

ACCESSIBILITY OF PUBLIC TRANSPORT NETWORKS FOR DISABLED PEOPLE IN BANGKOK

Viroat SRISURAPANON

Assistant Professor

Department of Civil Engineering

King Mongkut's University of

Technology Thonburi

Pracha-u-tid Rd., Bangmod, Tungkru,

Bangkok 10140 THAILAND

Fax: +66-2-427-9063

E-mail: viroat.sri@kmutt.ac.th

Anucha NILSRIPHAIWAN

Research Associate

Department of Civil Engineering

King Mongkut's University of

Technology Thonburi

Pracha-u-tid Rd., Bangmod, Tungkru,

Bangkok 10140 THAILAND

Fax: +66-2-427-9063

E-mail: anucha_nil@hotmail.com

Abstract: This research aimed to serve as a guideline for public transport improvement for Thai disabled people. Due to concentration of disabled, blind and people in wheelchairs who live in Bangkok and the surrounding areas, they were selected as a case study. The methodology was proceeded by two steps. First, the travel demands were surveyed by interviewing according to purpose, mode, frequency and origin/destination. Second, some routes with high travel demands were selected from the analyzed trip pattern. The evaluation of the routes represented the existing conditions of public transport handicap in Bangkok. From the study, it was observed that most of the blind people traveled by bus while the people in wheelchairs had to use taxi or a personal car. Generally, it lacked of continuity and efficiency to access the public transport system. Some improvements were recommended.

Key Words: Disabled People, Accessibility, Public Transport

1. INTRODUCTION

Recently the number of Thai disabled people increases rapidly. It is difficult to establish the exact number of people in Thailand with a disability or a transport handicap. According to the National Statistical Office Thai disabled people increased from 0.4 million in 1986 to 1.0 million in 1996. Most of them are poor, their concerns unknown and their right overlooked. In Thailand, many transport projects were implemented without concerning about the accessible usage of people with disabilities. The existing accessible facilities to public transport are lacking. It is inconvenient or almost impossible for the disabled people to use public bus without additional equipment, lift or ramp (shown in Figure 1) and footpath without ramp but obstacles (shown in Figure 2). Thereby, a national policy is necessary to be redeveloped for gaining and supporting condition under which people with disabilities achieving participation in society and equality in the development process. The transport system must be managed in a concept of the independent enabled to access transport for people with disabilities. In practical way, a master plan for developed public transport facilities should be implemented step by step within exactly planning years. Moreover the efficient management should be reconciled in comprehensive considerations, such as incorporation of access issues in the curricula of architects, town planners and engineers, encouraging the participation of disabled people in decision of transport project (United Nations, 1995).

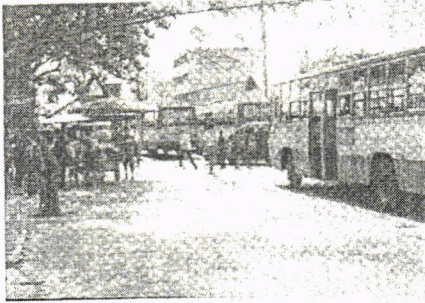


Figure 1. Existing Condition of Public Bus.

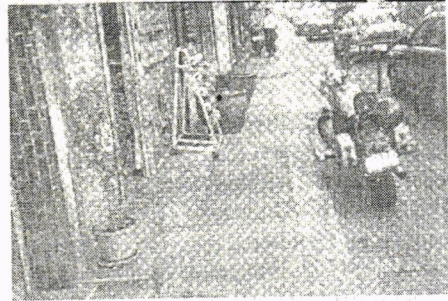


Figure 2. Existing Condition of Footpath.

Currently, accessible facilities improvement has been done with no awareness of the design for the ease of access for the handicap. Some parts of footpaths along the roads were attempted to be upgraded for disabled people without conforming to the standard (shown in Figures 3 and 4) and without concerning about the accessible paths from/to their residential areas. As a result, the renewed sidewalk, the essential footpath of traveling, could not be used in an appropriate way. This research aimed to serve as a guideline for developing the accessibility of public transport networks for Thai disabled people. Due to a concentration of disabled people, blinds and wheelchair people who lived in Bangkok and the surrounding areas, were selected as a case study.

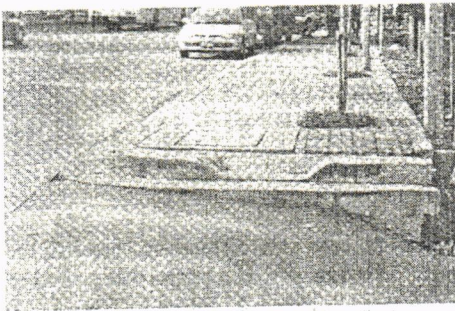


Figure 3. Improper Renewed Footpath.



Figure 4. Improper Installed Guide Block.

2. METHODOLOGY

This study was proceeded with the following two steps. First, the travel demands of disabled people were surveyed by interviewing according to trip purpose, mode, frequency and origin/destination of traveling, in order to explain their traveling behavior and to get the basic value finding their trip characteristics. Second, routes with high travel demands were selected from the analyzed trip pattern in the previous step. Some criteria for the evaluation of accessibility were set and applied for assessing the selected routes. The assessment can be used as a guideline of a plan to improving the accessibility of door-to-door public transport handicap.

2.1 Location

Since an interview could not be surveyed broadly, unobtainable interview from general disabled people. It was then decided to survey in residential areas of disabled people. There are ten surveyed places, the Foundation for the Employment Promotion of the Blind, the Thailand Caulfield Foundation for the Blind, the Bangkok School for the Blind, the Association for Lottery Trading of the Disabled Persons of Thailand, the Prapadang Vocational Training Center for Disabled Persons, the Foundation for the Welfare of the Crippled, the Foundation for Support and Development of Disabled Persons, the Vocational Development Center for Disabled Persons, the Veterans General Hospital, the National Council on Social Welfare of Thailand. Personal data and essential activities of the disabled samples were collected and used to find out basic characteristics of their travel demands.

For the evaluation of public transport, routes that have high travel demands according to their major purpose, work/school trip, were selected.

2.2 Data Collections and Criteria for Assessment

For analyzing the transport demand, frequency, mode selection, traveling distance and original/destination on five major activities, i.e. going to work/school, shopping for necessary goods, going to clinic/hospital, recreational park and banking, were surveyed to find out the characteristics of disabled people and their trip patterns.

For the system of transport handicap, the check-list of the evaluated items of each accessible facility along the selected routes was shown in Table 1.

Table 1. Evaluated Items by Mode.

Mode	Facility	Evaluated Item	
		For the Blinds	For the Wheelchair People
On foot/ Wheelchair	Guide way	Guide block	Curb with ramp
	Sidewalk	Width, Smoothness, Obstacles	Width, Smoothness, Obstacles
	Crossing	Acoustic equipment or other supporting accessories	Leveling median
Public bus	Bus stop	Guide block, Area	Area
	Bus	Acoustic equipment	Extendable ramp
Sky train	Station	Guide block, Area	Lift, Area
	Train	Acoustic equipment	Entrance/Exit equipment

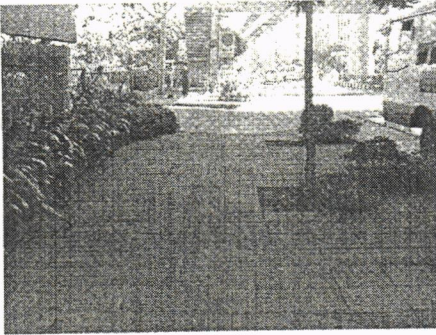
Each item would be evaluated into 3 levels, good, fair or poor using the criteria in Table 2. Some examples of the evaluated facilities were depicted in Figure 5.

Table 2. Criteria for the Evaluation of Quality Level of Each Accessible Facility.

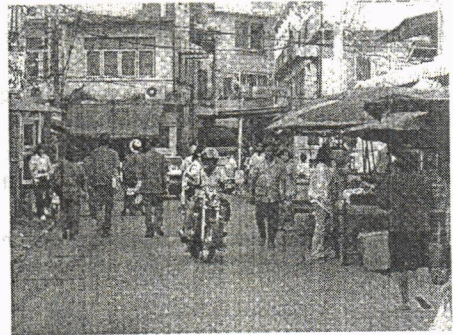
Quality level	Description
Good	Appropriately provided
Fair	Inappropriately provided
Poor	No facilities or inconvenient to use

For each facility, i.e., sidewalk, bus or train, a part of the transport systems would be categorized into 4 levels as below.

- Level A: All items are good, no barriers for accessibility.
- Level B: All items are good or fair.
- Level C: Some items are poor, some significant barriers for accessibility.
- Level D: All items are poor.



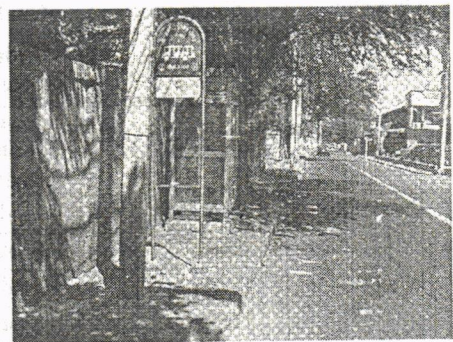
a) Sidewalk – Good for blinds.



b) Sidewalk – Poor for blinds.



c) Bus Stop – Good for wheelchair.



d) Bus Stop – Poor for wheelchair.

Figure 5. Quality Levels of Some Facilities.

3. CHARACTERISTICS OF DISABLED PEOPLE IN BANGKOK

In this study, 67 blind people and 69 wheelchair people were interviewed. Personal data, sex, educational background and income level, were analyzed to grasp the characteristics of the disabled people as shown in Tables 3, 4 and 5.

Table 3. Samples Classified by Sex.

Sex	The Blinds		The Wheelchair people	
	Number	Percent	Number	Percent
Male	42	63	43	62
Female	25	37	26	38
Total	67	100	69	100

Table 4. Samples Classified by Educational Background.

Educational Background	The Blinds		The Wheelchair people	
	Number	Percent	Number	Percent
No education	1	2	3	4
Primary school	8	12	23	33
Junior high school	30	45	22	32
Vocational education	8	12	5	7
High school	19	28	13	19
Bachelor degree	1	2	3	4
Total	67	100	69	100

Table 5. Samples Classified by Income Level.

Income	The Blinds		The Wheelchair people	
	Number	Percent	Number	Percent
Less than 3,000 Baht	30	45	40	58
3,001-5,000 Baht	15	22	15	22
5,001-10,000 Baht	21	31	7	10
More than 10,000 Baht	1	2	7	10
Total	67	100	69	100

It was noticed that the number of male disabled people was higher than the number of female disabled people with a proportion of 63 and 37. Most of disabled people have educational background at least grade 9, junior high school. About 42 percent of the blinds and 30 percent of the wheelchair people had educational background equaled grade 12 or higher. However, 45 percent of the blinds and 58 percent of the wheelchair people had low income which was less than 3,000 Baht.

4. TRAVEL DEMANDS ANALYSIS

Travel demands of the disabled people were analyzed and summarized into two parts, trip rate and mode selection analysis, and travel distance analysis.

4.1 Trip rate analysis and mode selection

Trip rate analysis was modified from Wegmann *et al.* (1983). Trips for work/school were the compulsory activity of disabled people. From Table 6, about 67 percent of the blinds and 57 percent of the wheelchair people had to travel from their residence for work/school about five times per week. More than 80 percent of them performed a minor activity, shopping for necessary goods, 1.60 and 1.38 times per week for the blinds and the wheelchair people, respectively. In addition, it was found that about half of them needed to go to see doctors approximately once a month. Furthermore, some of them also liked to go to recreational park and for banking.

Table 6. Number and Trip Rates of Disabled People by Trip Purpose.

Trip Purpose		The Blinds		The Wheelchair People	
		Number	Person trip rate per week	Number	Person trip rate per week
Work/School	Within residence	22 (33)	6.91	30 (43)	5.14
	Outside residence	45 (67)	4.80	39 (57)	5.41
Shopping for necessary goods		64 (96)	1.60	55 (80)	1.38
Clinic/hospital		32 (48)	0.19	38 (55)	0.25
Recreational park		17 (25)	0.18	20 (29)	0.55
Bank		31 (46)	0.25	18 (26)	0.60

Remark: () percentage of total samples who performed each activities

The percentages of mode selections were shown in Tables 7 and 8 and depicted in Figure 6. In general, it was found that most of blinds chose to travel by public bus while most of wheelchair persons selected taxi or personal cars. This seemed that the blinds could access public transport system more easily than the wheelchair people. For shopping the necessary goods, most of the blinds and wheelchair people selected to travel along the road and footpath.

Table 7. Percentage of Mode Selection of the Blinds by Trip Purpose.

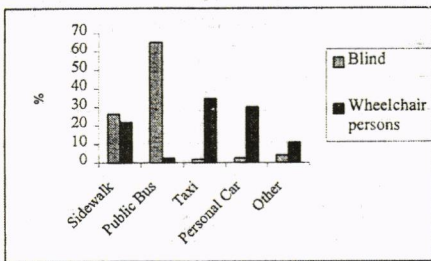
Mode	Trip purpose					
	Work/School	Shopping for necessary goods	Clinic/Hospital	Recreational Park	Bank	All
On foot	7	64	40	-	74	26
Public Bus	89	21	26	47	16	65
Taxi	2	-	16	37	-	2
Personal Car	2	3	4	13	-	3
Others	-	12	14	3	10	4

Remark * Such as Service bus, Tuk Tuk, etc.

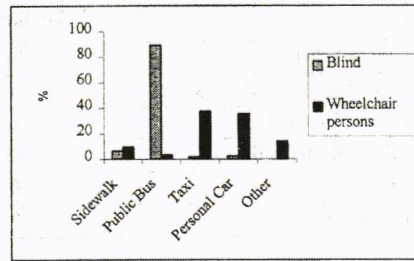
Table 8. Percentage of Mode Selection of the Wheelchair People by Trip Purpose.

Mode	Trip purpose					
	Work/ School	Shopping for necessary goods	Clinic/ Hospital	Recreational Park	Bank	All
Wheelchair	10	53	-	50	33	22
Public Bus	3	1	1	-	-	2
Taxi	37	29	36	25	30	35
Personal Car	36	17	8	25	32	30
Others*	14	-	55	-	5	11

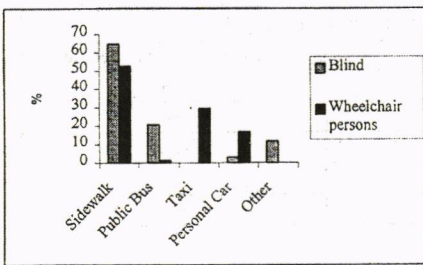
Remark * Such as Service bus, Tuk Tuk, etc.



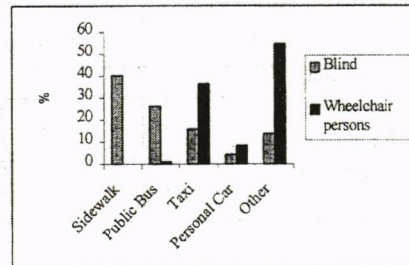
a) All trips.



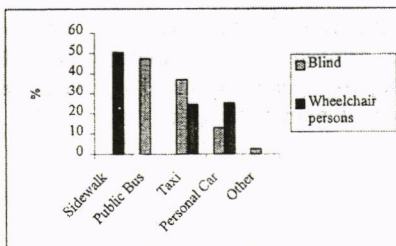
b) Work/school trips.



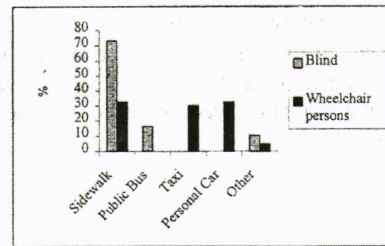
c) Shopping trips.



d) Clinic/hospital trips.



e) Recreational trips.



f) Banking trips.

Figure 6. Percentage of Mode Selections.

4.2 Travel Distance

Travel distance data were used to analyze in two ways, by trip purpose and by travelling mode as shown in Tables 9 and 10. The average travel distances were 7.9 and 12.2 km for the blinds and the wheelchair people, respectively. It was noticed that trips for the major purpose, work/school, varied from medium to long distance while trips for shopping the necessary goods were performed for short distance.

It was observed from Table 10 that the selection of travel mode depended on the travel distance. The disabled people traveled by taxi or personal car for long distance. For medium distance, the blinds selected public bus while the wheelchair people chose public bus or taxi. For short distance, the disabled people chose to travel along footpath.

Table 9. Average Travel Distance by Trip Purpose.

Trip purpose	Average distance per trip (km)	
	For the blinds	For the wheelchair people
Work/School	11.1	15.3
Shopping for necessary goods	1.5	3.6
Clinic/Hospital	6.7	15.5
Recreational Park	13.5	18.0
Bank	0.8	4.8
Average	7.9	12.2

Table 10. Average Travel Distance by Mode.

Mode	Average distance per trip (km)	
	For the blinds	For the wheelchair people
Sidewalk	0.4	1.9
Public Bus	8.1	5.0
Taxi	48.2	11.5
Personal Car	13.0	23.1
Others	1.8	8.5

4.3 Current trip patterns

From the analysis in sections 4.1 and 4.2, trip patterns could be classified into 3 categories, high travel demand with long distance, high travel demand with short distance and others. Some routes of the first two categories were represented in Tables 11 and 12. Five routes of the first category were selected for the evaluation of public transport usage in the next chapter.

Table 11. Routes with High Travel Demands for the Blinds.

Route	Total trip (trips/week)	Distance (km)
The Bangkok School the Blind – Wat Makutkasat school	50	3.5
Foundation for the Employment Promotion of the Blind – Nang linjee market	45	0.4
The Bangkok School the Blind – Samsen Vitayalai school	40	2
The Bangkok School the Blind – Santirat school	25	2
Foundation for the Employment Promotion of the Blind – Nakornluang Polytechnic College*	16	30
Foundation for the Employment Promotion of the Blind – Central department store (Rama III)	14	2
Bang-na km.3 – Thailand Caulfield Foundation for the Blind*	7	40
Donmueng -- Thailand Caulfield Foundation for the Blind*	7	27
On-nut – Thailand Caulfield Foundation for the Blind*	7	20
Yannava – Thailand Caulfield Foundation for the Blind*	7	20
Lumlug-ga – Phaholyothin	7	3
Prachasong krao – Thailand Caulfield Foundation for the Blind	7	1
Din Dang – Thailand Caulfield Foundation for the Blind	7	0.7
Darunpitaya – Thailand Caulfield Foundation for the Blind	7	0.1
The Bangkok School the Blind – Grocery shop	6	0.1

Remark * Selected routes for the evaluation of public transport handicap

Table 12. Route with high travel demand for the wheelchair people.

Route	Total trip (trips/week)	Distance (km)
Beside Ministry of Public Health – Foundation for Support and Development of Disabled Persons	35	1.8
Foundation for Welfare of the Crippled – Hor wang (Nontaburi) school	10	5
Jang wattana – Prapadang*	7	55
Rangsit – Prapadang*	7	55
Jatujak park – Bang-na km.3*	7	40
Suttisan – Prapadang*	7	30
Suttisan – Nontaburi*	7	25
Prapadang – The mall (thapra)	7	23
Suttisan – Charansanitwong	7	22
Huaykhrang – Sapan kray	7	10
Wongsawang – Soi Bumrungrasnaradune	6	7
Soi Bumrungrasnaradune – The Mall (ngam wongwan)	6	5
Prapadang Vocational Training Center for Disabled Persons – Prapadang market	6	1

Remark * Selected routes for the evaluation of public transport handicap

Five selected routes from the blinds' residential areas, shown in Figure 7, are as follows:

- Route 1 - From Foundation for the Employment Promotion of the Blind to Nakornluang Polytechnic College, about 30 km.
- Route 2 - From Bang-na km number 3 to Thailand Caulfield Foundation for the Blind, about 40 km.
- Route 3 - From Donmueng to Thailand Caulfield Foundation for the Blind, about 27 km.
- Route 4 - From On-nut to Thailand Caulfield Foundation for the Blind, about 20 km.
- Route 5 - From Yannava to Thailand Caulfield Foundation for the Blind, about 20 km.

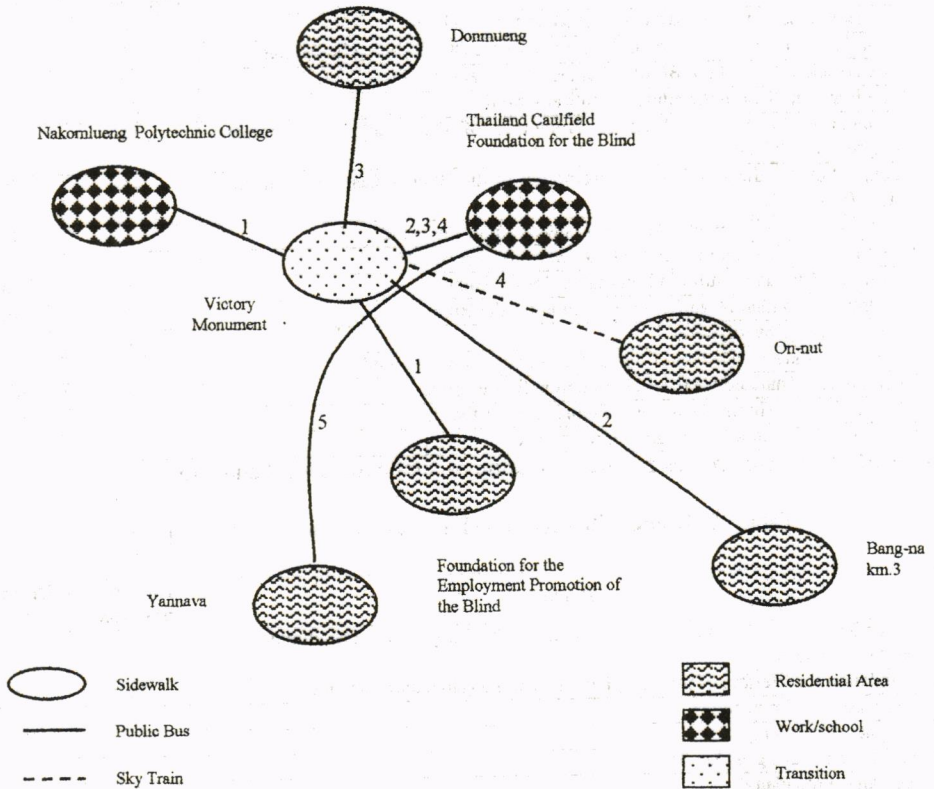


Figure 7. Selected Routes for the Blinds.

Five selected routes for the wheelchair people, shown in Figure 8, are as follows:

- Route 1 - From Jatujak park to Bang-na km number 3, about 40 km.
- Route 2 - From Jaeng Wattana to Prapadang, about 55 km.
- Route 3 - From Rangsit to Prapadang, about 55 km.
- Route 4 - From Suttisan to Prapadang, about 30 km.
- Route 5 - From Suttisan to Nontaburi, about 25 km.

5. EVALUATION OF PUBLIC TRANSPORT FACILITIES

For the assessment of accessibility that was simplified from Tajiri *et al.* (1998), five routes for the blinds and five routes for the wheelchair people were selected. For the typical format, shown in Figure 9, each route started from residential area (node 1), to the station of public bus or elevated train, and then transit at node 2 to another public transit ended at node 3. Only route 5 for the blinds and route 4 and 5 for the wheelchair people had no transition.

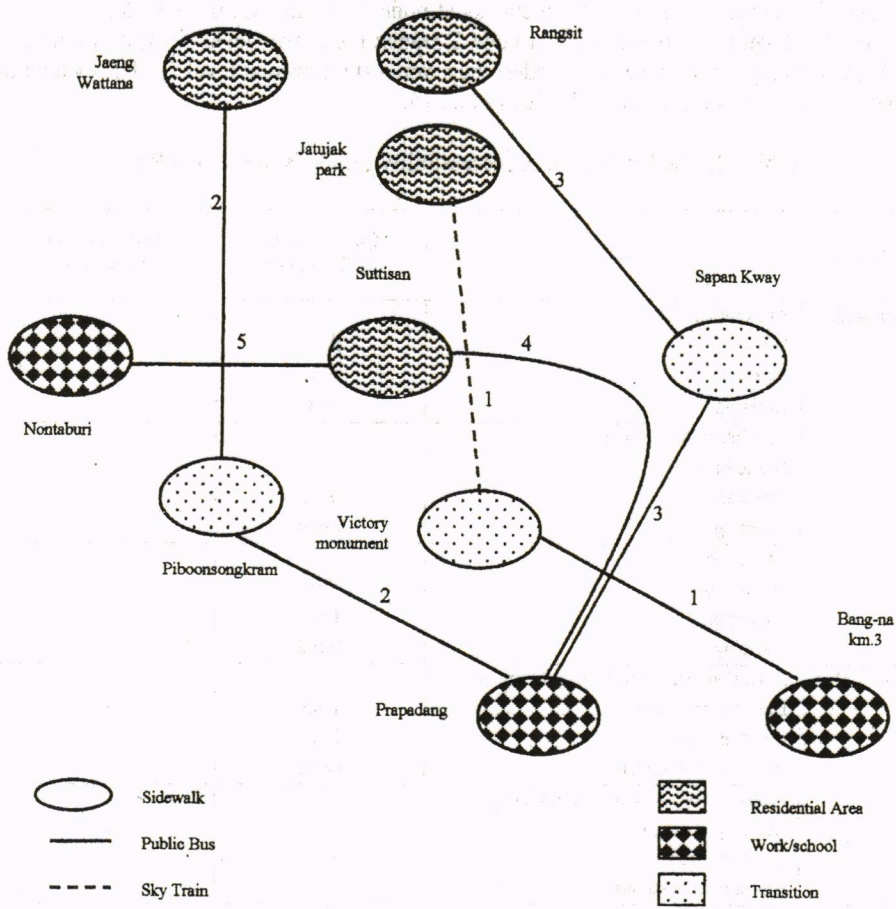


Figure 8. Selected Routes for the Wheelchair People.



Figure 9. Format of Selected Route.

An example of the evaluation of accessibility for the blinds along route number 1 was shown in Table 13. It was observed that sidewalks at node 1, origin, and node 3, destination, were classified at level C while sidewalk at node 2, transit point, was level A, well provided. For both links connected to these three nodes, they were categorized at level C. The evaluation of other routes were summarized in Tables 14 and 15.

Table 13. The Evaluation of Accessibility for the Blinds along Route 1.

Modes	Items	Quality Level of Each Item	Quality Level of Facility
Sidewalk	At Foundation ¹		
	Guide block	Poor	C
	Sidewalk	Fair	
	Crossing	Poor	
	At Victory Monument		
	Guide block	Good	A
	Sidewalk	Good	
	Crossing	Good	
	At College ²		
Guide block	Poor	C	
Sidewalk	Poor		
Crossing	Good		
Public Bus	From Foundation ¹ to Victory Monument		
	Bus stop at origin	Poor	C
	Bus condition	Poor	
	Bus stop at destination	Good	
	From Victory Monument to College ²		
	Bus stop at origin	Good	C
Bus condition	Poor		
Bus stop at destination	Fair		

Remarks 1 Foundation for the Employment Promotion of the Blind

2 Nakornluang Polytechnic College

Table 14. The Evaluation of Accessibility for the Blinds.

Route Number	Sidewalk			Public Bus		Sky Train	
	Node			Link		Link	
	1	2	3	1	2	1	2
1	C	A	C	C	C	-	-
2	D	A	C	C	C	-	-
3	D	A	C	C	C	-	-
4	D	A	C	C	-	-	C
5	D	C	-	D	-	-	-

Table 15. The Evaluation of Accessibility for the Wheelchair People.

Route Number	Sidewalk			Public Bus		Sky Train	
	Node			Link		Link	
	1	2	3	1	2	1	2
1	C	C	C	-	C	C	-
2	C	C	C	B	C	-	-
3	C	D	D	B	B	-	-
4	C	C	-	B	-	-	-
5	C	D	-	C	-	-	-

For the evaluation of the selected routes for the blinds, it was observed that there was almost no footpath nearby node 1, residential area. The footpath around node 2, the Victory Monument, was well developed with guide block while the footpath surrounded node 3, destination, had no guide block. For public bus, there was no installed voice accessory so it hard for the blinds to catch the buses by themselves. Moreover, there was no preparation of the guide block at the station of elevated train shown in Figure 10. Generally, the blinds still faced many difficulties along their trips.

For the evaluation of the selected routes for the wheelchair people, it was found that sidewalks connected to public bus and elevated train were classified at level C since no ramp was provided. Even though lifts (shown in Figure 11) were installed in four buses, in selected route number 2, 3 and 4, no proper management was implemented.

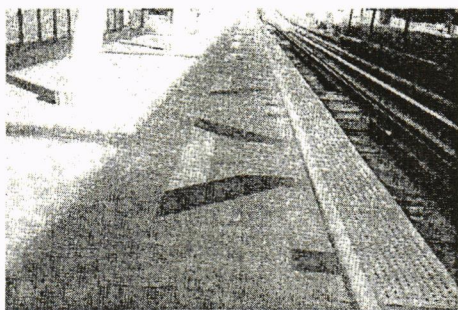


Figure 10. Platform of Sky Train.

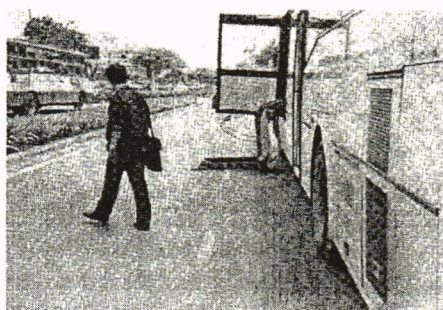


Figure 11. Public Bus with Lift.

6. CONCLUSION

This study serves as a guideline for developing of the transport network for the disabled people, the blinds and the wheelchair people. Personal data and travel demands were surveyed to find out the characteristics of disabled people and trip patterns in Bangkok. Two trip purposes, work/school and shopping, were the main activities. Work/ school trip was performed for a long distance required to take public transport or private car/ taxi while shopping trip was performed for a short distance using sidewalk nearby the residence. From the evaluation of supply side, it generally lacked of continuity and efficiency for the disabled

people. The selected routes in the study could be used to develop for a prototype in the early stage of the development of the accessibility for the disabled people. Reconciliation of some issues, in the curricula of architects, town planners and engineers, encouraging the participation of disabled people in decision of transport project, were also essential.

REFERENCES

- Tajiri, K., Date, S., Koganezawa, M. and Ando, S. (1998) A Fundamental Approach Towards Policy Changes for Barrier-Free Public Transportation in Japan. **Proceedings the 8th World Conference on Transport Research**, Antwerp, Belgium, 13-17, July 1998.
- United Nations (1995) **Promotion of Non-Handicapping Physical Environments for Disabled Persons: Guidelines**, New York, 1-182.
- Wegmann, F.J., Heathington, K.W., Middendorf, D.P., Redford, M.W., Chatterjee, A. and Bell, T.L. (1983) Planning Transportation Services for Handicapped Persons, **National Cooperative Highway Research Program, Report No.262**, 1-74.