Chapter 3

Modal Preference of Da Nang Citizens

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CHAPTER 3

Modal Preference of Da Nang Citizens

1. Stated Preferences Survey

The study conducted a stated preferences survey to understand the modal choice behaviour of Da Nang citizens and develop a modal split model. The survey was conducted during 7–12 November 2015. Four survey locations were selected (Figure 3.1). Respondents were chosen from each area using the random sampling method and were interviewed to determine the following information:

(i) Trip information (purpose, origin and destination, mode, travel time, travel cost and reason of modal choice)

(ii) Alternative transport mode (travel time and travel cost)

(iii) Stated preference on transport mode

(iv) Personal information (gender, age, car or/ motorcycle ownership, driving licence ownership, daily use mode, preference to use BRT, and income)

The survey collected 1,296 samples using the questionnaire form in Figure 3.2.

Figure 3.1: Survey Locations in Da Nang City

Zone 1: Lien Chieu District

Zone 2: Lien Chieu District and Cam Le District

Zone 3: Son Tra District

Zone 4: Ngu Hanh Son District

Source: Study team.

Figure 3.2: Survey Form

Questionnaire on Modal Choice in Da Nang City Urban Area

Area Code (Zone xxx)

- Survey date:________________________
- Surveyor's name:________________________________

This is a questionnaire survey about a new bus rapid transit (BRT) system that will open in the future. It aims to understand the modal choice behavior in Da Nang City urban area to assist in forecasting transportation demand. We will only use the information you provide for this purpose. We will not reveal your personal information and will only provide the questionnaire survey results in statistical form. Thank you for your cooperation.

1. Question about your modal choice behavior at present.

1.1. Please answer about mode of transportation and travel time that you usually use from your home to any destinations in the using order. And if you use public transportations, please answer these costs, travel time, waiting time and location.

Travel Purpose : ☐ Home - Office ☐ Home - School Home – Shopping Place

Origin	Location :	Waiting Time (min) :

Mode of Transportation : ☐ Walk ☐ Bicycle ☐ Private Car ☐ Private Motorcycle ☐ Motorcycle Taxi ☐ Taxi ☐ Bus ☐ Railway	Travel Time (min) :	Cost (VND) :

Transfer Location or Destination	Location :	Waiting Time (min) :

Mode of Transportation : ☐ Walk ☐ Bicycle ☐ Private Car ☐ Private Motorcycle ☐ Motorcycle Taxi ☐ Taxi ☐ Bus ☐ Railway	Travel Time (min) :	Cost (VND) :

Transfer Location or Destination	Location :	Waiting Time (min) :

Mode of Transportation : ☐ Walk ☐ Bicycle ☐ Private Car ☐ Private Motorcycle ☐ Motorcycle Taxi ☐ Taxi ☐ Bus ☐ Railway	Travel Time (min) :	Cost (VND) :

Transfer Location or Destination	Location :	Waiting Time (min) :

Mode of Transportation : ☐ Walk ☐ Bicycle ☐ Private Car ☐ Private Motorcycle ☐ Motorcycle Taxi ☐ Taxi ☐ Bus ☐ Railway	Travel Time (min) :	Cost (VND) :

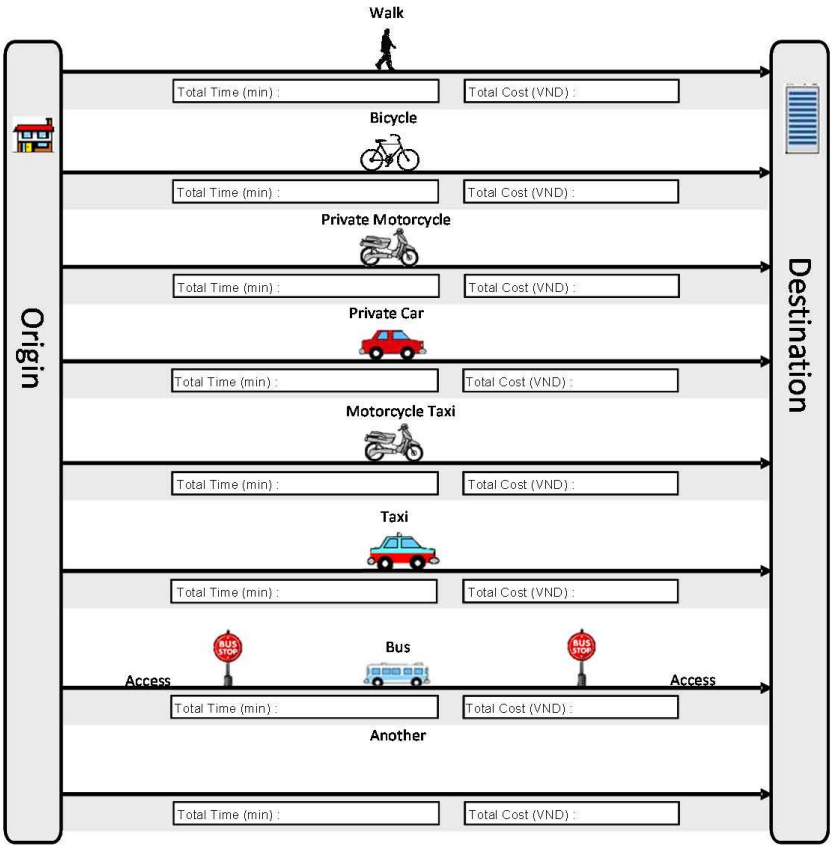
Transfer Location or Destination	Location :	Waiting Time (min) :

1.2. Why do you choose modes above? Please select the most appropriate reason for you.

☐Travel Cost ☐Reliability/ Punctuality ☐Travel Time

☐Convenience ☐Safety ☐Comfort

1.3. Please estimate travel time and cost of each of the following modes. (Travel purpose and destination is the same as Question No. 1.1.)



1.4. Please select some of the following modes that you might use for your travel purpose. (Travel purpose and destination is the same as Question No. 1.1.)

☐  Private Car

☐  Private Motorcycle

☐  Taxi

☐  Bus

☐  Motorcycle Taxi

2. The new BRT system will open near here in the future. Please describe your expected modal choice behavior once the BRT is open under each of the following three cost and time scenarios. Assume the HAGL Plaza Hotel is your destination.

If travel time, costs, transfer frequency and so on of each mode of transportation is as follow, which transport mode do you choose? (*Please select the most appropriate mode for you*)

Case 1

1.1						
Modes	Total time [min]	Total Cost [VND]	Breakdown of (2) & (3) include the below			
			Access Time [min]	Waiting Time [min]	Acces Cost [VND]	Parking Cost [VND]
(1)	(2)	(3)	(4)	(5)	(6)	(7)
□ 1. Motorcycle	30	11, 800				5, 000
□ 2. Car	30	107, 700				12, 500
□ 3. Bus	28	5, 000	4	10		
□ 4. BRT	21	6, 000	4	3		
□ 5. Motorcycle + BRT	21	10, 250	1	3	250	4, 000
□ 6. Feeder Bus + BRT	21	6, 000	1	3	0	

Case 2

1.2						
Modes	Total time [min]	Total Cost [VND]	Breakdown of (2) & (3) include the below			
			Access Time [min]	Waiting Time[min]	Acces Cost [VND]	Parking Cost [VND]
(1)	(2)	(3)	(4)	(5)	(6)	(7)
□ 1. Motorcycle	30	10, 800				4, 000
□ 2. Car	44	105, 200				10, 000
□ 3. Bus	30	5, 000	8	5		
□ 4. BRT	27	5, 000	8	5		
□ 5. Motorcycle + BRT	24	5, 500	2	5	500	0
□ 6. Feeder Bus + BRT	26	9, 000	2	5	4, 000	

Case 3

1.3						
Modes	Total time [min]	Total Cost [VND]	Breakdown of (2) & (3) include the below			
			Access Time [min]	Waiting Time[min]	Acces Cost [VND]	Parking Cost [VND]
(1)	(2)	(3)	(4)	(5)	(6)	(7)
□ 1. Motorcycle	30	10, 800				4, 000
□ 2. Car	44	105, 200				10, 000
□ 3. Bus	30	5, 000	8	5		
□ 4. BRT	27	5, 000	8	5		
□ 5. Motorcycle + BRT	24	9, 500	2	5	500	4, 000
□ 6. Feeder Bus + BRT	26	5, 000	2	5	0	

Why did you choose the mode above? Please select the most appropriate reason for you each case.

Case 1 ☐Travel Cost ☐Reliability/ Punctuality ☐Travel Time
☐Convenience ☐Safety ☐Comfort

Case 2 ☐Travel Cost ☐Reliability/ Punctuality ☐Travel Time
☐Convenience ☐Safety ☐Comfort

Case 3 ☐Travel Cost ☐Reliability/ Punctuality ☐Travel Time
☐Convenience ☐Safety ☐Comfort

3. Finally, please provide the following personal information.

3.1 Please answer about your sex.

☐ Male ☐ Female

3.2 Please answer about your age.

☐ under 10's ☐ 10's ☐ 20's ☐ 30's

☐ 40's ☐ 50's ☐ over 60's

3.3 Do you have a car license?

☐ Yes. ☐ No.

3.4 Do you have a private car?

☐ Own car ☐ Family car ☐ No.

3.5 Do you have a motorcycle license?

☐ Yes. ☐ No.

3.6 Do you have a private motorcycle?

☐ Own motorcycle ☐ Family motorcycle ☐ No.

3.7 Please answer about mode of using main transportation when you come home in your daily life.

☐ Bicycle ☐ Motorcycle ☐ Taxi ☐ Motorcycle Taxi

☐ Car ☐ Bus ☐ Railway

3.8 If BRT will open near your home, do you want to use that Line?

☐ Yes. ☐ No.

3.9 Please answer about income of your family. (1000 VND/Month)

☐ ~1,999VND ☐ 2,000~5,999VND ☐ 6,000~9,999VND ☐ 10,000~13,999VND

☐ 14,000~19,999VND ☐ 20,000~25,999VND ☐ 26,000~39,999VND ☐ 40,000VND~

3.10 Please answer about your personal income. (1000 VND/Month)

☐ ~1,999VND ☐ 2,000~3,999VND ☐ 4,000~5,999VND ☐6,000~7,999VND

☐ 8,000~9,999VND ☐ 10,000~11,999VND ☐ 12,000~13,999VND ☐ 14,000VND~

3.11 Please answer about your occupation

☐ Office Worker ☐ Self-employed ☐ Civil Officer ☐ Part-time Worker

☐ Student ☐ unemployed ☐ Other

Thank you for your cooperation.

Note: For Question, 27 combinations of assumptions (travel time and cost for each mode) were prepared by zone (four locations) and by area (four areas) to obtain a wide range of preferences.
Source: Study team.

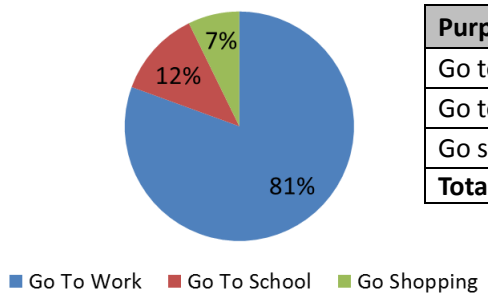
2. Survey Results

2.1 Information on daily trips

The following figures show the results regarding daily travel of respondents. 'Go to work' accounted for 81 percent of all trip purpose (Figure 3.3). 'Go to school' accounted for 12 percent and 'Go shopping' made up 7 percent. Most of the respondents uses private motorbikes as their mode of transport for their daily travel, while only a few uses buses, bicycles, and private cars (Figure 3.4).

Figure 3.5 lists the reasons for the choice of transport mode. Convenience was the dominant reason selected by 88 percent of the respondents; comfort and travel cost were selected by fewer than 5 percent.

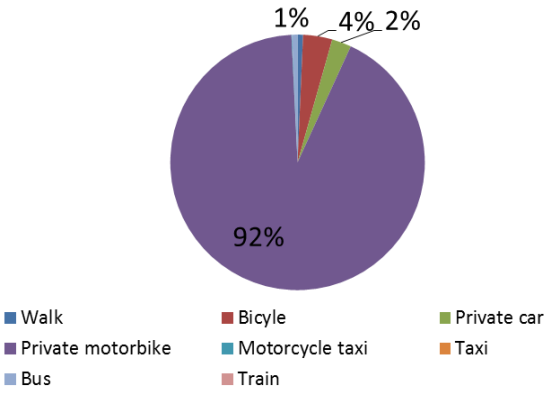
Figure 3.3: Trip Purpose



Purpose	Sample	%
Go to work	1,044	80.56
Go to school	158	12.19
Go shopping	94	7.25
Total	**1,296**	**100**

Source: Study team.

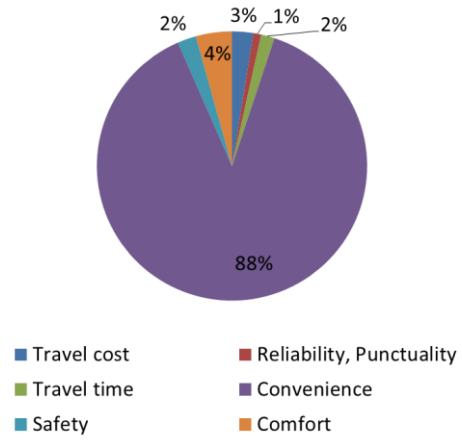
Figure 3.4: **Transport Mode**



Transport Mode Used for Trip Purpose in Figure 3.3	Sample	%
Walk	9	0.69
Bicycle	48	3.70
Private car	32	2.47
Private motorbike	1197	92.36
Motorcycle taxi	1	0.08
Taxi	0	0.00
Bus	9	0.69
Train	0	0.00
Total	**1,296**	**100.00**

Source: Study team.

Figure 3.5: **Reason for Selection of Transport Mode**



Reason for Selection of Transport Mode in Figure 3.4	Sample	%
Travel cost	33	2.55
Reliability, punctuality	12	0.93
Travel time	21	1.62
Convenience	1,145	88.35
Safety	29	2.24
Comfort	56	4.32
Total	**1,296**	**100**

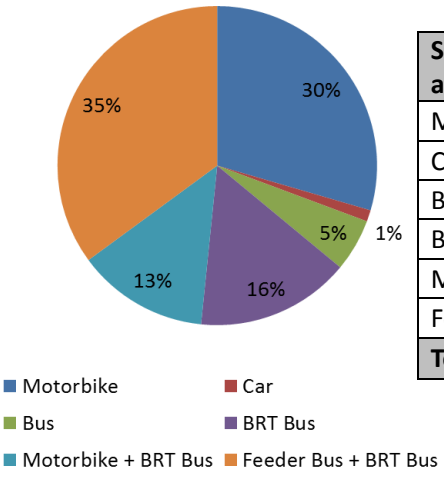
Source: Study team.

2.2 Results of stated preferences

In the questionnaire, respondents were interviewed to select one that they prefer out of six modes with various combinations of travel time and cost. Three cases were given in order to develop the modal split model.

Figure 3.6 shows the results of mode selection based on the assumed travel conditions for each transport mode. The 'Feeder bus and BRT bus' was selected by 35 percent. 'Motorcycle,' 'BRT bus,' and 'Motorcycle and BRT bus' are 29 percent, 15 percent, and 13 percent, respectively. The results, though, do not show a preference of modal choice directly because the combination of travel time and cost of each mode varies by case.

Figure 3.6: **Selected Transport Mode**



Selected Mode in Cases 1, 2, and 3	Sample	%
Motorbike	1,148	29.53
Car	45	1.16
Bus	207	5.32
BRT Bus	607	15.61
Motorbike + BRT Bus	517	13.30
Feeder Bus + BRT Bus	1,364	35.08
Total	**3,888**	**100**

Source: Study team.

2.3 Respondents' personal information

Tables 3.1–3.6 present information about the respondents. These results show that a wide selection of citizens was surveyed.

Table 3.1: Gender

Gender	Sample	%
Male	699	53.9
Female	597	46.1
Total	**1,296**	**100**

Source: Study team.

Table 3.2: **Age**

Age	Sample	%
Under 10	2	0.2
in 10's	8	0.6
in 20's	388	29.9
in 30's	503	38.8
in 40's	271	20.9
in 50's	112	8.6
in 60's	12	0.9
Total	**1,296**	**100**

Source: Study team.

Table 3.3: **Car Driving License Ownership**

Car Driving License Ownership	Sample
Yes	146
No	1,150
Total	**1,296**

Source: Study team.

Table 3.4: **Motorcycle Driving License Ownership**

Motorbike Driving License Ownership	Sample
Yes	1,204
No	92
Total	**1,296**

Source: Study team.

Table 3.5: **Monthly Personal Income**

Monthly Personal Income (VND per month)	**Sample**
1999	48
2,000–3,999	368
4,000–5,999	473
6,000–7,999	156
8,000–9,999	52
10,000–11,999	34
12,000–13,999	8
>14,000	19
No choice	138
Total	**1,296**

Source: Study team.

Table 3.6: **Profession**

Profession	**Sample**	**%**
Employee	797	61.50
Self-employed	171	13.19
Government employee	138	10.65
Part-time employee	36	2.78
Student	147	11.34
Unemployed	7	0.54
Total	**1,296**	**100**

Source: Study team.

3. Modal Split Model

A multinomial logit model was adopted as a modal split model. The model structure and model equation are described below. Based on the results of the SP survey, the parameters of this model were estimated.

$$P_{in} = \frac{\exp[V_1]}{\exp[V_1] + \exp[V_2] + \cdots + \exp[V_i]}$$

$$V_i = \beta_1 Z_1 + \beta_2 Z_2$$

Where:

P_{in}: Choice probability of mode i

V_i: Utility index of mode i

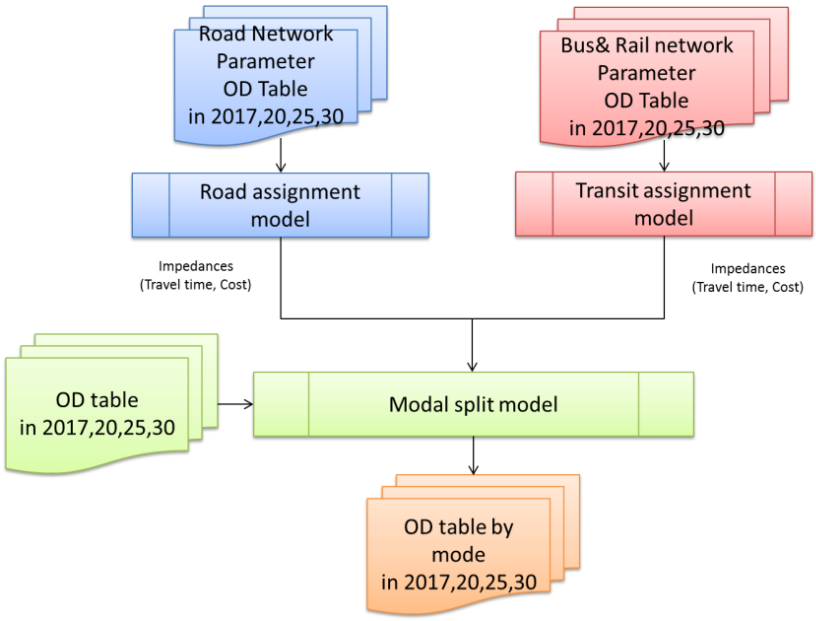
Z1: Travel time of mode i (min)

Z2: Travel cost of mode i (VND)

β1: Parameter, –0.036
β2: Parameter, –0.0000206

The model was used to calculate the modal shares in the future years. Figure 3.7 shows the flow of modal share calculation. Travel time and travel cost by mode, which are input data of the modal split model, were calculated by road and transit assignment models. However, travel time and travel cost by mode would change because of the future transport network and its level of services. In this study, those conditions were assumed with reference to related documents and the current situation, as shown in Tables 3.7–3.9.

Figure3.7: **Flow of Modal Share Calculation**



OD = origin–destination.
Source: Study team.

Table 3.7: **Public Transport Network**

Mode	Route		2015	2017	2020	2025	2030
BRT	BRT1	Khu CN Hoa Khanh–CD Viet Han		○	○	○	○
	BRT2	Cau Song Han–Tran Dai Nghia			○	○	○
	BRT3	Tho Quang–C. vuot Hoa Cam				○	○
	BRT4	Kim Lien–BX phia Nam				○	○
BRT Standard BUS	BRTR1	San bay quoc te Da Nang–Hoi An			○	○	○
	BRTR2	Tho Quang–San bay quoc te Da Nang			○	○	○
	BRTR3	San bay quoc te Da Nang– Ba Na			○	○	○
Metro	Metro1	NH Trung Vuong–Lien Chieu					○
Bus	R1	BX Da Nang–Hoi An	○	○			
	R2	Kin Lien–CD Viet Han	○	○			
	R3	BX Da Nang–TT hanh chinh Hoa Vang	○	○			
	R4A	Da Nang (Cau Thuan Phoc)–Tam Ky (BX phia Nam)			○	○	○
	R5	Nguyen Tat Thanh–Trien Lam Quoc te		○	○		
		Ga DS moi–Trien Lam Quoc te				○	○
	R5	Nguyen Tat Thang–Xuan Dueu			○		
	R6A	BX Da Nang–BX My Son (BX phia Nam)	○	○			
		Nguyen Tat Thanh–BX phia Nam			○	○	○
	R7	Cau Thuan Phuoc–Cau Cam Le		○		○	○
		Cau Thuoc Phuoc–Tran Dai Nghia			○		
	R7	Xuan Dieu–Pham Hung			○		
	R8	Tho Quang–CMT8 (Nguyen Huu Tho)		○	○	○	○
	R8	Tho Quang–Pham Hung			○		
	R9	Tuyen du lich–Ba Na		○			
		Ga duong sat moi–Tien Son (Nguyen Thanh Y)			○	○	○
	R10	Nguyen Tat Thanh–My Khe		○			
		Tho Quang–Cau Vuot Hoa Cam			○	○	○
	R11	Tho Quang–Cam Le		○			
		Tho Quang–Ong Ich Duong			○	○	○
	R11	Xuan Dieu–Lotte mart			○		
	R12	Nguyen Tat Thanh–Hoa Hai			○	○	○
	R12	Tho Quang–Truong Sa			○		
	R13	Vanh dai nam Thanh pho			○	○	○
	R14	Trung tam thanh pho–khu CNC			○	○	○
	R15	BX Da Nang–Tho Quang			○		
		Nguyen Tat Thanh–Tho Quang				○	○
	R16	Kim Lien–My Khe			○	○	○
	R17A	Cau Thuan Phuoc–TT hanh chinh Huyen Hoa Vang			○	○	○
	R18	Tho Quang–Son Tra			○	○	○
	R19	Nguyen Tat Thanh–khu dan cu Tien Son				○	○
	R20	Nhu Nguyet–Cung the thao Tuyen Son				○	○
	R21	Lang DH–TT Tuyen Son				○	○
	R22	CV 29/3–xa Hoa Phong				○	○
	R23	BX phia Nam–Duong Truong Sa					○
	R24	KCN Thanh Vinh–CV 29/3					○

Sources: Approval of master plan for public passenger transport by bus in Da Nang City for 2013–2020 and vision to 2030.

Table 3.8: **Service Level of Public Transport**

Mode	**Frequency** (per hour)	**Speed** (km/h)	**Fare** (VND/ Trip)
BRT	20	25	8,000
BRT Standard Bus	6	Depend on road traffic volume (Max 18 km/h)	8,000
Metro	12	35	16,000
Bus	3 (2017, 2020) 12 (2025, 2030)	Depend on road traffic volume (Max 18 km/h)	8,000

BRT = bus rapid transit, km/h = kilometre per hour, VND = Viet Nam dong.
Sources: Ticketing, Fares, Subsidy and Management and Operations Review Report, Frequent (Monthly and 'pay As You Go' Smartcard User); approval of ticketing plan and subsidy policy for public passenger transport by bus in Da Nang City from 2015 to 2020, Phase 3; and approval of master plan for public passenger transport by bus in Da Nang City for 2013–2020 and vision to 2030.

Table 3.9: **Speed and Costs of Private Modes**

Mode	**Speed** (km/h)	**Vehicle Operation Cost** (VND/km)	**Parking Fee** (VND)	**Access Time to Destination from Parking Space** (min)
Walk	4	0	0	
Bicycle	Depends on road traffic volume	270	2,000	0
Motorcycle	Depends on road traffic volume	1,500	4,000 (2017, 2020) 12,500 (2025, 2030)	0 (2017, 2020) 5 (2025, 2030)
Car	Depends on road traffic volume	13,000	12,500	5
Bus and motorcycle	Depends on road traffic volume	3,000 (VND per trip)	4000	10

km/h = kilometres per hour, min = minutes, VND = Viet Nam dong.
Source: Study team.

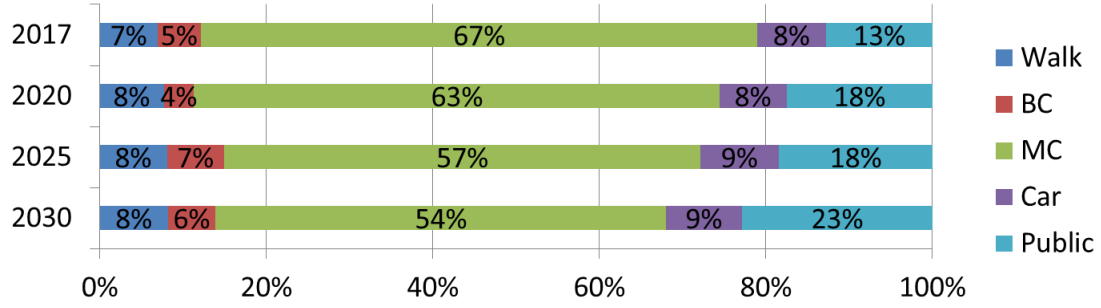
The estimated modal share in the future years is summarised in Table 3.10 and Figure 3.. The number of trips of all modes in 2030 will nearly double compared with 2017. Under the assumed future transport network and level of services, the modal share in Da Nang City will change with the public transport network expanding extensively and then increasing the modal share in 2030 to 23 percent from 13 percent in 2017. The modal share of motorcycles in will decrease to 54 percent in 2030 from 67 percent in 2017. The share of cars will remain the same. The modal share in future years will change based on the transport network and service level provided.

Table 3.10: **Modal Share in Future Years**

Mode	2017		2020		2025		2030	
	Trip	%	Trip	%	Trip	%	Trip	%
Walk	131,689	7	172,598	8	238,093	8	283,531	8
Bicycle	96,388	5	79,939	4	200,581	7	194,027	6
Motorcycle	1,255,341	67	1,408,251	63	1,678,569	57	1,859,235	54
Car	154,973	8	178,914	8	276,768	9	311,577	9
Public mode	239,531	13	390,362	18	540,399	18	784,968	23
Total	**1,877,922**	**100**	**2,230,064**	**100**	**2,934,410**	**100**	**3,433,338**	**100**

Source: Study team.

Figure 3.8: **Modal Share in Future Years**



BC = bicycle, MC = motorcycle.
Source: Study team.