Residents' transportation mode preferences in Transit Oriented Area: A case study of Mentari Court, Petaling Jaya, Malaysia

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Abstract

Transit Oriented Development (TOD) is often linked to the compact, green, mixed use and sustainable development. It encourages people to reduce the use of private vehicles. A TOD area consists of various types of land uses *i.e.* residential, commercial, public facilities and employment area. A transit station within the walking distance to houses centres the TOD area. Conceptually, it is attracting people to use public transport in making a trip. However, the actual level of acceptance by residents on the public transport services within the TOD area is not being clearly examined in Malaysia. As a TOD area, Mentari Court, still jams out with private car as large numbers of residents in the study area were still using private cars for their daily working trip purposes. This study examined the residents' transportation mode preferences in the transit oriented (TOD) area of Mentari Court Apartment, Sunway City, Petaling Jaya. The findings from the field study of 99 respondents of the Mentari Court residents revealed that most of the respondents chose public transport for leisure trip and walking for the daily working trip to the short distance between their apartment and work place. However, incomplete route of public transport network, poor connectivity and services, long journey, and fear of crime had discouraged some of the respondents to use public transport. As a proposal, TOD should be implemented in a regional level instead of local level to increase the integration and coverage of transit network.

Keywords: connectivity, public transport, ridership, safety, Transit Oriented Development (TOD), working trip

Introduction

Transit Oriented Development (TOD) is building on vibrant centres of activity and in higher density areas. Many cities (for instance, in the USA) are starting or expanding rail transit systems with objectives that include more focused economic development near transit stations and along transit corridors. Denver, Colorado is one of the cities that is aggressively expanding the TOD developments. Based on the research (Ratner & Goetz, 2013), TOD development in Denver is considerable, successfully bring the development back to the "downtown". It is resulting in nearly 18,000 residential dwelling units, 5.3 million square feet of retail space, 5.4 million square feet of office space, and 6.2 million square feet of medical space within one-half mile of existing or planned transit stations from 1997 to 2010 (Ratner & Goetz, 2013).

Beside the economic benefits of TOD, the TOD also gives satisfaction to people in providing alternative mode of transportation. Thus, TOD is important to reduce the problems associated to the high dependency on private transportation. As mentioned by previous research, cities in developing countries including Yogyakarta and Surakarta in Indonesia were facing a number of urban transportation problems, for instance, a high private vehicle growth rate, traffic congestion, and unstructured transportation network (Saputra & Widyasmara, 2014). Thus, TOD development is seen to be important for cities.

Research shows that most people who live near to transit station have higher rate in transit use as compared to residents who didn't live near to transit station (Cervero & Gorham, 1995). However, in

some area such as Pleasant Hill Bay Area Rapid Transit (BART) shows the decline in transit taking. In 1993, 47 percent of station area residents took transit to work, but ten years later (2003), the share was 44 percent only (Cervero & Gorham, 1995). It raises the question of effectiveness of TOD in increasing the use of public transport and reduction of dependency on private vehicles.

In Malaysia, Setia Jaya KTM train station is located adjacent to the study area with no parking facilities for passengers. Most of the people from the surrounding area can get to the KTM train service by walking, especially residents from Mentari Court Apartment (the study area). However, the connection between the Mentari Court apartment and Setia Jaya KTM station is not really safe and convenience for the users. As a result, not everyone prefers to use the KTM train service for daily trip. On the other hand, the study area still jams out with private car. It further highlights the question on the acceptance of public transport services by the residents in TOD area. Nationwide, there is only 5 percent of Malaysian used public transportation (Dahalan et al., 2015).

Literature review

Transit Oriented Development (TOD) is a mixed use and compact development of the residential, commercial, and public spaces. The design is more on the walkability and cyclist friendly (Citizens for Improve Transit, 2015). In practice, transit stations are located in bustling downtowns at the heart of the regional economy, as well as residential neighbourhoods where transit provides a convenient means for commuters to travel to and from work and other destinations (Center for Transit-Oriented Development, 2015). It aims to reduce automobile dependence, encourage economic development, and increase housing and lifestyle choice (Renne, 2005). TOD is supported by accessible, frequent, reliable and safe public transport services and other transportation modes (Planning Institute Australia, 2009). Therefore, the transit station is located in the centre of the TODs development, where within walking distance in radius in between 400m to 800m (Citizens for Improve Transit, 2015). To make the TOD become successful, the highest priority should be given to the design of the pedestrian walkway, and train station should be one of the prominent features of town centre, besides the factors of density and diversity of land uses (Ogra and Ndebele, 2014).

According to Betts (2008), public transport services should be accessible by public within 400m safe walking distance, also accessible by disabled and elderly, and good connection to aged-care facilities, educational, medical and community facilities within 200m. Based on previous study (Nurdden et al., 2007), the mode of choice probabilities ranged only 34% for the car usage if the distance from home to public transport within 100 meter. However, percentage of car usage increased to 68% when the distance within 700 meter. So, to make the number of the car usage decrease, the distance from home to public transport should be set at 350 meter (Nurdden et al., 2007). In addition, one of the important principles is every home should have direct access to a principal or major activity centre in the town/area by public transport with a maximum travel time of 30 minutes (ideally) without changing vehicles (Department of Transport, 2008). Nurdden et al. (2007) mentioned that the mode of choice probabilities were 25% car usage with current distance from home to work in 1 km, and 47% the car usage increase when the distance in 30 km.

Besides the factors of design (pedestrian walkway, distance, connectivity, density, land use diversity), the choices of mode of transport also influenced by other factors, as follow:

- Trip schedule, waiting time, travel time, punctuality, facilities and services of public transportation (Ibrahim et al., 2013).
- Age: the older people are more likely to use public transport (Nurdden et al., 2007).
- Gender: female are commuting more on public transport (Nurdden et al., 2007; Coughlin, 1985).
- Income: higher income group is more affordable to spend their expenses on car, thus prefer to use private car (Abdullah et al., 2007).

- Other public transport service quality attributes *i.e.* transit stop furniture, cleanliness, cost, information, promotion, safety, route characteristics, service reliability, and comfort (Eboli & Mazzulla, 2007; Eboli & Mazzulla, 2009). Thus, it is related to the perceived service quality, which is defined by Friman and Fellesson (2009) as a function not only of what the customer gets but also how he or she gets it.

Objectives of study

The study had been carried out with the following objectives:

i. To examine the choice of residents on mode of transportation for their daily working trips and leisure trip.
ii. To investigate the factors that influences the residents' choice.
iii. To conclude and construct appropriate recommendation based on the findings.

Research method

Scope of research

This study is focusing on the ridership of respondents in public transport and private transport in a TOD area. This study aimed to understand the decision of respondents in choosing the mode of transportation in daily working trip (weekdays) and leisure trip (weekends). Besides, it also analyses and evaluates the factors that influence the residents' choice on mode of transportation.

Case study

Mentari Court Apartment, Sunway City, is located within the administration boundary of Petaling Jaya City Council. It consists of seven blocks of apartments with a total of 1,428 units of apartment. Study area is well connected with roads and public transportation networks. Study area is directly connected to Federal Highway, Damansara Puchong Expressway (LDP) and Shah Alam Expressway (KESAS).

For the aspect of public transport connection, Setia Jaya Commuter Station (Sentul-Port Klang KTM Commuter Route) is located beside the study area (Mentari Court) within 5 to 10 minutes walking distance. It is an integrated station with new Bus Rapid Transit (BRT) route. Within the radius of 600m from the train station (Figure 1), the main land uses are industrial and commercial. The nearest and prominent commercial building is Kurnia Tower/Leisure Commerce Square. Freescale Semiconductors Malaysian Sdn. Bhd. and Sungai Way Free Trade Industrial Zone are the major industry activities. Besides, there are also others residential areas located in adjacent to the Mentari Court, which are Damai Apartment, Kayangan Apartment, and Makmur Apartment. In addition, there is a primary school (Kampung Lindungan Primary School) that is also located within the 600m radius from the train station.

This mixed use zone (within 600m from train station) with commercial, industries, medium and high rise residential, and primary school, can be defined as a TOD area with the train station at the centre. In addition to the train station, this TOD area is also connected with Rapid KL bus service that connects this TOD area with other areas. As a TOD area, study area is also connected by pedestrian walkways (Figure 2). For the purpose of this research, Mentari Court was chosen for the purpose to examine the choice of residents on mode of transport in the TOD area.

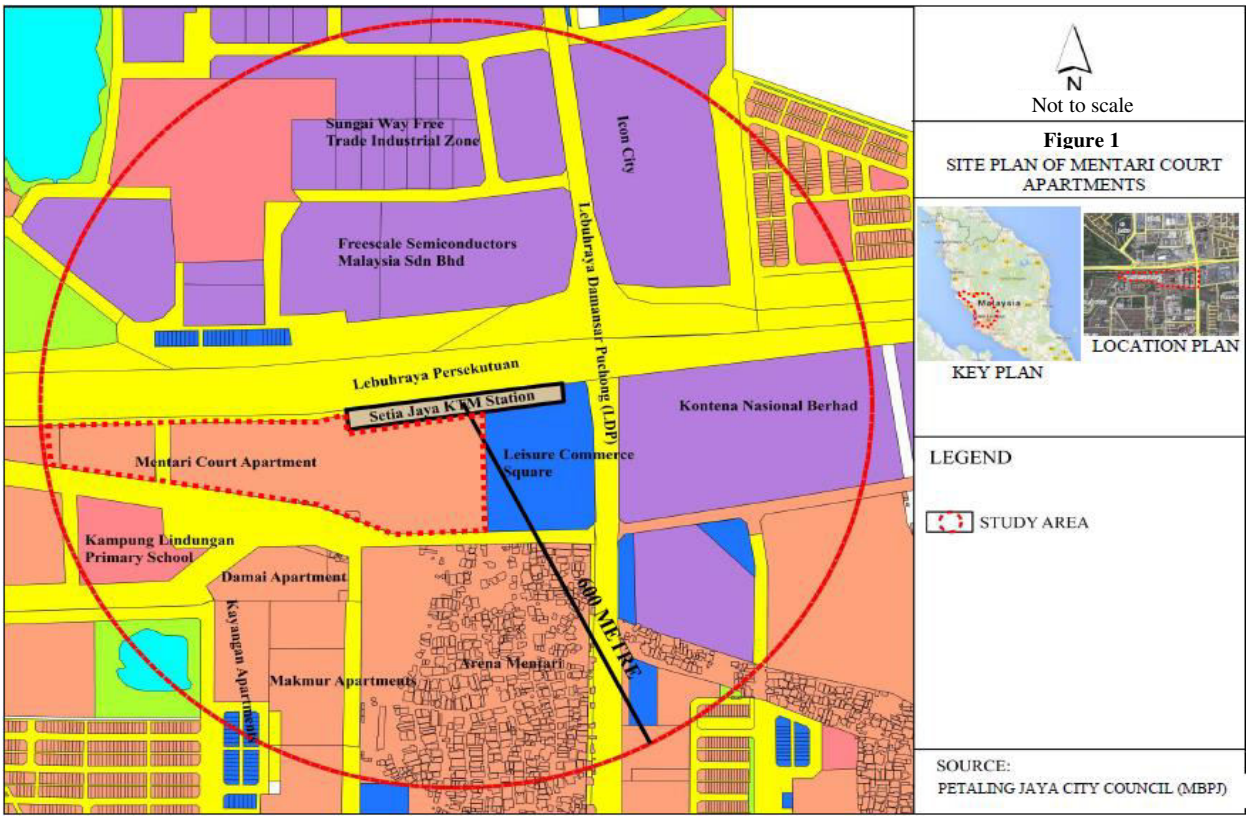
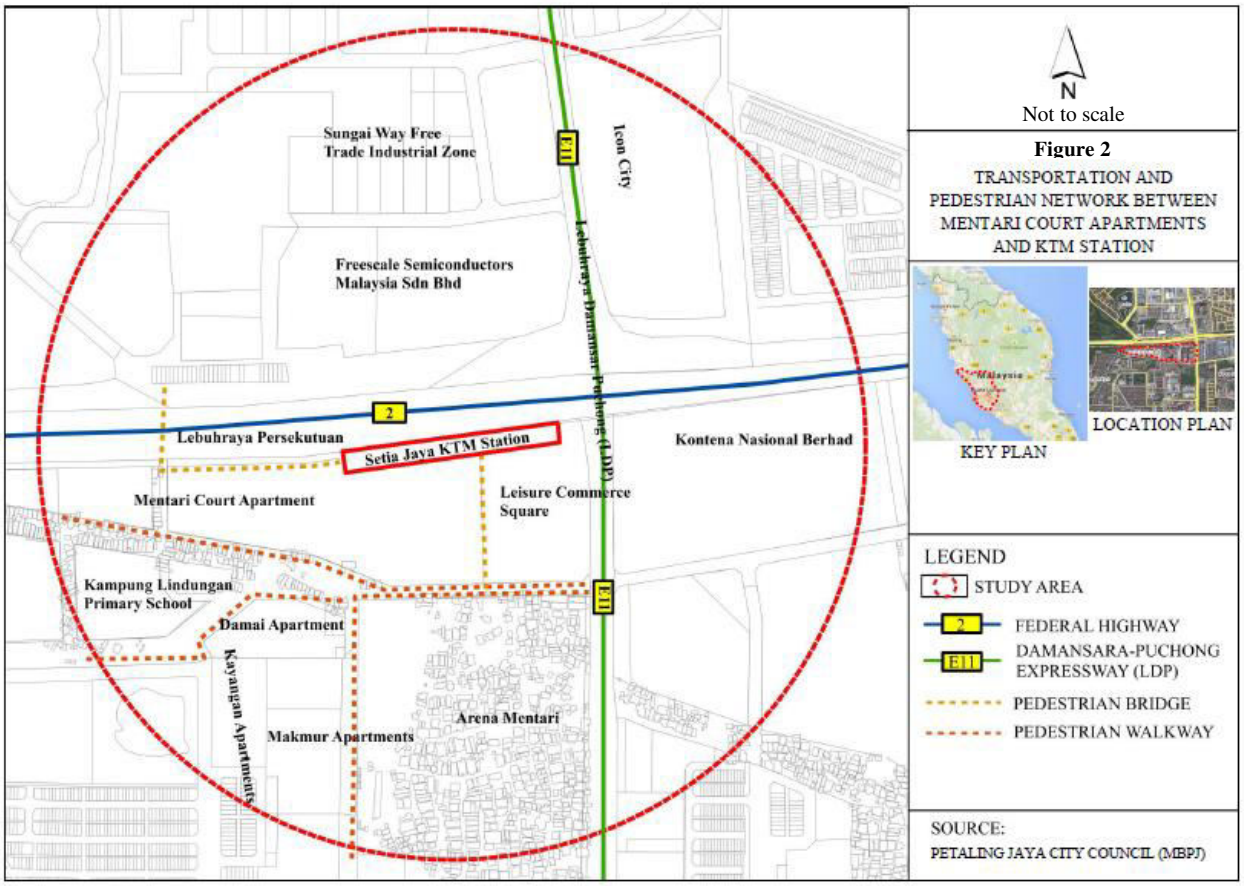


Figure 1
SITE PLAN OF MENTARI COURT APARTMENTS



Questionnaire survey and sampling of respondents

A total of 99 respondents were selected in the study area by using simple random sampling method. The sample size was identified with a confidence level of 90%. All the respondents are Malaysian.

Table 1. Background of respondents

Variables	Percentage (%)
Gender	
Male	46.5
Female	53.5
Age	
21-25 years old	21.2
26-30 years old	49.4
31-35 years old	16.1
36-40 years old	7.0
41-45 years old	1.0
46-50 years old	1.0
> 50 years old	1.0
Employment	
Employed	64.6
Self-employed	5.1
Student	15.2
Retired	1.0
Housewife / carrying for family	14.1
Unemployed	0.0

The samples cover residents both male and female, different age groups, and different types of employments in the study area. However, the sampling only covers adult who are 21 years old and above. The major questions in the questionnaire cover the following aspects:

a) Mode of transportation for daily working trip
b) Mode of transportation for leisure (weekends) trip
c) Frequency in using public transport
d) Reasons for using public transport
e) Reasons for not using public transport

Method of analysis

The data were analysed using Frequency and Cross-tabulation tests as available in Statistical Package for Social Science (SPSS) software. The purpose of the analysis is to examine the choice of transportation mode by residents in the TOD area. Factors that encourage and discourage people to ride on public transport in the TOD area were analysed.

The results and findings

Mode of transportation for daily working trip and leisure trip

Based on the study, there was only 30% of the respondents in the study area (a TOD site) used private vehicle or car pool for their daily working trip (Table 2). Majority of the respondents walked to their work places (46%). Meanwhile, there were around 10% of respondents who used train (KTM commuter) service for their daily working trip. It is in line with the target of TOD development concept that encourages residents to walk and use public transport for their daily trip.

Table 2. Mode of transportation for daily working trip

Mode	Number of respondents	Percentage (%)
Own private vehicle	29	29.3
Car pool	1	1.0
KTM Commuter / Train	9	**9.1**
Bus	0	**0.0**
Cycling	0	**0.0**
Walking	45	**45.5**
No working trip	15	15.2
Total	99	100.0

Table 3. Mode of transportation for leisure (weekend) trip

Mode	Number of respondents	Percentage (%)
Own private vehicle	40	40.4
Car pool	2	2.0
KTM Commuter / Train	56	**56.6**
Bus	1	**1.0**
Cycling	0	0.0
Walking	0	0.0
No working trip	0	0.0
Total	99	100.0

For the purpose of leisure trip (weekends), majority of respondents (58%) used public transportation services (KTM Commuter, 56.6% and bus, 1.0%) (Table 3). There were only 40% of respondents who used the private vehicle for the leisure trip. It is shown that, a study area with TOD characteristics has successfully encouraged residents to use public transport.

Choices of public transportation

In general, 40% of the respondents did not use the public transportation (Table 4). However, majority of them (45%) used the public transportation only once per week. It is because larger percentage of respondents walked to their work place for daily working trips and used the private vehicle for their leisure trips.

Table 4. Riding public transportation by frequency

Day per week	Number of respondents	Percentage (%)
1	44	**44.4**
2	7	7.1
3	0	0.0
4	0	0.0
5	7	7.1
6	1	1.0
7	0	0.0
Do not use	40	**40.4**
Total	99	100.0

Factors for using and not using public transportation

From the study, it is found that residents were using public transportation services due to the following factors (Table 5 & 6):

a. High frequency of public transportation (train and bus)
b. Reasonable duration of ride
c. Well connected with other public transport systems
d. Good drop off area
e. Feeling comfortable with the public transportation services
f. Within walking distance to public transport station
g. Convenient to walk/cycle to/from public transport station

Table 5. Reasons for choosing public transportation for daily working trip

Opinion of the respondents	Daily working trip		Total
	Agree	Disagree	
Time duration did not takes too long	9	0	9
The train/bus service quit frequent	7	2	9
Ease of passenger drop-off near train station/bus stop	7	2	9
Well connected with other public transport	8	1	9
Seat availability in the train	0	9	9
Train/bus journey is comfort (smoothness of ride)	7	2	9
Close to your apartment within walking/cycling distance	9	0	9
Convenient by walking/cycling between apartment & train station/bus stop	9	0	9

From the aspect of walkability (Table 7), the study area is located within 15 minutes walking distance from public transport station (KTM Commuter and bus) based on the feedback from respondents. It is in line with the idea of TOD that walkable distance between public transportation and houses is within 15 minutes.

Table 6. Reasons for choosing public transportation for leisure trip

Opinion of the respondents	Leisure trip		Total
	Agree	Disagree	
Time duration did not takes too long	47	10	57
The train/bus service quit frequent	54	3	57
Ease of passenger drop-off near train station/bus stop	57	0	57
Well connected with other public transport	55	2	57
Seat availability in the train	8	49	57
Train/bus journey is comfort (smoothness of ride)	49	8	57
Close to your apartment within walking/cycling distance	57	0	57
Convenient by walking/cycling between apartment & train station/bus stop	57	0	57

Table 7. Time duration to the public transportation station from houses

Duration	Mode of transportation (go to station)					Total
	Vehicle (as driver)	Vehicle (as passenger)	Walked only	Cycling	Motorcycling	
< 5 minutes	1	-	-	-	-	1
5 – 10 minutes	-	-	57	-	-	57
10 – 15 minutes	-	-	10	-	-	10
> 15 minutes	-	-	-	-	-	-
Not sure	18	13	-	-	-	31
Total	19	13	67	-	-	99

On the other hand, some of the respondents were not choosing public transportation services due to the following factors (Table 8 & 9):

a. Public transportation not servicing their destination
b. Long journey (duration)
c. Less/not punctual
d. Less frequent of service
e. Fear of crime
f. Not enough seat on bus/train
g. Very inconvenient of the public transportation services including the connectivity by walking/cycling
h. No bicycle parking

Even though "not enough seat on bus/train" has been chosen as one of the discouraging factors for respondents to choose public transport (Table 8 & 9), that factor actually was not among the factors chosen for factors that affect respondents to choose public transport (Table 5 & 6). Thus, it is an unclear factor of encouraging/discouraging respondents to use public transport.

From the analysis of factors/reasons of respondents in choosing to use/not using public transport services, it is found out that a TOD development is going to encourage residents to walk but not really in encouraging the ridership of public transportation. It is because, the elements of connectivity to destination within reasonable duration of trip, connected through pedestrian/cycling pathways, availability of parking spaces (including bicycle), safety, as well as punctuality and high frequency of public transport

services are the major factors that encourage people to ride on public transport. As discussed by Dahalan et al. (2015), public transport services are always disturbed by technical incidents due to misconduct by the transport operator.

As refer to the findings on respondents' satisfaction on the aspects/factors of connectivity between study area and public transportation station (Table 10), majority of respondents were moderately satisfied with all the aspects (average mean > 3). The only weak aspect is the safety concern on the night walk/cycling (average mean = 2.84). Photo 1 shows the pedestrian facilities in the study area. The existence of foreign immigrants in the study area might raise the issue of security (Photo 2).

Table 8. Reasons for not choosing public transportation for daily working trip

Opinion of the respondents	Daily working trip		Total
	Agree	Disagree	
KTM commuter does not serve my destination	29	1	30
Bus does not serve my destination	29	1	30
Transit/bus takes too long	30	0	30
Transit/but does not run punctually	30	0	30
Transit/but service is less frequent	16	14	30
Fear of crime, going or from the transit stop	24	6	30
Cost is too high	0	30	30
Need to carry things	9	21	30
Not enough seat	30	0	30
Very inconvenient and tired	36	0	30
Distance between apartment and station is too far	5	25	30
No parking for bicycle	30	0	30
Not convenient to walk/cycling to the station	29	1	30

Table 9. Reasons for not choosing public transportation for leisure trip

Opinion of the respondents	Leisure trip		Total
	Agree	Disagree	
KTM commuter does not serve my destination	36	6	42
Bus does not serve my destination	34	8	42
Transit/bus takes too long	41	1	42
Transit/but does not run punctually	42	0	42
Transit/but service is less frequent	32	10	42
Fear of crime, going or from the transit stop	34	8	42
Cost is too high	0	42	42
Need to carry things	29	13	42
Not enough seat	42	0	42
Very inconvenient and tired	42	0	42
Distance between apartment and station is too far	7	35	42
No parking for bicycle	38	4	42
Not convenient to walk/cycling to the station	40	2	42

Table 10. Satisfaction of respondents on public transportation and study area

Perception on transportation	Average (mean)	Scale
Feel safe when walking / cycling around the area at daytime	3.34	Moderate
Feel safe when walking / cycling around the area at night	2.84	Moderate
Quality of pedestrian walkway	3.07	Moderate
Easily to walk/cycling to the public transport station from the apartment	3.51	Moderate
The distance between commuter station & apartment	3.85	Satisfied
The distance between bus stop and apartment	3.77	Satisfied

Note: 1 = Highly unsatisfied; 5 = highly satisfied

Photo 1. *Pedestrian overhead bridge and roadside walkway at the study area*

Photo 2. *Existence of foreign immigrants might raise the issue of security*

Summary and concluding remarks

To conclude, this research found out that most of the respondents chose public transport for leisure trip only, and not for the daily working trip. For the daily working trip, most of the respondents chose to walk. It shows that the study area is a TOD development area that is walkable to employment area and centred by a transit stop (*e.g.* KTM commuter station). However, the incomplete coverage of public transport network (less connected to employment areas), poor connectivity and service, long journey, and fear of crime has discouraged some of the respondents to use public transport. The major reasons of not using public transport in the study area are the security issue, especially walking/cycling at the night.

In line with the origin idea of TOD, concept of TOD should be implemented in a regional level, instead of local level only. All the major development areas should be connected by public transport service and developed with TOD principles. With the improvement of the coverage of public transport network, the ridership might be further increased.

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