飽和交通流率

　3) 平均乗車人員

オートバイの乗用車換算係数
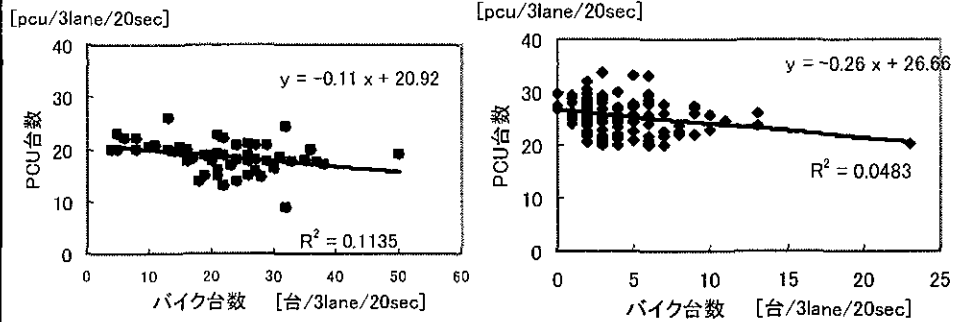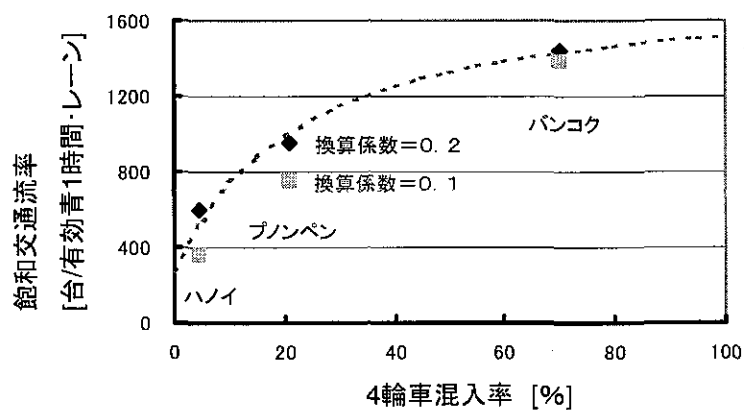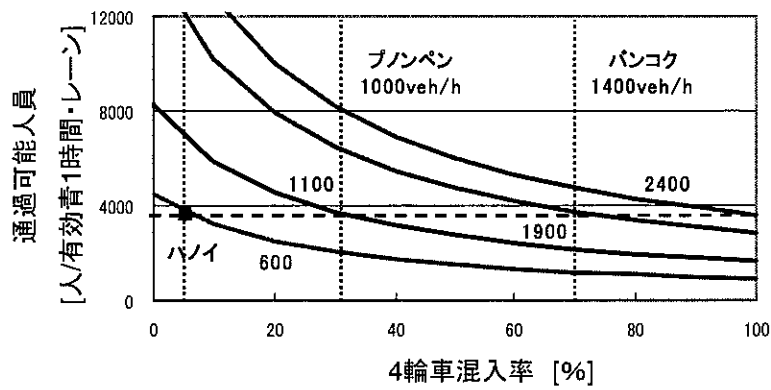
青開始直後20秒まで　　　青開始から20秒経過後以降

オートバイの換算係数は0.1～0.3

交差点の運用効率（飽和交通流率）

・3都市の比較

断面通過人員

4輪車の普及⇔公共交通機関の導入

総括
研究成果のまとめと
今後の課題

本年度の研究成果

■ 多くの新しい知見を得た。

□ 保有構造を分析。所得水準によってある程度説明可能であることを確認。

□ 安全意識と安全教育の動向を把握。地域により安全意識・教育に大きな較差があり、安全教育に対する取り組みが必要であることを把握。

□ オートバイタクシーの実態を把握。重要な都市交通モードとなっているが、都市や地域により役割は異なることを把握。

□ 交差点での飽和交通流率を推計。二輪車が四輪車へ転換した場合は、大きな交通問題となる可能性があることを示唆。

本年度の研究成果における課題

□ 保有構造
  ➤ 今後の保有動向;四輪車への転換
  ➤ 所得以外の要因;公共交通の整備水準

□ 安全意識と安全教育
  ➤ 安全教育の効果の分析
  ➤ 安全教育の課題の整理とあり方の提言

□ オートバイタクシーの実態
  ➤ 経済発展の中での、今後の需要動向
  ➤ 都市交通体系における位置づけの検討

□ 交差点での飽和交通流率
  ➤ 統計的な安定性の向上

新たな検討課題

- 政策動向とオートバイの役割の変遷を包括的に整理する。
- 交通手段選択特性を分析し、オートバイの利用について解明する。
- 役割と限界を考察し、政策を提言する。
  例えば、
  - 交通社会の発展の中でバイクをソフィスティケートされた形で位置づけていくための計画論
  - パラトランジットの計画論を整理していく中でのバイクタクシーの行く末の議論
  - 普及しない都市（例えばマニラなど）との比較
  - 日本の公・民による支援の方法　など