Internal Assessment

Geography – Standard Level

May 2019

Topics	Tourism, leisure, and sports Urban development Sustainable urban development
Research question	**How sustainable is the growth of tourist areas around Orchard Road, with an increase in physical infrastructure and tourist influx?**
Syllabus connection and units	- **Option E: Leisure, tourism and sport:** Unit 4: Managing tourism and sport for the future - **Option G: Urban environments:** Unit 3: Urban environmental and social stresses
Area of investigation	Sustainable tourism
Theoretical context	The main topics of study are tourism and the effects on urban environments, which are in **Option E: Leisure, tourism and sport**, and **Option G: Urban environments** from the syllabus. The subtopics of Managing tourism and sport for the future and Urban environmental and social stresses will be studied.
Theories	- Sustainable tourism - Over-consumption - Carrying capacity - Urban heat island
What to investigate	- Energy consumption - Air temperature of tourist areas - Area of forested land - Number of buildings

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Acronyms

1. HIC – High Income Country
2. UHI – Urban Heat island
3. CBD – Central Business District

Acknowledgements

1. My geography teacher, for guiding me at every step of the investigation.
2. My fellow geography students, for making the investigation and data collection process enjoyable.

Criterion A: Fieldwork Question and Geographic Context

Fieldwork question

How sustainable is the growth of tourist areas around Orchard Road, with an increase in physical infrastructure and tourist influx?

Geographic context

Singapore is a small island in Southwest Asia, at the southern tip of Malaysia. It is an HIC as it has experiences a rapid growth of GDP from $2.98 billion in 1965 to $300 billion in 2014[1]. The employment structure has dramatically changed, with a shift from agriculture to tertiary industry, one of the most important being tourism, which earned $26.8 billion in 2018[2], and transformed Singapore into a UHI. Therefore, the sustainability must be investigated, through a study of the carrying capacity.

[1] *The Singapore Economy: Then and Now*. (2014). Retrieved from The Straits Times: https://www.straitstimes.com/sites/default/files/attachments/2015/08/09/st_20150809_4thennow09_1586110.pdf

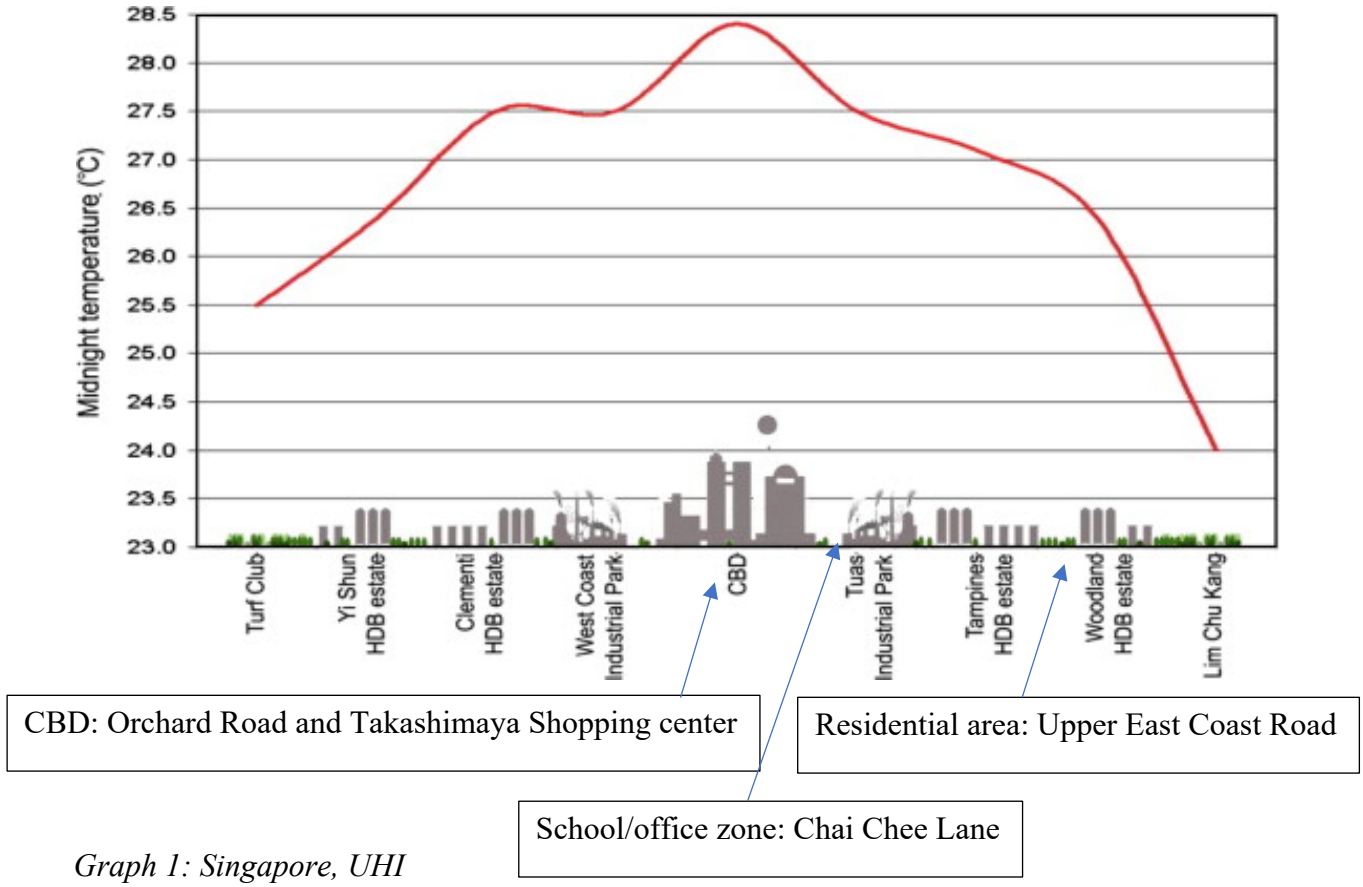
[2] Singapore Tourism Board (STB), 2018

Map 1: World map, with Singapore

Map 2: Orchard Road, Singapore's CBD (Sites 1 and 2: Takashimaya shopping center and Wheelock Place)

Map 3: Upper East Coast Road (Site 3)

Map 4: Chai-Chee Lane (Site 4)



Graph 1: Singapore, UHI

In the three sustainability circles model (*Figure 1: Three overlapping circles sustainability model*), the differences in sizes of circles show that certain aspects are paid more attention to. In most cases, it is economy, followed by society, resulting in the environment circle being small.

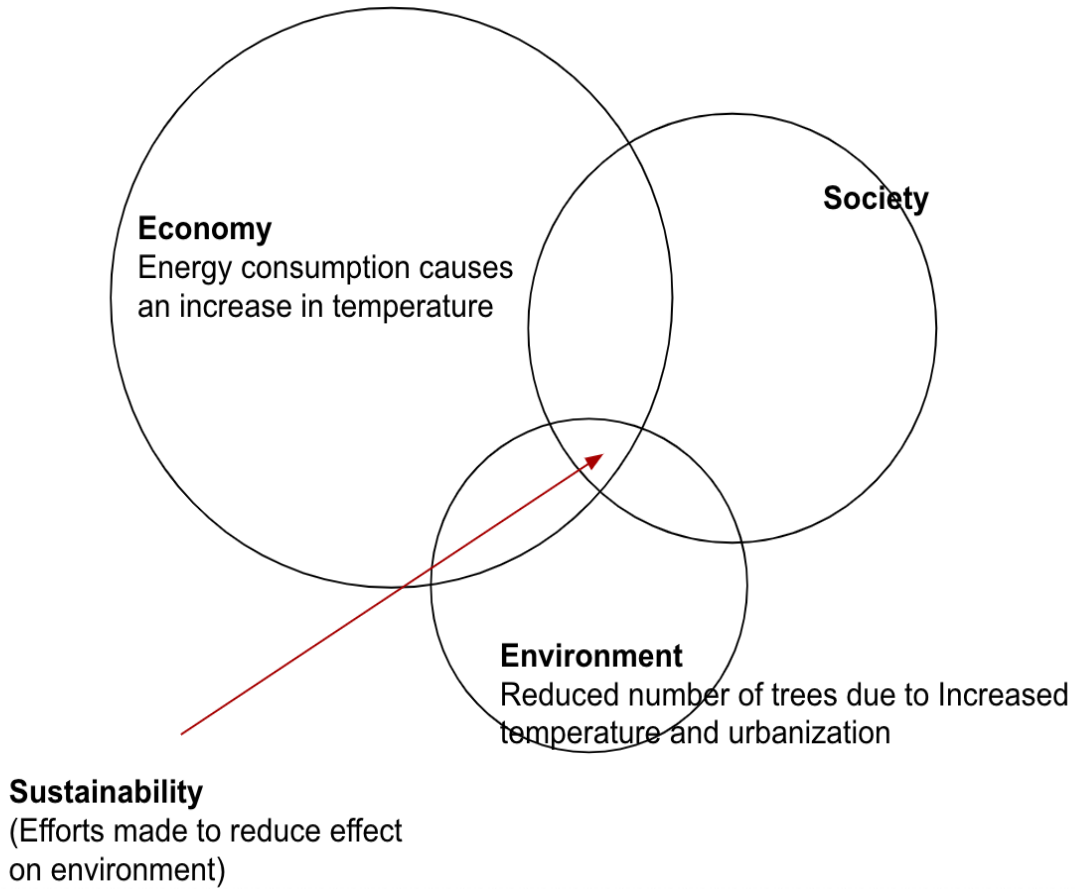


Figure 1: Three overlapping circles sustainability model

Criterion B: Methods of investigation

Data to collect and justification

Various **fieldwork** skills were used in the data collection. The air temperature at different locations will be collected in order to investigate the first hypothesis. This will be done using alcohol thermometers[3]. The air temperatures of tourist and non-tourist locations, can be linked to the energy consumption, as a higher energy consumption leads to an increase in temperature. Zones can also have higher temperatures if they have more tall buildings.

A **traffic survey** will also be taken at intervals of 15 minutes, over a period of 10 days at the same time and place. A higher amount of automobiles will state that there is more crowding,

[3] Thermometers will be placed in Sites 1, 2, 3, and 4

energy consumption, and a higher temperature. This can be linked to an influx in tourists, and is relevant to the second hypothesis.

Information on temperature changes over time from the locals was also collected through **questionnaires**; this is a **public opinion poll**. Through **random sampling**, I will gain insights on people's opinions on the sustainability and growth in the infrastructure, giving a perceptive picture. This is relevant to both hypotheses.

Additionally, the number of and height of high-rise buildings in a 200-meter radius in all sites in the area was counted using maps, through a **survey**. This was also done for both hypotheses. This data can be connected to the air temperature. A higher number of buildings and the higher their height, corresponds to higher temperatures in the area due to higher energy consumptions.

A **pedestrian count** was also taken by counting the number of people passing a point for 15 minutes over a period of 10 days. This is for the first hypothesis. If we find that more people are in the tourist areas, we can conclude that there are more attractions in that area. We will also distinguish whether the pedestrians are tourists or locals.

This data will be the best possible data as it will encompass all variables in the hypotheses[4].

How the data is authentic, significant, and relevant

This data will be authentic as it provides us information on the level of tourism and different factors showing the sustainability of an area. This will help in concluding the sustainability of Orchard Road with the increase in tourists over the past few years. We will also be able to compare the sustainability of Orchard Road, a touristic area, to that of residential areas.

Data collection zones

Four sites were selected, two tourist, two non-tourist areas:

1. **Takashimaya shopping center**[5], a tourist location with a shopping center. It is busy the entire day.

[4] See Hypothesis and Justification
[5] Map 5: Takashimaya shopping center

2. **Wheelock Place**[6], a shopping center, popular for tourists and locals as it is 2 km away from the Orchard MRT station.
3. **Upper East Coast Road**[7], a residential zone with three high-rise condominiums and landed properties.
4. **Chai-Chee Lane**[8], a school and office zone. It is busy at peak hours.

Criterion C: Quality and treatment of information collected

Theoretical context

The main topics of study are tourism and its effects on urban environments, which are in **Option E: Leisure, Tourism and Sport**, and **Option G: Urban Environments** from the syllabus. The subtopics of Managing tourism and sport for the future and Urban environmental and social stresses will be studied.

Aim and objective

This investigation aims to research, with the help of theories of UHI, sustainable tourism, over-consumption, and carrying capacity, whether the rise in temperature and energy consumption are sustainable. The instigation will done by comparing tourist and non-tourist zones, and by looking trends in historical data of tourist arrivals and temperatures.

Hypothesis and Justification

1. **There has been an increase in the range of temperature with more tourists visiting every year and more buildings**: The temperature will rise not only because of an influx of tourists, but also because more structures are being built.
2. **There are proper provisions such as enforcement, regulations, sustainable consumption practices, for maintaining the sustainability of this area, even though**

[6] Map 6: Wheelock Place
[7] Map 7: Upper-East Coast Zone
[8] Map 8: Chai-Chee Lane

the tourist influx and number of buildings have increased: The Singapore Government makes efforts to make tourism a sustainable industry.

Worthy of investigation

This investigation aims to research on tourism and its positive and negative impacts. The results for the investigation in Singapore can be generalized and applied to other HICs. I have also studied tourism in my geography classes, and a question on whether these concepts have a practical applicability came to my mind.

Graphical techniques

In order to visually present results, I will make use of various graphical techniques. For most results, **bar graphs** are suitable. For a yes/no survey, **a pie chart** is more suitable. In order to show trends in temperature and tourist arrivals, **line graphs** will be used. **Maps** of all four sites will be hand-drawn to count the number of buildings[9].

[9] See Number of buildings

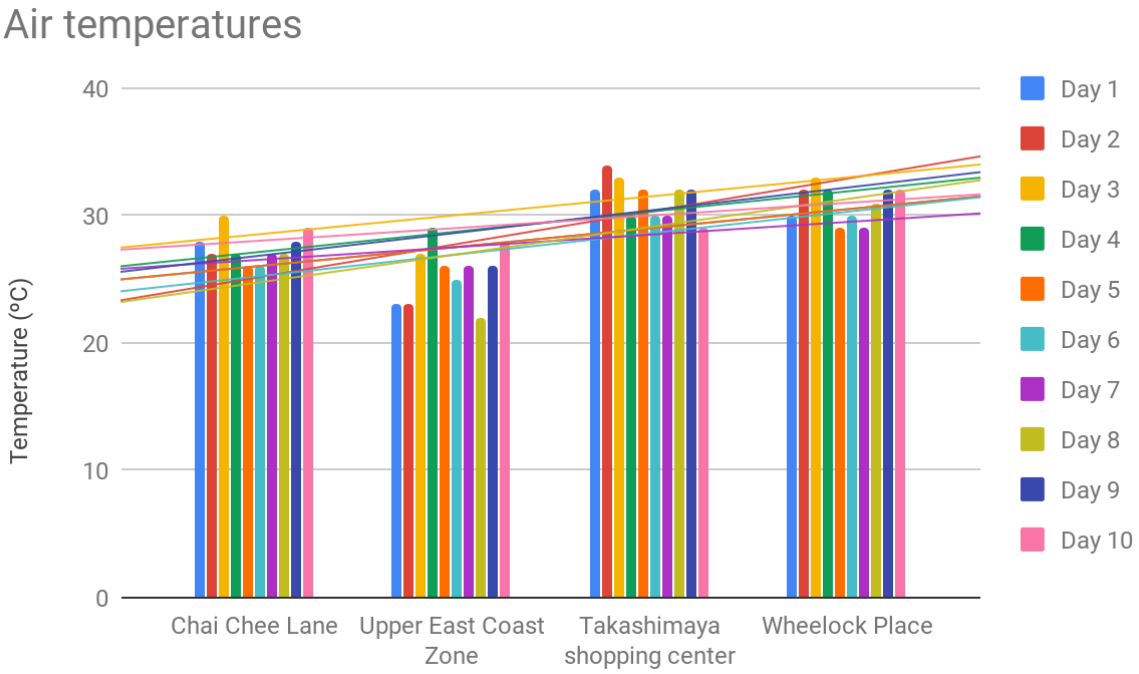
Criterion D: Written analysis

All data was collected over a period of 10 days, weekends and weekdays, from the 10th to the 19th of October 2018.

Temperature

	Chai Chee Lane	Upper East Coast Zone	Takashimaya shopping center	Wheelock Place
Day 1	28	23	32	30
Day 2	27	23	34	32
Day 3	30	27	33	33
Day 4	27	29	30	32
Day 5	26	26	32	29
Day 6	26	25	30	30
Day 7	27	26	30	29
Day 8	27	22	32	31
Day 9	28	26	32	32
Day 10	29	28	29	32
Average	27.5	25.5	31.4	31

Table 1: Air temperature



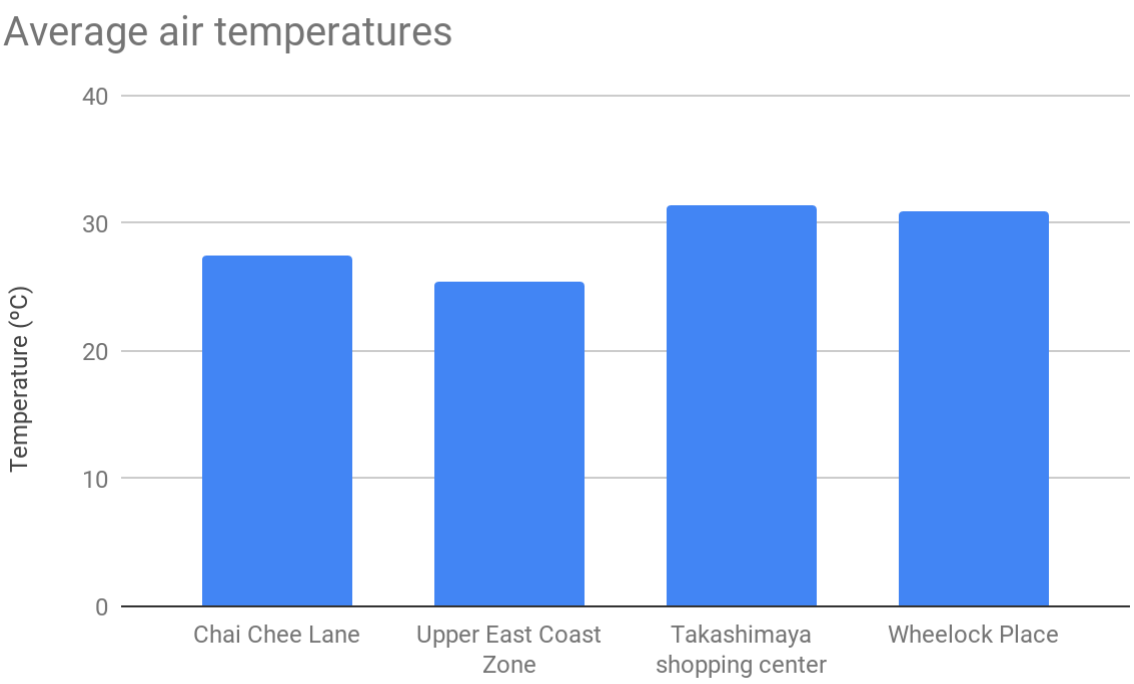
Graph 2: Air temperatures

As seen the graphs (*Graph 2: Air temperatures, Graph 3: Average air temperatures*), the temperatures are higher in the tourist zones, in general.

The average temperatures were calculated for the graph (Graph 3: Average air temperatures). For example, for Chai-Chee Lane, the following calculations were made:

$$\text{average temperature} = \frac{\text{sum of all temperatures for the 10 days}}{10}$$

$$= \frac{28 + 27 + 30 + 27 + 26 + 27 + 28 + 29}{10} = 27.5ºC$$



Graph 3: Average air temperatures

Chai-Chee Lane and Upper East Coast zone both had relatively low average temperatures of 27.5 and 25.5ºC, while the tourist zones, Takashimaya shopping center and Wheelock Place had higher average temperatures of 31.4 and 31.0ºC. It is highly possible that Chai Chee Lane's average temperature was 2ºC more than Upper East Coast's because of the time of the day: The peak hours of Singapore at 4:00 PM. Chai-Chee Lane, a school zone, had school buses along the roads at the time. The emission of these buses plays a role in increasing the overall temperature of the area.

The two tourist zones had higher average temperatures than the non-tourist zones, as number of vehicles was considerably higher, as seen by the automobile count[10]. Furthermore, the tourist zones had more than two lanes on the main road, allowing more automobiles to be present a particular time. There were also a significantly higher number of coaches and taxis in these tourism zones, further raising temperatures.

[10] Graph 4: Average automobile count

This data is collected to provide information on **Hypothesis 1**, as it shows us the difference in temperatures between tourist and non-tourist locations. So, we can see how much above the normal level the temperatures in tourist locations are.

Automobile count

	Chai Chee Lane		**Upper East Coast zone**		**Takashimaya shopping center**		**Wheelock Place**	
	L	R	L	R	L	R	L	R
Day 1	159	126	114	143	429	418	391	385
Day 2	146	117	120	139	415	426	379	371
Day 3	151	121	126	130	419	421	388	385
Day 4	158	129	149	138	436	424	403	409
Day 5	145	125	142	164	441	433	394	392
Day 6	146	119	115	131	437	447	381	396
Day 7	152	132	122	149	421	431	375	370
Day 8	139	126	124	138	417	426	379	362
Day 9	147	127	141	123	428	412	385	371
Day 10	142	114	134	139	423	413	393	402
Average	148.5	123.6	128.7	139.4	426.6	425.1	386.8	384.3
Average	136.05		134.05		425.85		385.55	

Table 2: Automobile count[11]

The data in the table (*Table 2: Automobile count*) and graph (*Graph 4: Average automobile count*) comprises of the average of the number of automobiles on the left and right lanes counted and averaged over the 10 days.

Certain calculations were made to obtain the averages. For example, for Chai-Chee Lane, the following calculations were made:

$$\text{average on the left} = \frac{\text{sum of all automobiles on the left}}{10}$$

[11] **L** stands for left and **R** stands for right

$$= \frac{159 + 146 + 151 + 158 + 145 + 146 + 152 + 139 + 147 + 142}{10}$$

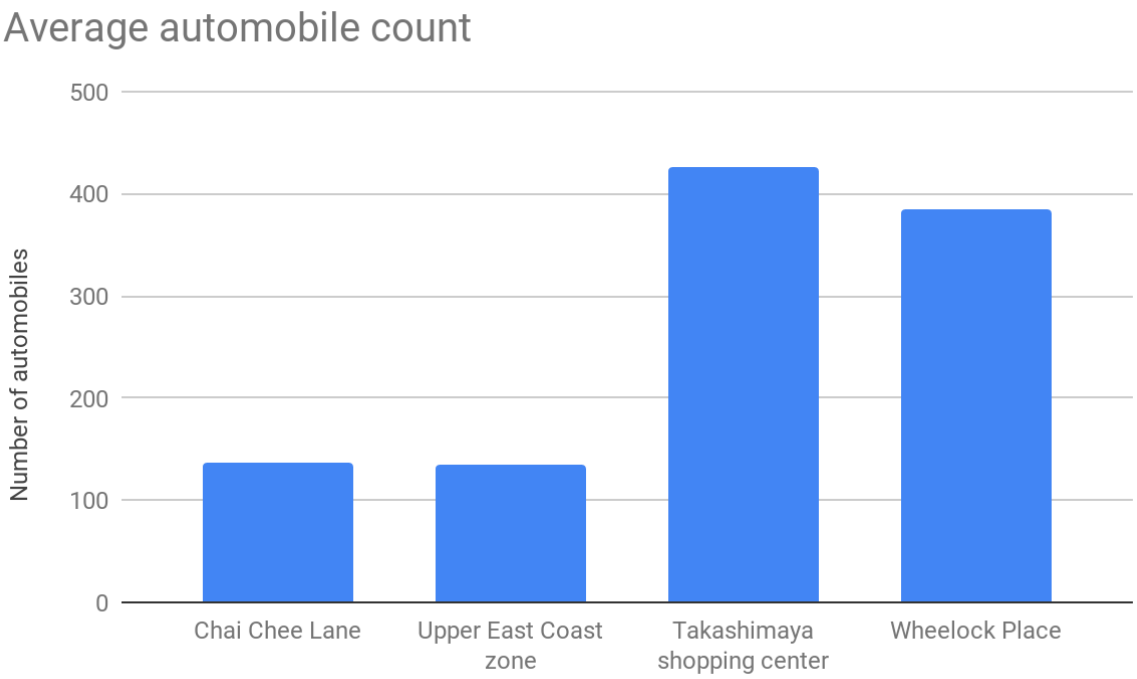
$$= 148.5 \text{ automobiles/day}$$

$$\text{average on the right} = \frac{\text{sum of all automobiles on the right}}{10}$$

$$= \frac{126 + 117 + 121 + 129 + 125 + 119 + 132 + 126 + 127 + 114}{10}$$

$$= 123.6 \text{ automobiles/day}$$

$$\text{average on both sides} = \frac{148.5 + 123.6}{2} = 136.05 \text{ automobiles/day}$$



Graph 4: Average automobile count

The above chart shows that the two tourist locations, the Takashimaya Mall entrance and Wheelock Place, have the highest automobile count. They have almost triple the count of the non-tourist areas.

Majority of the vehicles in Chai Chee lane and the Upper-East Coast zone are either cars or taxis, or school buses in the case of Chai-Chee lane. However, in the tourist zones, there will likely be tourist vehicles, such as tourist coaches. The automobile count for the Takashimaya shopping center was significantly higher than that of Wheelock Place. This could be related to the presence of the large parking lot in Takashimaya Mall, which is used by locals.

This data is useful in testing **Hypotheses 1**, as automobiles lead to an increase in temperature through energy consumption, which causes greenhouse gas emission.

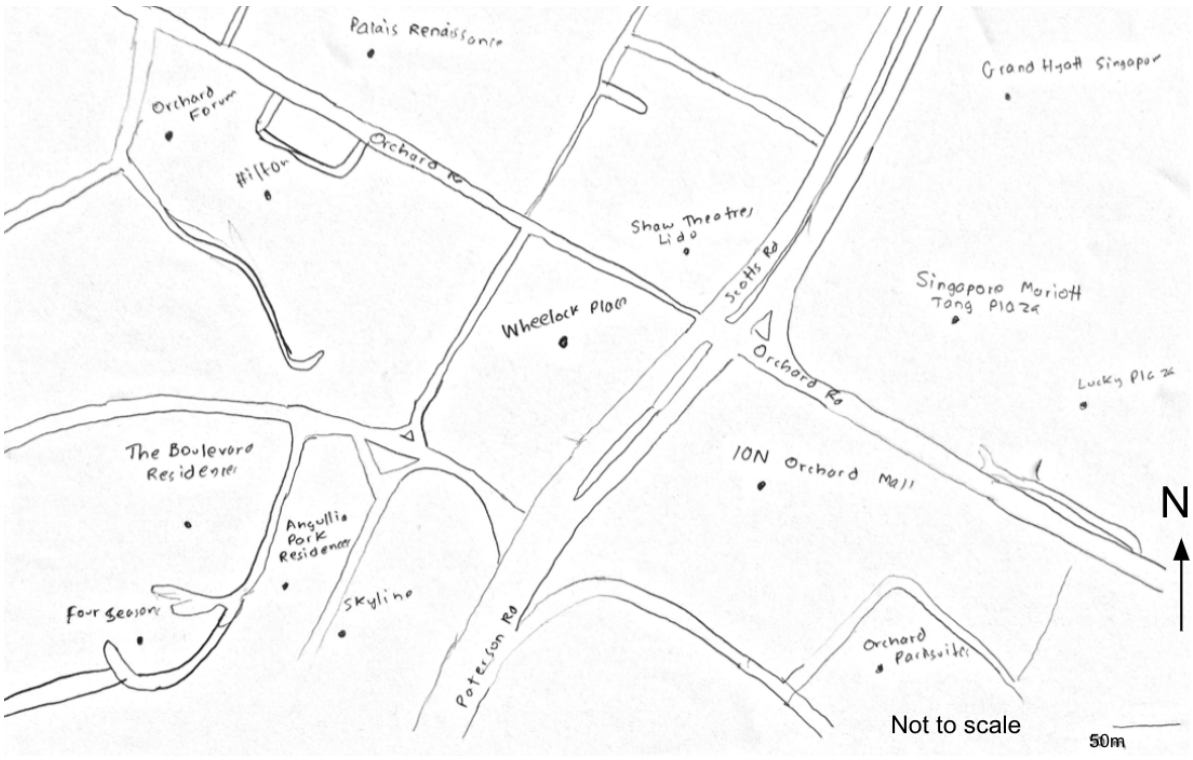
Number of buildings

	Chai Chee Lane	Upper East Coast Zone	Takashimaya shopping center	Wheelock Place
Buildings and stores	10	9	12	14
Bus stops	2	2	4	6

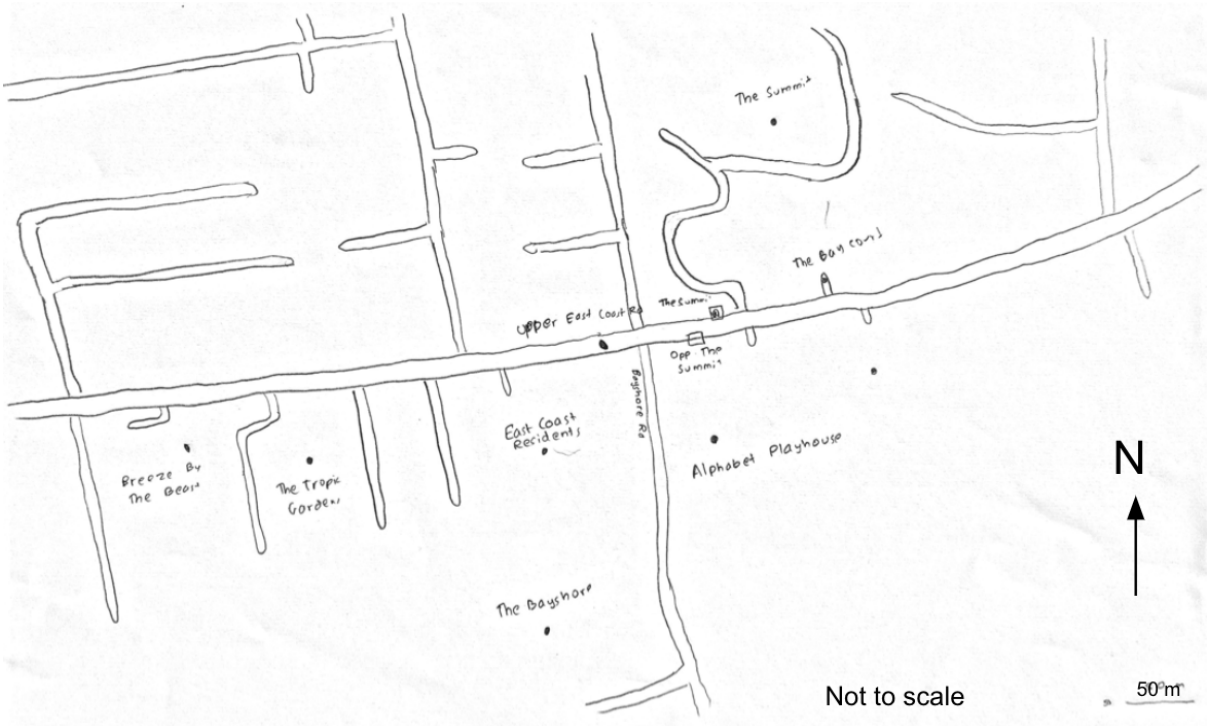
Table 3: Number of buildings

For this task, I drew maps of each area with the help of online resources:

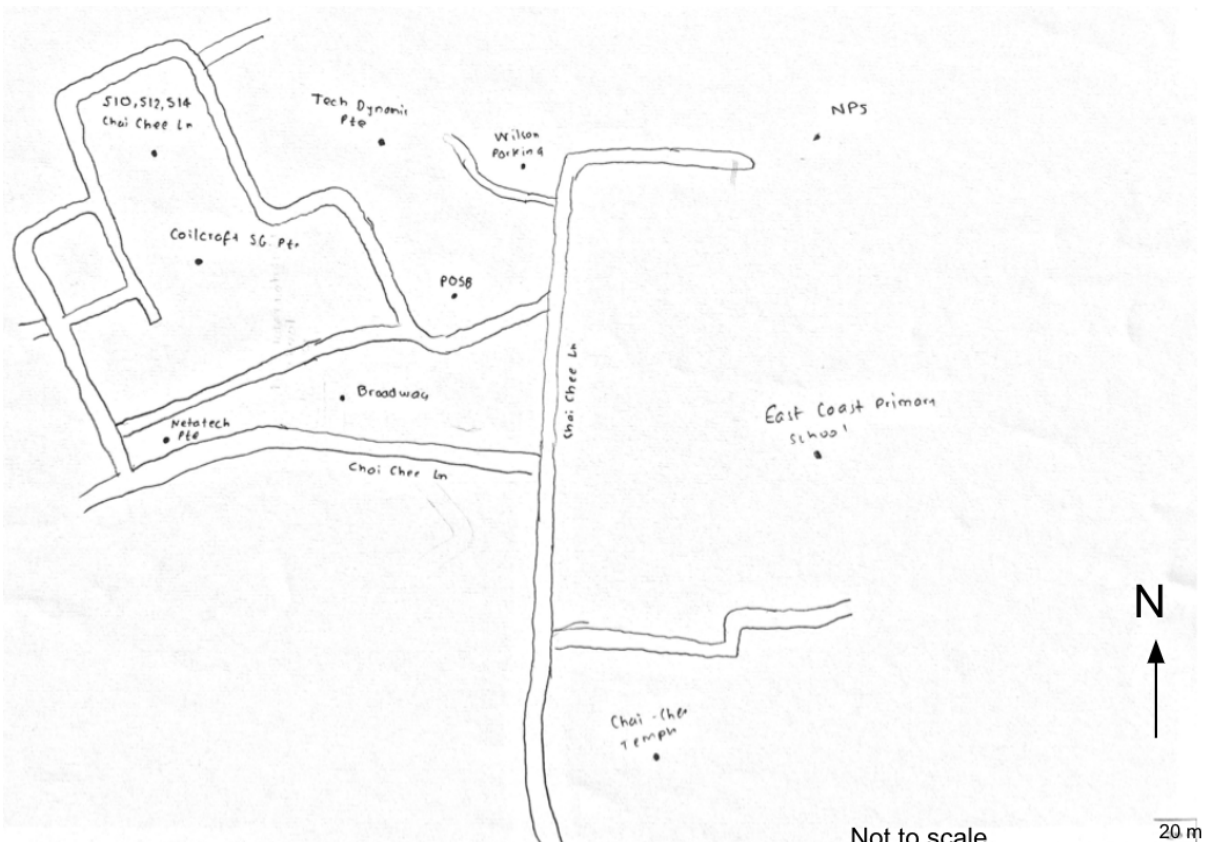
Map 5: Takashimaya shopping center



Map 6: Wheelock Place



Map 7: Upper-East Coast Zone



Map 8: Chai-Chee Lane

A radius of 200 meters was taken from the center, and the number of buildings in the area were counted[12].

As seen, the tourist zones have a much higher number of buildings in the 500 meter radius. This can be related to the higher temperatures: a higher number of buildings increase the local temperatures[13]. For this reason, Singapore is a UHI. There is a high demanding of cooler temperatures is these buildings, and the use of air conditioning increases external temperatures.

[12] Table 3: Number of buildings
[13] Walker, A. (6 September, 2014). *Why Tall Buildings Make Cities Hotter*. Retrieved from Gizmodo: https://gizmodo.com/why-tall-buildings-make-cities-hotter-1588242736

According to an Eco-Business regional survey in Singapore, 68% stated that public places such as shopping malls and cinemas were excessively cooled with the air conditioners[14]. Relating this to the higher number and height of buildings in the tourism zones of Takashimaya and Wheelock place, we can say that this has increased the temperature.

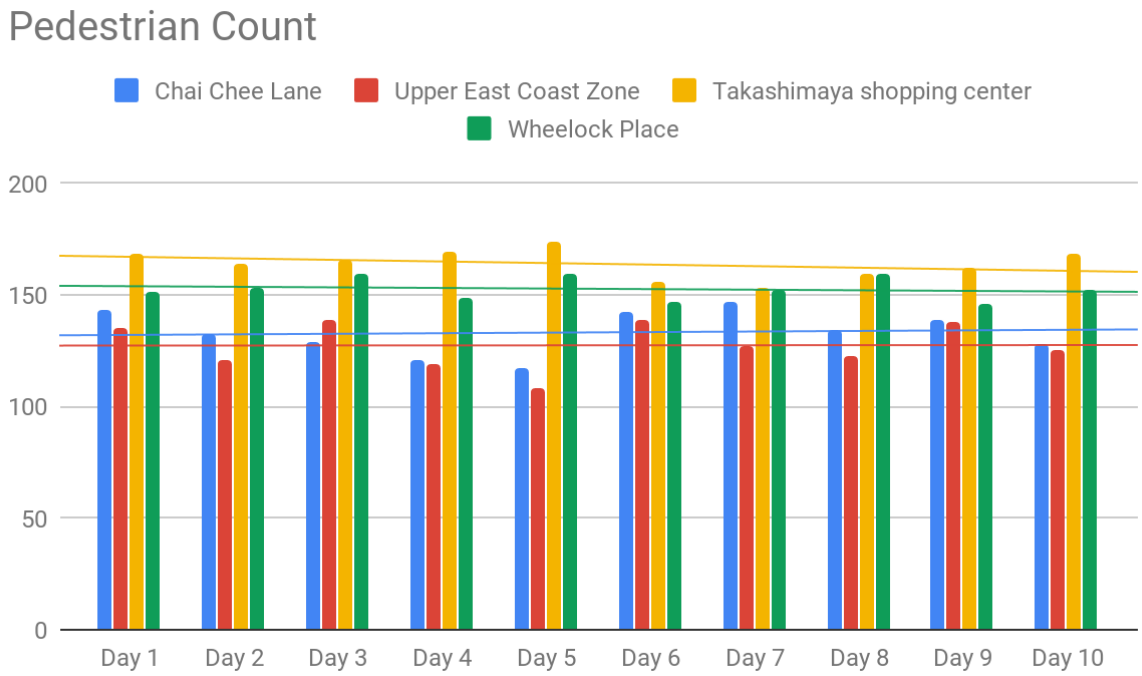
Pedestrian count

I spent 15 minutes per trial in counting the pedestrians at each zone.

	Chai Chee Lane	**Upper East Coast Zone**	**Takashimaya shopping center**	**Wheelock Place**
Day 1	143	135	168	151
Day 2	132	121	164	153
Day 3	129	139	166	159
Day 4	121	119	169	149
Day 5	117	108	174	159
Day 6	142	139	156	147
Day 7	147	127	153	152
Day 8	134	123	159	159
Day 9	139	138	162	146
Day 10	128	125	168	152
Average	133.2	127.4	163.9	152.7

Table 4: Pedestrian count

[14] *New property cooling measures announced: Higher ABSD rates, tighter loan limits -loan-limit-10502710.* (17 September, 2018). Retrieved from Channel NewsAsia: https://www.channelnewsasia.com/news/singapore/singapore-property-cooling-measures-higher-absd-rates-loan-limit-10502710

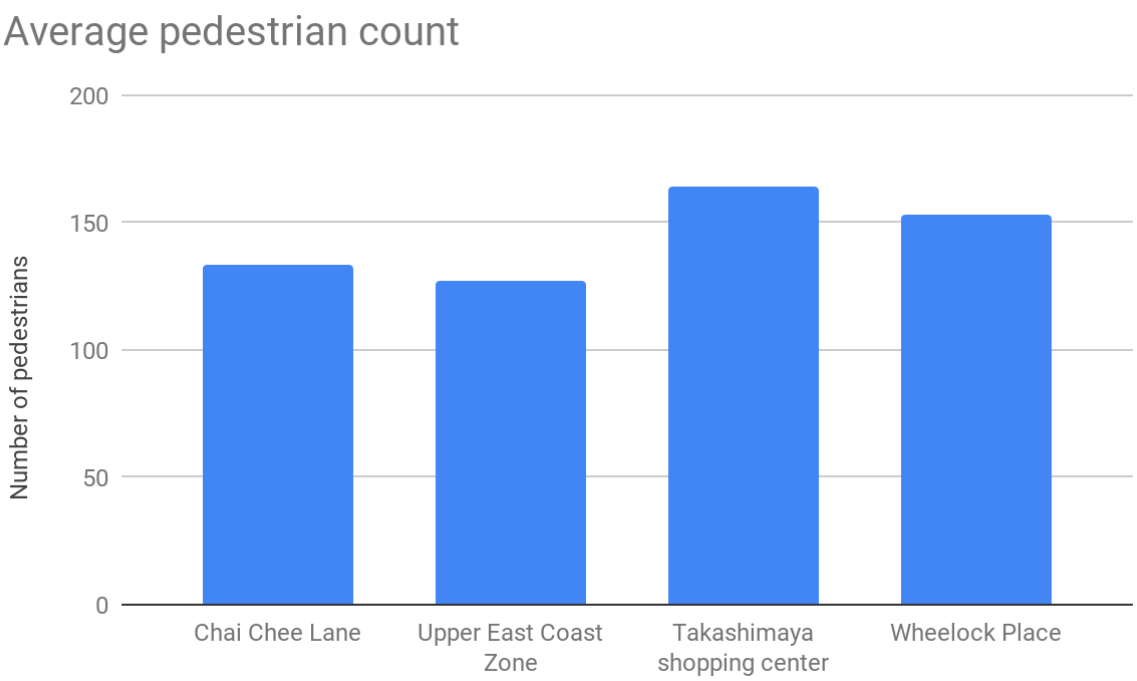


Graph 5: Pedestrian count

The average for leach location was also taken. This was calculated by taking the sum of all counts on separate days, followed by dividing by ten (the number of days). For example, for Chai-Chee Lane, the following calculations were made:

$$\text{average} = \frac{\text{sum of pedestrians on the 10 days}}{10}$$

$$= \frac{143 + 132 + 129 + 121 + 117 + 142 + 134 + 139 + 128}{10} = 133.2 \text{ pedestrians}$$



Graph 6: Average pedestrian count

The graphs (*Graph 5: Pedestrian count* and *Graph 6: Average pedestrian count*) show that the not-tourism zones have a considerably lower average number of pedestrians than the two tourist locations. Chai-Chee lane and the Upper-East Coast zone had averages of 133.2 and 127.4 respectively, which are lower than that of the Takashimaya shopping center and Wheelock Place, 163.9 and 152.7 respectively.

This can be related to the type of activities around the area. The pedestrian count in the tourism locations are higher due to the fact that there are not only locals, but also tourists.

This data on pedestrians will be useful for **Hypothesis 1**. It provides about whether the carrying capacity has been reached. This data goes together with the automobile count[15].

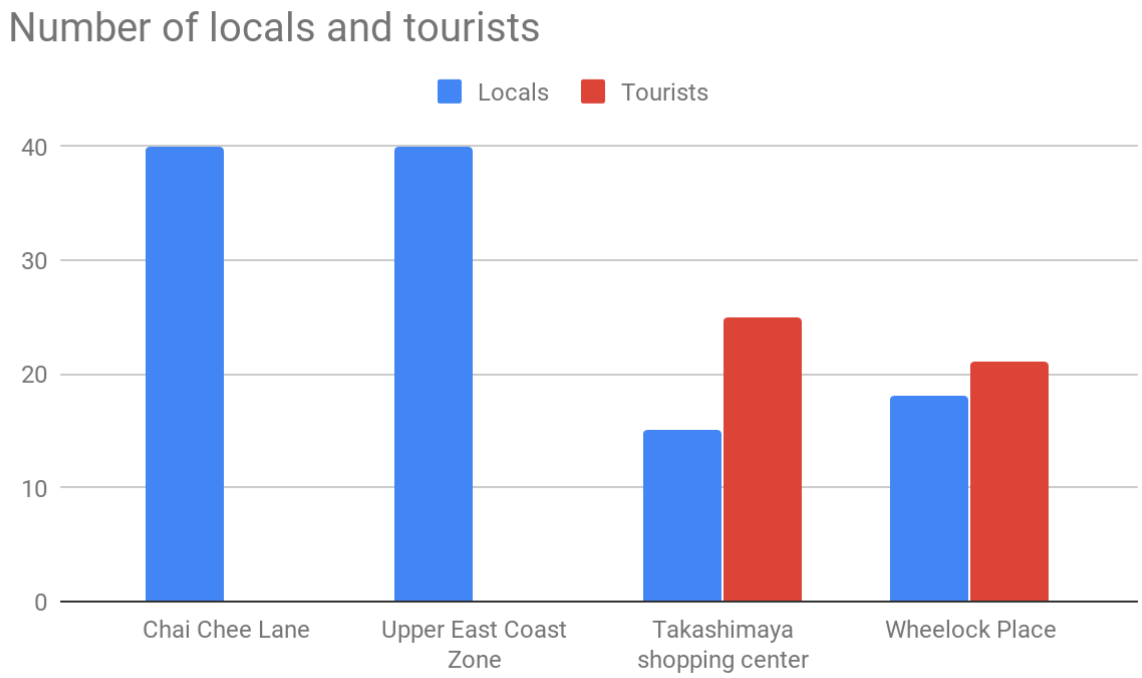
[15] Graph 4: Average automobile count

Survey and Questionnaire

People were asked whether they were locals or tourists. If they were locals living in Singapore for over 4 years, they were asked whether they thought the temperature had increased over the time they have been living in Singapore[16].

	Chai Chee Lane	**Upper East Coast Zone**	**Takashimaya shopping center**	**Wheelock Place**
Locals	40	40	15	18
Tourists	0	0	25	21

Table 5: Number of locals and tourists



Graph 7: Number of locals and tourists

As seen in the graph (*Graph 7: Number of locals and tourists*), out of the 40 people surveyed in the non-tourist zones, all were locals. This is because the Upper-East Coast zone is a residential area and Chai-Chee lane is an office and school zone, so it is unlikely to find tourists there. In the zones on Orchard Road, on the other the tourists outnumbered the locals. Furthermore, the surveys were taken at peak hours, so majority of the employed locals in the country would be commuting.

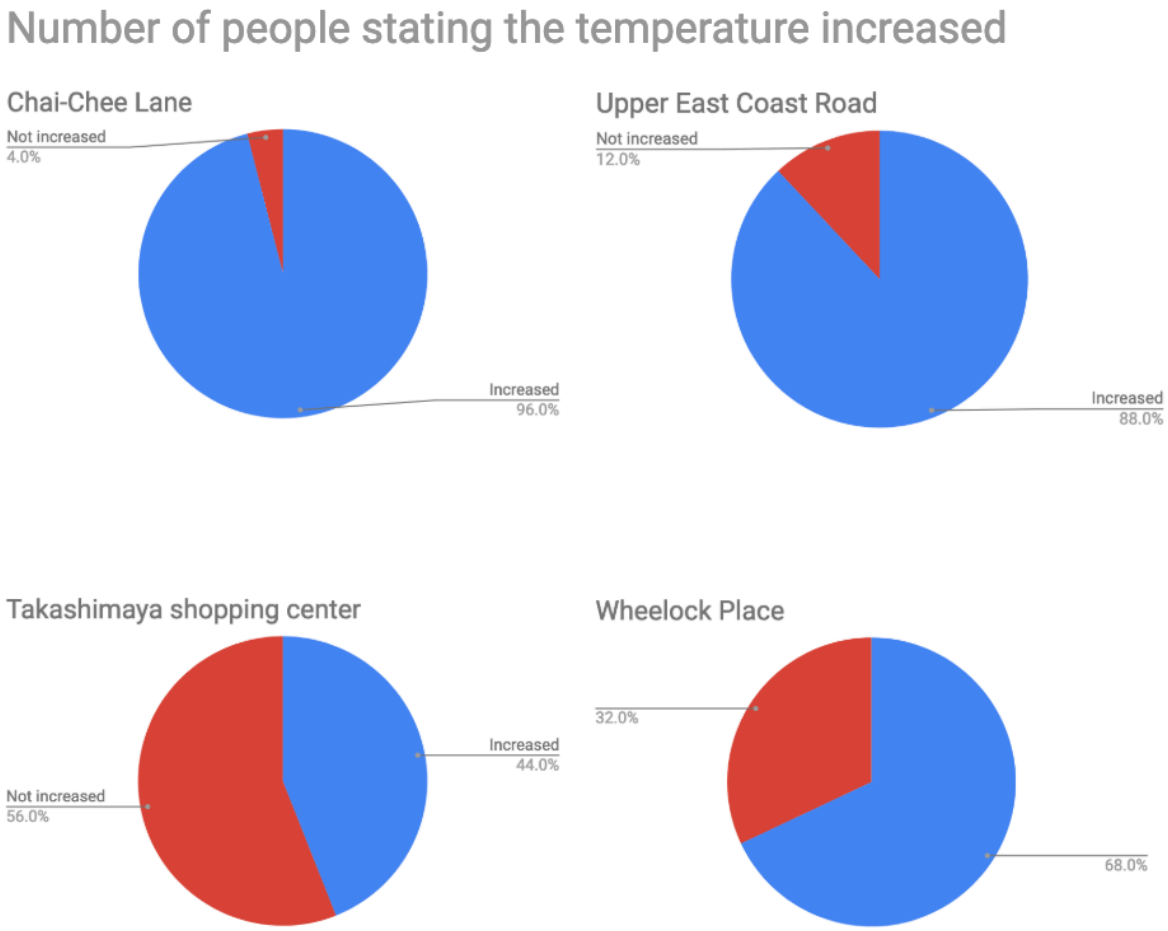
[16] See *Appendix 1: Questionnaire* for the questionnaire

The results for the number of locals who believed that the temperature has increased for the time they have been living in Singapore is shown in *Table 6: Locals and tourists who believed the temperature increased*:

	Chai Chee Lane	**Upper East Coast Zone**	**Takashimaya shopping center**	**Wheelock Place**
Number of people who said "yes" to the Temperature increasing	24	22	11	17

Table 6: Locals and tourists who believed the temperature increased

For this data, we can only rely on the local's input as their input is a better gauge of the change in temperature as they have lived on the island for a longer time. In the non-tourist zones, 100% of the people surveyed were locals, and out of them, 60% and 55% thought that the temperature had increased. While in the tourist zones, only 37.5% and 45% of the people surveyed were tourists, and out of them, 73.3% and 81% though the temperature had increased. This data can be seen in the graph (*Graph 8: Number of people who believed the temperature increased*):



Graph 8: Number of people who believed the temperature increased

The percentage of tourists who thought the temperature had increased in the tourist zones was higher as there were less tourists in total as compared to the non-tourist zones. This data will also be useful for **Hypothesis 1**, as we are obtaining perceptual information from the 25 people questioned.

Tourist arrivals

Data from the Singapore Transport Board provides information on the total tourist arrivals in Singapore every year[17]:

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Tourist arrivals	11638663	13171303	14496091	15567923	15095152	15231469	16403595	17424611	15489632

Table 7: Yearly tourist arrivals

Historical data on Singapore's yearly weather was also found:

Year	**Temperature (ºC)**
1997	28.3
1998	28.3
2002	28.1
2004	27.9
2005	28
2009	27.9
2010	28.1
2014	27.9
2015	28.3
2016	28.4
2017	27.7
2018	26.6

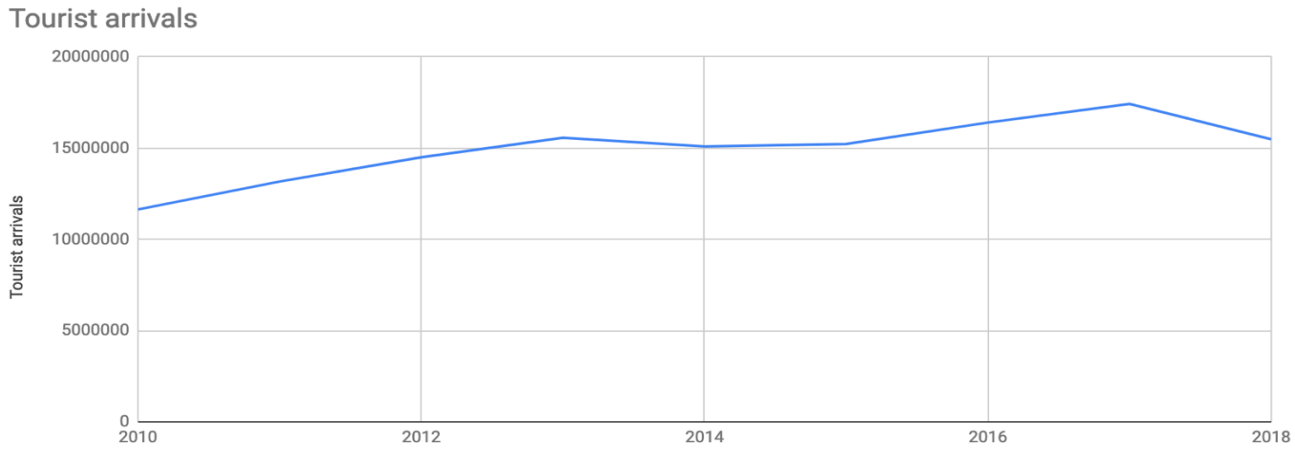
Table 8: Yearly temperature

Note that in *Table 7: Yearly tourist arrivals*, data for 2018 is incomplete as it has not been published by the Singapore Transport Board[18] yet. Furthermore, in *Table 8: Yearly temperature*, data for certain years as it could not be found from a valid source.

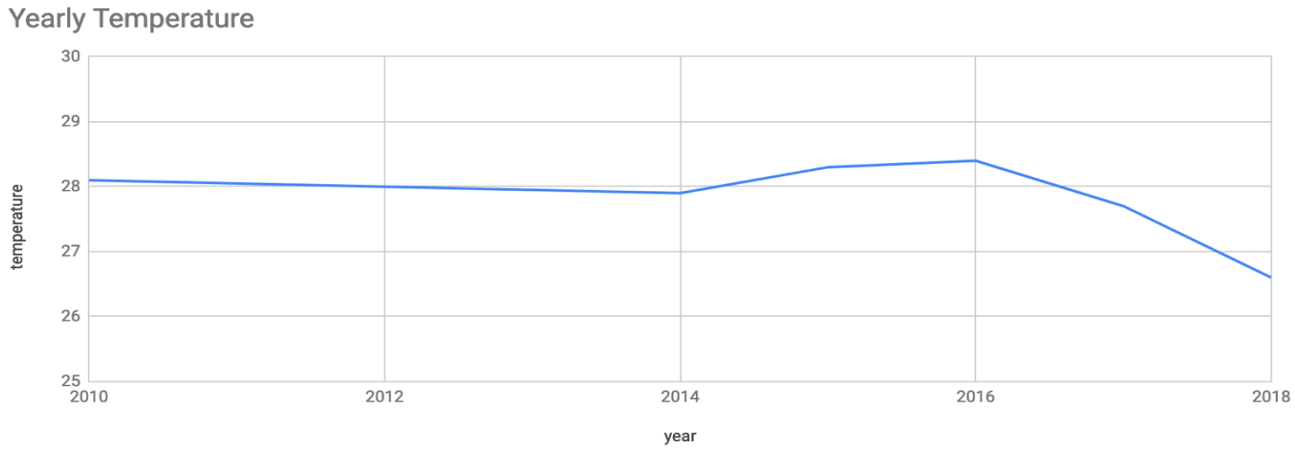
[17] *International Visitor Arrivals*. (2018). Retrieved from Singapore Transport Board: https://www.stb.gov.sg/statistics-and-market-insights/Pages/statistics-Visitor-Arrivals.aspx

[18] Data for tourist arrivals (*Table 7: Yearly tourist arrivals*) and early temperatures (*Table 8: Yearly temperature*) was taken from the Singapore Transport Board

The following graphs were also produced:



Graph 9: Yearly tourist arrivals



Graph 10: Yearly temperature

Graph 9: Yearly tourist arrivals shows that from 2010 to 2013, the tourist arrivals have increased steadily, with around 4 million more tourists in 2013. However, in 2014 and 2015–2017, the number of tourists decreased. The years 2014 and 2015 are **anomalous** in terms of the tourist arrivals, as the trend is increasing, but in 2014 and 2015, the arrivals reduced.

Similarly, as seen in *Graph 10: Yearly temperature*, the average yearly temperature has reduced significantly from 2015 to 2018, from 28.3ºC to 26.6ºC, creating an **anomalous** result. This is unexpected due to global climate change and the influx of tourists in Singapore.

However, the data could also show that the sustainable efforts of the Singapore Government are working. These efforts include aims to make Orchard Road completely vehicle-free, giving tourists and locals more freedom. Not only will this make the area more pedestrian-friendly, but it will also reduce the greenhouse gas emission of vehicles and reduce the overall temperatures. This is currently being implemented in certain parts of Orchard Road: for example, there is a 600-meter stretch from ION Orchard (*Map 5: Takashimaya shopping center* and *Map 6: Wheelock Place*) to Ngee Ann City that is closed to automobiles every Sunday. This has also played a role in improving locals' and tourists' appeal on the area as they are given more freedom.

The non-tourist areas, however, are far more sustainable. This includes recycling and sorting trash for better waste management. This has already been put in place in condominiums such as Bayshore Park in Upper East Coast Road. There are also plans for a new MRT station and shopping mall, which led to a large area of forested land cleared at Upper East Coast Road (as seen in *Map 3: Upper East Coast Road (Site 3)*). Due to the construction, the overall sustainability will likely decrease.

Further efforts from the Singapore Government in improving the sustainability include limiting the number of cars. In 2017, drivers were required to buy a Certificate Of Entitlement from the government in order to use a car. The plan was to slow down the growth rate of car ownership to only 0.25% per year[19]. The decision was made due to shortages in parking spaces in Singapore, will also help in reducing gas emissions, and hence reduce the temperature.

Criterion F: Conclusion

How sustainable is the growth of tourist areas around Orchard Road, with an increase in physical infrastructure and tourist influx? The fieldwork question was answered through the two hypotheses.

The **second hypothesis** was proved to be true. Although the number of tourists has increased, *Graph 10: Yearly temperature* shows that the temperature has been decreasing, although it

[19] *Singapore slaps limit on the number of cars on its roads* . (24 October, 2017). Retrieved from CNN Money: http://money.cnn.com/2017/10/24/news/singapore-car-numbers-limit/index.html

could be due to the effects of global climate change. This disproved **Hypothesis 1**: although the energy consumption has increased, the data shows that the temperature has been decreasing. The results of this investigation can be generalized to any HIC. Although Singapore is sustainable, more data on the sustainability of tourist activities should be collected for a more conclusive answer to the research question.

Criterion E: Evaluation

The data collected in the investigation was supportive, as it helped prove various theories of tourist influx and sustainability. It was relevant as various variables involving tourism and locals were taken into account.

However, the **accuracy** of the data can be improved in certain ways. For example, more people could have been **surveyed** and asked for their opinion on whether the temperature has increased. Another potential weakness is related to the **traffic survey**. More accurate data could have been collected by taking the automobile count twice a day. This improvement could not have been made due to time constraints. All in all, the entire investigation proved to be quite an enjoyable experience for me, as a geography student.

Certain improvements can be made to the hypotheses. For example, **Hypotheses 1** can be modified to better take into account the differences between the tourist and local areas.

Certain difficulties were faced in the data collection. For example, in the **questionnaire**, one of the questions was: "*For how long have you lived in Singapore?*", and some people did not want to answer it. For future investigations, I will try to avoid such personal questions

Appendix

Appendix 1: Questionnaire

1. Are you a tourist or a local?
2. For how long have you lived in Singapore?
3. Do you think the temperature has increased in Singapore in the past years?

Thank you for your time.

If the answer to Question 1 was "No", Questions 2 and 3 were not asked

Bibliography

The Singapore Economy: Then and Now. (2014). Retrieved from The Straits Times: https://www.straitstimes.com/sites/default/files/attachments/2015/08/09/st_20150809_4thennow09_1586110.pdf

Singapore Toursim Board (STB). (12 Febuary, 2018). Singapore.

Chin, N. C. (11 Febuary, 2015). *For first time in 6 years, number of visitors drops* . Retrieved from Today Singapore: https://www.todayonline.com/singapore/tourism-receipts-flat-2014-arrivals-slip-31-cent-151m-stb

Chua, A. (14 April, 2017). *Going fully car-free among plans to refresh Orchard Road* . Retrieved from Today Singapore: https://www.todayonline.com/singapore/going-fully-car-free-among-plans-refresh-orchard-road

Hill, T. (20 Febuary, 2018). *High time Singapore does something about its inefficient reliance on air-conditioning* . Retrieved from Today Opinion: https://www.todayonline.com/commentary/high-time-singapore-does-something-about-its-inefficient-reliance-air-conditioning

International Visitor Arrivals. (2018). Retrieved from Singapore Transport Board: https://www.stb.gov.sg/statistics-and-market-insights/Pages/statistics-Visitor-Arrivals.aspx

Singapore slaps limit on the number of cars on its roads . (24 October, 2017). Retrieved from CNN Money: http://money.cnn.com/2017/10/24/news/singapore-car-numbers-limit/index.html

Singapore: Annual Weather Averages. (n.d.). Retrieved from Holiday Weather: http://www.holiday-weather.com/singapore/averages/

Walker, A. (6 September, 2014). *Why Tall Buildings Make Cities Hotter*. Retrieved from Gizmodo: https://gizmodo.com/why-tall-buildings-make-cities-hotter-1588242736

New property cooling measures announced: Higher ABSD rates, tighter loan limits. (17 September, 2018). Retrieved from Channel NewsAsia: https://www.channelnewsasia.com/news/singapore/singapore-property-cooling-measures-higher-absd-rates-loan-limit-10502710

`