The Lost Pedestrian: Identifying determinant factors of no-pedestrian phenomenon in the area of Baiturrahman Grand Mosque, Banda Aceh, Indonesia

vom Fachbereich Raum-und Umweltplanung der Technischen Universität Kaiserslautern zur Verleihung des akademischen Grades Doktor-Ingenieur (Dr.-Ing.) genehmigte Dissertation

von
MArch. Mufti Ali Nasution

Tag der mündlichen Prüfung: 27. Juli 2022

Vorsitzender der Prüfungskommission: Prof. Dr. Willy Spannowsky
Erste Berichterstatterin: Prof. Dr. Karina Pallagst
Zweiter Berichterstatter: Prof. Dr. Anke Schmidt

Technische Universität Kaiserslautern DE-386

Pemerintah Aceh

Deutscher Akademischer Austauschdienst
German Academic Exchange Service

Acknowledgment

All truly great thoughts are conceived while walking.

Friedrich Nietzsche

First of all, I would like to thank Allah SWT, the most merciful, for His blessings of knowledge and education that I have received to study for a doctorate at TU Kaiserslautern under the guidance of Prof. Karina Pallagst.

Since I arrived in Kaiserslautern, Prof. Karina Pallagst has welcomed me warmly and friendly and supported all the knowledge and research materials I needed in writing my dissertation. Several difficulties while studying at Kaiserslautern have been resolved thanks to the support of Prof. Karina Pallagst. She is a supervisor, but at the same time, like a friend who always supports me when I need her.

I want to thank Prof. Anke Schmidt for being willing to be my second supervisor when I needed it because I lost my second supervisor, Prof. Kai Tobias. May he rest in peace. I really appreciate this support, and please accept my appreciation from the bottom of my heart.

One of the biggest challenges in pursuing a doctoral program is living far from my family in Indonesia. Fortunately, the Department of international planning system was family to me during my stay in Kaiserslautern. Beate and René, my colleagues, and friends of mine, have helped me a lot and inspired me because of their friendly nature and always inviting me to spend my free time doing positive things while studying at Kaiserslautern. I hope our friendship will always be established even though we don't live in the same city.

Next, I want to say special gratitude to the wonderful people who came to my aid when I was in a very emergency situation. Thanks to Lia for helping me manage the submission of my dissertation to the faculty when I was in Indonesia. And thank you to Himzo, who was willing to come to Kaiserslautern to accompany me and help me take care of essential matters in my last days at Kaiserslautern.

I want to express my gratitude to the government and people of Aceh, DAAD, and all stakeholders who financially support my study. In addition, I would like to thank my fellow Indonesian students at Kaiserslautern and my colleagues at the Muhammadiyah University of Aceh. You all have always guided and given me moral support during my education at TUKL.

Finally, I would like to express my deepest gratitude and love to my family in Indonesia, my mother, who always prays for me, my sisters Vivi and Dina, and my brother Fuad. They always pray for and encourage me to be enthusiastic about accomplishing this dissertation.

Summary

The area of Baiturrahman Grand Mosque in Banda Aceh, Indonesia, is a trade and service area and, at the same time, is a historical site that has a lot of historical heritage. Nevertheless, only a few people walk along the corridor of the town. People prefer driving to commute within the area and stop at their destination point. Some of them walk but only for 20 to 30 meters. Synergically, the growing number of motor vehicles increases significantly. Research in 2016 shows that 77% of 3600 respondents go by motorcycle for daily trips. The traffic jam appears during the rush hours.

A walkability concept is an approach to this problem because it gives social, economic, and environmental benefits. Before analyzing the case study of Banda Aceh, the writer determined a definition of walkability for the context of the research. By comparing Journals from Indonesia, Malaysia, and Thailand, it is to know how the researchers of the three countries define walkability. The researchers describe it in 3 ways: creating or adapting the definition, building variables, or starting by defining elements that shape it. After building a definition, the writer chose the researcher's most often used parameters. The chosen parameters become variable to evaluate the site condition in the case study.

The absence of pedestrians and the trend of using a motor vehicle in the case study area is a time bomb that will endanger human survival in the future. This research investigates three aspects: the people, physical environment, and policy to answer the problem. The structured questionnaires spread over the research site to get the people's background of not walking. An observation in the research site is to get a clear idea of the condition of the pedestrian system and its physical environment. The writer learned the official planning documents related to city spatial plans and pedestrian development to get a deeper understanding.

Kaiserslautern in Germany is a comparative study in this research because it is one of the best practice examples of pedestrian development. The local government has built the pedestrian zone system since the 1960s and was entirely successful 38 years after the construction. Moreover, the city has two planning tools for the transport plan. Firstly, *Mobilitätsplan Klima+ 2030* provides information about people's mobility, standards, principles of transport development, and strategic guidelines for traffic development. Secondly, *Nahverkehrsplan Stadt Kaiserslautern* service/trip performance, minimum standards, connection reliability, and local transportation network development/development, including various investment steps.

The questionnaire result shows that two-thirds of respondents who visited the old city center denied walking due to personal reasons and weather. It is because most of them own motor vehicles. Meanwhile, there are obstacles and destroyed parts along the pedestrian lane. The barriers are broken lane material, traders' products, street vendors, street cafés, and plants. Nonetheless, Banda Aceh has a plan for pedestrian system development in its city spatial plan. The document plans four segments of pedestrian lane development.

This research is advantageous in adding some knowledge to the field of urban pedestrian development. It could be a consideration in researching and planning a pedestrian system development for the cities that face a similar problem. Moreover, it helps promote a healthy, sustainable town that can save people and the environment from pollution in the future.

Kurzfassung

Das Gebiet der Großen Baiturrahman-Moschee in Banda Aceh, Indonesien, ist ein Handels- und Dienstleistungsgebiet und gleichzeitig eine historische Stätte mit viel historischem Erbe. Trotzdem laufen nur wenige Menschen den Korridor der Stadt entlang. Die Menschen ziehen es vor, mit dem Auto innerhalb des Gebiets zu pendeln und an ihrem Zielpunkt anzuhalten. Einige von ihnen gehen, aber nur 20 bis 30 Meter. Synergetisch nimmt die wachsende Zahl von Kraftfahrzeugen deutlich zu. Untersuchungen aus dem Jahr 2016 zeigen, dass 77 % von 3600 Befragten täglich mit dem Motorrad unterwegs sind. Der Stau tritt während der Hauptverkehrszeiten auf.

Ein Walkability-Konzept ist ein Ansatz für dieses Problem, da es soziale, wirtschaftliche und ökologische Vorteile bietet. Vor der Analyse der Fallstudie von Banda Aceh legte der Verfasser eine Definition der Gehfähigkeit für den Forschungskontext fest. Durch den Vergleich von Fachzeitschriften aus Indonesien, Malaysia und Thailand ist zu erfahren, wie die Forscher der drei Länder Gehbarkeit definieren. Die Forscher beschreiben es auf drei Arten: Erstellen oder Anpassen der Definition, Erstellen von Variablen oder Beginnen mit der Definition von Elementen, die es formen. Nachdem der Autor eine Definition erstellt hatte, wählte er die am häufigsten verwendeten Parameter des Forschers aus. Die gewählten Parameter werden variabel, um die Standortbedingungen in der Fallstudie zu bewerten.

Das Fehlen von Fußgängern und der Trend zur Nutzung eines Kraftfahrzeugs im Fallstudiengebiet ist eine Zeitbombe, die das Überleben der Menschheit in Zukunft gefährden wird. Diese Forschung untersucht drei Aspekte: die Menschen, die physische Umgebung und die Politik zur Lösung des Problems. Die strukturierten Fragebögen wurden über das Forschungsgelände verteilt, um den Hintergrund der Personen zu erfassen, warum sie nicht gehen. Eine Beobachtung im Forschungsgelände soll ein klares Bild vom Zustand des Fußgängersystems und seiner physischen Umgebung übertragen. Der Autor lernte die offiziellen Planungsdokumente in städtischen Raumplänen und Fußgängerentwicklung kennen, um ein tieferes Verständnis zu erlangen.

Kaiserslautern in Deutschland ist eine Vergleichsstudie in dieser Forschung, da es eines der Best-Practice-Beispiele für Fußgängerentwicklung ist. Die Stadtverwaltung hat das Fußgängerzonensystem seit den 1960er Jahren gebaut und war 38 Jahre nach dem Bau vollkommen erfolgreich. Darüber hinaus verfügt die Stadt über zwei Planungsinstrumente für den Verkehrsplan. Zum einen informiert der Mobilitätsplan Klima+ 2030 über die Mobilität der Menschen, Standards, Grundsätze der Verkehrsentwicklung und strategische Leitlinien für die Verkehrsentwicklung. Zweitens Nahverkehrsplan Stadt Kaiserslautern Angebot/Fahrleistung, Mindeststandards, Anschlusssicherheit und Nahverkehrsnetzentwicklung/-ausbau inkl. diverser Investitionsschritte.

Das Ergebnis des Fragebogens zeigt, dass zwei Drittel der Befragten, die die Altstadt besuchten, das Gehen aus persönlichen Gründen und wegen des Wetters verweigerten. Das liegt daran, dass die meisten von ihnen Kraftfahrzeuge besitzen. Inzwischen gibt es Hindernisse und zerstörte Teile entlang der Fußgängerzone. Die Barrieren sind kaputtes Fahrbahnmaterial, Produkte von Händlern, Straßenverkäufer, Straßencafés und Pflanzen. Dennoch hat Banda Aceh einen Plan für die Entwicklung des Fußgängersystems in seinem Stadtraumplan. Das Dokument sieht vier Segmente der Entwicklung von Fußgängerwegen vor.

Diese Forschung ist vorteilhaft, da sie dem Bereich der städtischen Fußgängerentwicklung einiges an Wissen hinzufügt. Dies könnte eine Überlegung bei der Erforschung und Planung einer Fußgängersystementwicklung für Städte sein, die mit einem ähnlichen Problem konfrontiert sind. Darüber hinaus trägt es zur Förderung einer gesunden, nachhaltigen Stadt bei, die Menschen und Umwelt in Zukunft vor Umweltverschmutzung bewahren kann.

Contents

CHAPTER 1: INTRODUCTION

CITY OF BANDA ACEH

The city of Banda Aceh was founded on 22 April 1205 by Sultan Johan Syah and had the golden ages on the rule of Sultan Iskandar Muda. In the 17th century, Aceh was a hub of world trade traffic (Raap, 1986). It was surrounded by forest located around half kilometers from the bay and only accessible through the delta of the river. The city had no fortress; however, the king had a large fleet and an army of battle elephants. Moreover, the palace complex was situated in the north-western of the city. It consisted of pavilions and courts without any fortifications.

The population in the city was about 100,000, of which foreigner was the highest in the group. They consisted of Arab, Turkish, Chinese, Indian, Bengali, and Portuguese merchants. The livelihood of the city's community was mainly from the river, and the primary point of community activities was mosques and markets, one in the center of town and another at the mouth of the river, where the local and foreign merchants met and made trading.

Since the end of the 18th century, Banda Aceh and Indonesia overall had a civil war against Dutch colonialism. In Aceh itself, during the battle over 40 years, the Dutch soldiers succeeded in occupying the "dalam" (palace area). This situation did not make people give up, but it even made them angry and continuously planned assault to re-occupy the area. Thanks to the bravery of Aceh's people, the Aceh region became the last region attacked by the Dutch and the first region which got their freedom from Dutch colonialism. Today, Banda Aceh is the capital of Aceh Province and one of the oldest Islamic cities in Southeast Asia. From it was founded to 1963, the name of this city, which is located at the most western Indonesia, was "Kutaraja" (city of the king). In 1963, the name of "Banda Aceh" was appointed as the official name for this capital of Aceh Province[1].

Location of Banda Aceh

Banda Aceh is a capital in the most western of the Republic of Indonesia. The city's area is 61.357 $km^{2,}$ with a population density of 3,654 per km^2.[2] Geographically, Banda Aceh is located between 05 16' 15" - 05 36' 16" NL and 95 16' 15" - 95 22' 35" EL with an average elevation 0.80 meters above sea level. It is the capital city of Aceh Province, lies on the north-western Sumatra Island, which has boundaries of Malacca strait in the north and district of Aceh Besar in the east, south, and west.

According to *Rencana Tata Ruang Wilayah Banda Aceh*[3] 2009-2029, before Tsunami, the structure of the urban space of Banda Aceh shows a type of symmetry radial pattern. It indicates the city center as the point of activity which extends linearly following primary roads and is relatively radial with the Baiturrahman Grand Mosque sector as the main focus of activities. This main center was supported by sub-centers functioning as education, commercial, tourism, etc. Interaction between the center and sub-centers stimulate the development of traffic in the city (Ch. 1 p. 15).

[1] Official website of Banda Aceh government, accesed on 30 August 2016

[2] Website of Banda Aceh's Community Development Agency

[3] Spatial Plans of Banda Aceh's Region year 2009-2029

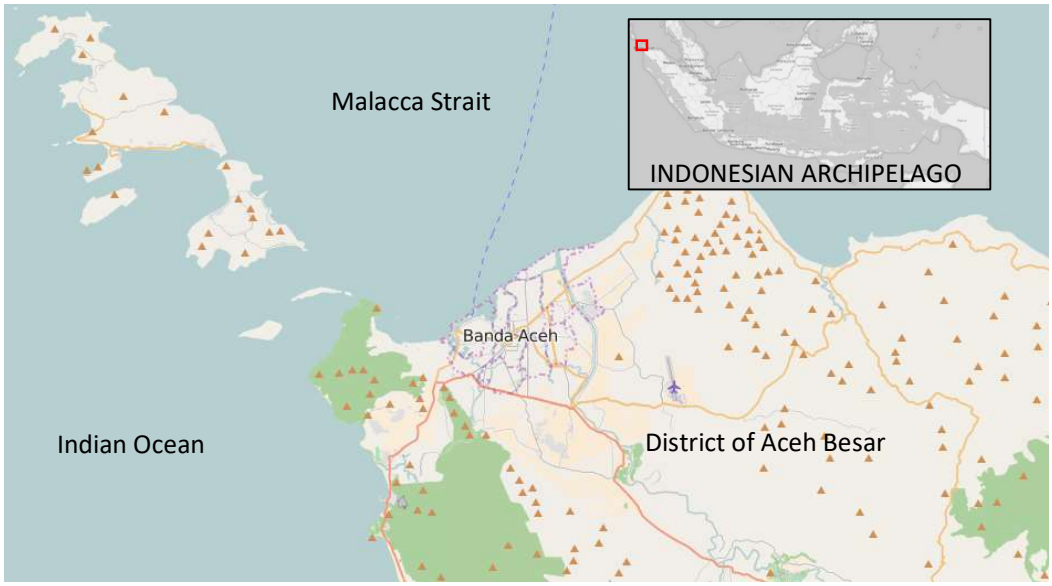


Figure 1.1. Banda Aceh is located at the most western of Indonesia
Map source: openstreetmap.org

Before and After Tsunami

A tsunami in December 2004 had killed more than 100,000 people in Banda Aceh and destroyed most of the urban buildings and infrastructures. The coastal area as part of the city had the worst impact in which houses, socio-economic facilities, urban utilities, as well as bridges and road networks were totally destroyed.

After Tsunami, Banda Aceh starts to re-develop itself primarily in the sector of infrastructure. Along the process of rehabilitation and reconstruction, Aceh becomes open to the world; in particular, after the signing a signature of a Memorandum of Understanding (Peace Agreement) between GAM[4] (Gerakan Aceh Merdeka) and the Indonesian government, which shows the end of the conflict in Aceh since the 1970s.

In this post-tsunami and post-conflict period, the development of Banda Aceh focuses on 4 urban regions; (1) the old city center region, (2) the new city center region, (3) Ketapang region, and (4) Ulee Kareng Region. The two centers have equivalence functions for development as commercial and service and center of governance and office. However, the new city center also functions as a development for settlement. It is constructed on a new site as an extension of the city.

For those reasons, the function of Banda Aceh as the capital of Aceh Province significantly grows, in which the flow of people, commodities, and services are getting higher. Banda Aceh becomes a center of activities in its region and begins to be crowded. The increasing number of vehicles year by year is potential to disturb people's mobility and pollute the city's environment. According to *Buku Data Statistik Banda Aceh 2013*[5], the increasing number of vehicles in Banda Aceh from 2010 to 2011 is 6,23%, while from 2011 to 2012 is 13,72%. The increasing number of the vehicle could happen because

[4] Aceh's Independence Movement

[5] Official Statistical data Book of Banda Aceh 2013

the current public transportation is not well organized. It leads people to like using personal vehicles better than public transportation[6].

Figure 1.2. Impact of tsunami 2004 (left) and situation of the area after reconstruction 2014 (right)
Source: merdeka.com

OLD-CITY CENTER OF BANDA ACEH

Research location

The old city center region is the heart of Banda Aceh. On this site stands the Grand Mosque of Baiturrahman, which was established in 1614 by the king of Aceh, Sultan Iskandar Muda[7]. This Mosque is the biggest Mosque in the city and the center of Islamic religious activity in Banda Aceh. Muslims around the Mosque and from outside of the area always come five times a day to fulfill the calling of prayer. This tradition makes the surroundings lively from dawn to midnight.

In April 1873, The Grand Mosque was burned out on an attack of Dutch soldiers. Four years later, it was rebuilt on the same site by the kingdom of the Netherland. The reconstruction of the Mosque was a manifestation of the Dutch's guilt, apology, and worry about the people of Aceh whose spirit of war grew due to the destruction of the grand Mosque. Nowadays, it has become the prominent landmark of Banda Aceh city and the pride of Aceh people.

In addition to worship, people come to this area for sightseeing and shopping daily needs and souvenirs as well as gastronomy tours. Traders in the traditional market sell vegetables, fruits, etc., at affordable prices. Merchants of fashions and electronics devices offer products with reasonable prices and comparable quality. Coffee shops and restaurants are mostly open until midnight. In spite of its lively and safe, many young and older people sit in the coffee shops from the evening to midnight.

[6] *Menyoal Transportasi Kota Banda Aceh Pasca Tsunami* [Questioning City Transportation in Banda Aceh after Tsunami], Tribun news 28 December 2015, accessed on 22 September 2016

[7] Kantor Wilayah Departemen Agama Provinsi Aceh, 2009. **Mesjid Bersejarah di Nanggroe Aceh Jilid I**. [Historical Mosques in Aceh's Land Volume 1, p. 6, created and published by Regional Office of Aceh Province's Religion Department]

In this old-town center, there are two large fields called Blang Padang and Taman Sari. They are two places where the urban community spends leisure time with family and friends. Blang Padang is a green open space that is visited In the morning and late afternoon, mainly on Saturday and Sunday. People come to do sport-jogging-exercise, sit under the trees, play with children, or meet friends while enjoying local food and drink. It is also utilized for national and local official ceremonies as well as for cultural exhibitions. Moreover, 53 monuments of countries that helped Aceh after the Tsunami stand there, called "Aceh Thanks to the World." On each monument spread out around the field, people can see a printed picture of a flag and a writing "peace and thanks" in each country's language.

Figure 1.3. People are accessing free internet wifi in Taman Sari.
Source: http://beritadaerah.co.id/2014/07/21/akses-internet-gratis-di-taman-sari-depan-balai-kota-banda-aceh/

Meanwhile, Taman Sari is a park located 200 meters south of Baiturrahman Grand Mosque. It becomes an alternative for a "cheap tourism destination" for families in the city. This park is equipped with a playground for children and free internet wireless connection for the visitor. It encourages university students to visit, do their tasks in a provided space, or enjoy access to social media.

Additionally, this historical site contains historical heritages, such as Governor and Mayor's Residence, official residences, Colonial building complex, Chinatown, Tsunami museum, government office, etc. This area has the typical Islamic urban pattern, where the heart is a Grand Mosque surrounded by a market (Mortada, 2003).

Mobility on Site

Recently, it is rarely seen people walk along the corridor of the town. Some are still walking, but only for 20-30 meters. Most people drive when they are coming to the commercial area; move along the road and stop right at their destination. The driver can park his vehicle at the roadside. The intensity

of the traffic is high at the specific day time; in the morning, at noon, and in the late afternoon, which triggers moderate traffic jams after office hours.

The same behavior happened to the area of Blang Padang and Taman Sari. People come, park their car and motorcycle, enjoy time in the field, then leave. If they need to buy something nearby the fields, they will use their vehicle instead of walking for 100 meters. The driver can easily say to the parking attendant that he will be back so that he doesn't have to pay the parking fee twice.

In fact, the government provides the pedestrian way. It is built almost on every side of roads, with 2 – 2.5 meter width. It is covered by concrete in some parts, and the rest is covered by tile. Due to lousy maintenance, there are holes in some parts, it is not continuously flat, and there is a break every some meter with 15-30 cm different elevation.

In April 2016, the city government officially announced the operation of a city bus called Transkutaraja[8]. The bus serves two city corridors for the early phase, from the city center to Syiah Kuala university area and from the city center to Sultan Iskandar Muda International airport. Interestingly, it is free of charge for the first year of service. However, after a month of operation, passengers, especially students, complain about its time of operation. There is no time schedule makes students spend a lot of time at the bus stop with uncertainty. Moreover, the service time, which should be ended at 18:00, does not happen[9]. The buses often stop operating at 16:30 and it makes passengers fed up and re-thinks to use this transportation.

Figure 1.4. Situation of pedestrian line in front of shopping area
Source: Personal documentation

STATEMENT OF PROBLEM, AN EARLY HYPOTHESES

The phenomenon of no-pedestrian in the old city center of Banda Aceh is seen as a basic problem for the near future. This problem affects local people and the environment and, on a larger scale, the city overall. As an early observation, some conjectures could become basic points in investigating the root of the problem.

[8] Official website of government's inspectorate of Banda Aceh, news on 29 April 2016, accessed on 19 September 2016

[9] Habadaily news on 8 May 2016, accessed on 19 September 2016

Space and Climate

1. Nowadays, the tendency of driving rather than walking in Banda Aceh potentially creates traffic jams, pollution, and might be obesity in the near future. It will raise healthy and environmental problems on a larger scale.
2. Banda Aceh is located in a tropical area with an average annual temperature of 27.3o Celsiusand humidity of 81%[10]. From 10 to 18 o'clock, the daily average temperature is 28 – 33 degrees Celsius. It makes people always utilize air conditioners while driving, to get comfortable with the temperature and to avoid air pollution during the trip in the city. As time goes by, this behavior becomes a habit; people do this not only during the day, but also when driving in the evening and at night. The heat from the machines of the car contributes to heating up the temperature of the area.
3. There is not enough vegetation in the area. Trees can only be found in Blang Padang and Taman Sari area. In the commercial area, there is no place for vegetation to grow because the land is covered by concrete and asphalt. In the afternoon, the temperature in this area can reach 35 degrees Celsius.
4. The territory problem can be observed on the pedestrian line. Some traders put their product on the pedestrian way in front of shops to invite more visitors. In many ways, it succeeds in attracting buyers, but it also disturbs the flow of walkers. Walking passerby must go down from the path to the road when traveling across these points.
5. The Tsunami in December 2004 changed the setting of the city. With the new setting for the time period of post-Tsunami reconstruction and rehabilitation, there are some things lost for the community; memories, color, aroma, certain shapes, scale, functions, etc.

Social and Politic

The conflict between GAM and Indonesian Government happened from 1976 to 2005. During this period, the situation in Aceh was not secure because there were violence and armed clashes between Indonesian troops and separatist group. The most severe situation occurred from 1998. Win Wan Nur[11], whose writing about the conflict was released by the Globe Journal[12], said that[13] *4 December is a special day for us living in Aceh because that day is the birthday of GAM*. *At this date, the atmosphere in Aceh that has been strained became much more tense than usual because the security forces assigned by the state to combat the separatist movement in Aceh has always been more actively checking every person passing on the street. We prefer to dwell in the house while occasionally shocked to hear the sound of explosions or a barrage of gunfire. In addition, another special date is 17 August[14]. As of 4 December, the date was always used as a demonstration of power between the two armed forces in our country*. [Translated from the Indonesian Language]

It forced people not to spend a lot of time out of the house. At that time, they could not even go to worship when the callings of prayer were heard from mosques in the neighborhood, especially in the evening. The people were avoiding being interviewed by the armed soldier patrol; once someone was

[10] *e-Kinerja, Aplikasi Penilaian Kinerja PNS dan SKPD* [e-Performance, assessment application on staffs and task forces' performance] accessed on 22 September 2016 10:00 (UTC+01:00)

[11] Win Wan Nur is an independent writer from Aceh. During the conflict period, he worked as interpreter for some international journalist who came to Aceh to cover the situation.

[12] *Kisah Harry Burton si Wartawan Perang Meliput Konflik Aceh* [The story of Harry Burton, The war correspondent in covering conflict in Aceh], the Globe Journal news, 27 October 2012, accessed on 28 September 2016.

[13] Suasana Aceh semasa conflict (in Memoriam Harry Burton). [Atmosphere in Aceh during conflict], Reader's opinion – Kompas News on 2 December 2009, accessed on 27 September 2016.

[14] Indonesia's Independence Day.

suspected, it would be a harsh interrogation. Luckily, this situation ended after signing the Memorandum of Understanding (MoU) signature between GAM and the Indonesian government in Helsinki, Finland, on 15 August 2005.

On rehabilitation and reconstruction period after Tsunami as well as after the signature of MoU Helsinki, Aceh developed fast. Aceh, which in the past was closed to outsiders, is now open to any kind of people and business. Many people come to Aceh to work, study, trade, etc. The atmosphere, which was silent, suddenly became lively. Many people spend time out of home, on the street, market, coffee shop, and there are no more soldiers seen on the street. In addition, the business of new vehicles is also progressive, where almost every family has 1 - 2 motorcycles[15]. The Income and Wealth Department of Aceh Province[16], Mr. Masri, said that *the augmentation number of new vehicles in Aceh during 2015 reached 113,206 units. That number was higher than the preceding year, which was 109,064 units. The dominant augmentation was motorcycle reached 104,209 units, and then the car was 4,964 units.* One reason for the increase in motorcycles demand might be because there are amenities from leasing companies, where people can have a new motorcycle only by paying down payment IDR 2-3 million (±150€) and monthly installment IDR 500,000 – 700,000 (±45€) for three years.

Meanwhile, the local government gets to benefit from vehicle sales. Mr. Masri added that the augmentation of new vehicles could indeed increase tax revenue. He said that the tax for motorcycles in 2015 reached IDR 173.5 billion (±11.7 million €) and the total tax revenue for vehicle tax was IDR 341 billion (±23 million €). It is quite problematic for the government because, on the one hand, this tremendous increasing number profits them, but on the other hand it is also potential to lead the chaos of traffic in the future. For that reason, it is necessary to have comprehensive regulations to limit the number of vehicles sale and develop public mass transportation.

PURPOSE OF STUDY

No-pedestrian phenomenon happened in Banda Aceh is the main challenge need to answer in this research, so that, the first purpose of the research is to investigate determinant factors that lead to no-pedestrian phenomenon in the old-city center of Banda Aceh. The research will reveal the background the matter, from the aspect of people, environment and physical situation, as well as from the regulation and policy.
For the second purpose, the research aims to evaluate the physical challenge on the pedestrian lane and the the policy that regulate the planning of pedestrian development to strengthen the function of city center as a place for recreation; worshiping, shopping, leisure, doing sport, sightseeing, etc.
At the end, the research produce recommendation based on analysis, evaluation, and finding during the research, in order to revive the walking habit to urban community; campaign it as a lifestyle and create a sustainable healthy environment.

DEFINING PEDESTRIAN

Human naturally move in his life. Moving is important not only as physical attributes such as strength and endurance but it also plays a major role in emotions, learning, and relationship. The body is

[15] *Interview with Henny Marlina, ST, MSc; the head of Architecture Department, Universitas Muhammadiyah Aceh*

[16] *113.206 Kendaraan di Aceh Bertambah* [113,206 units of vehicles augment in Aceh], Serambi Indonesia news 19 January 2016, accessed on 29 September 2016.

intimately involved in all human's thought processes, understanding, emotion, and decision making. It means that human health is much determined by his movement or mobility.

A kind of mobility to get healthiness is walking. Nowadays, walking is part of lifestyle and needs. People walk to work, sport, recreation, enjoy the atmosphere the city life, and to have socialization. It makes pedestrian lines become a "compulsory subject" must there. These lines are connected a place to places from origin to certain destinations.

For the authority or planner of a city, *Pedestrian circulation is not easily discussed in specific terms because of the large differences in purpose between various types of the system* (Fishbeck, 1998). It much depends on some considerations such as location, climate, built environment, sun shine, wind, distance, and so on. Therefore, it is necessary to determine the definition of pedestrian before discuss it further. According to early observation, pedestrian considered in this research is people who only move by walking more than 30 meter in the city center area.

RESEARCH QUESTIONS

Questions arise on the research are:

- The land use of old-city center is trade and service which function as commercial area; market and shops. Why does no-pedestrian phenomenon exist in this area? What factors determine it?
- How far the role of the factors in hypothesis embraces the situation?
- What kind of strategy could be conducted to encourage/force people to walk in the area relative to factors found in case study?

RESEARCH METHODOLOGY

The research is conducted using the model of case study research, which uses qualitative and quantitative methods. It also take Kaiserslautern as the a comparative study for a good sample of the city in pedestrian development.

1. **Site observation**. Both of Banda Aceh and Kaiserslautern city center are observed to understand the current situation; how people move through urban space, what already there are, and what still missing are. It includes examining the existing physical aspects in the both of city centers; which are spatial standards, outdoor accessibility, site furniture and features, and outdoor lightning.
2. **Questionnaire**. The needs, hope, and vision of the urban walker of Banda Aceh are caught by questionnaire. It is performed on site and online, where the respondents are chosen randomly with the number of 140 respondents.
3. **Interview**. Interview is carried out to get subjective information from government and official planning, in both cities. Moreover, interviewing local people who live in or close to the research area, elder, and the walker is to get additional information about the changes and occurrences happened in the area from time to time.
4. **Literature Study**. As literature study, planning documents of both cities will be examined to know the policy of area development, the transportation management system, and the consideration and tendency in developing the city center. Besides that, collecting informal documents such as old maps, photos, and scripts are considered in shaping the visual image of past situation. it is useful to understand the transformation and to predict what comes subsequently.

The framework of research method can be seen in appendix 1.

SIGNIFICANCE OF STUDY

- This research is advantageous to add the knowledge in the field of urban pedestrian particularly with the research site in tropical pos-disaster and post-conflict area with its historical value.
- Promoting a sustainable healthy city with its walking habit.
- Escalating number of goods trading.

SCOPE OF STUDY

Investigation during the research focuses on policy and political aspect, human behavior aspect, and physical built environment aspect. Meanwhile, the site of research is located on the old-city center of Banda Aceh, which is the area of Baiturrahman Grand Mosque, Blang Padang, and Taman Sari, as well as all physical margins that limit. The site of research is present on map in page 10.

STRUCTURE OF THESIS

Chapter 1 is the introduction part of Aceh, especially Banda Aceh as the capital of the province. It narrates a brief history of Aceh from its establishment until the time of the conflict and its condition after the Tsunami. Issues raised as the basis of the research are described based on some hypothesis underlying the problem. Moreover, the method used and the scope of the study are explained in general.

Chapter 2 discusses the definition of walkability; how to build its understanding through the parameters made by the experts from the South-East Asian countries.

Chapter 3 states the area analysis of the comparative study, which is the city center of Kaiserslautern city. It examines the role of the city center and its elements for the urban community and the strategies carried out by the local government to energize the area through a pedestrian system.

Chapter 4 is about an investigation of the research site of the old city center of Banda Aceh. It is a comprehensive discussion of three principal aspects of the no-pedestrian phenomenon: the aspect of the change in the physical environment, the human behavior aspect, and the policy aspect.

Chapter 5 is a comparison between 2 city centers, Banda Aceh and Kaiserslautern. It elaborates on the spatial situation, mobility, and pedestrian lane condition.

Chapter 6 summarizes the research findings and SWOT analysis of Banda Aceh. This discussion leads to recommendations about practice, policy, and future research.

Baiturrahman Grand Mosque

Green open space - Blang Padang

Green open space - Taman Sari

Location of research

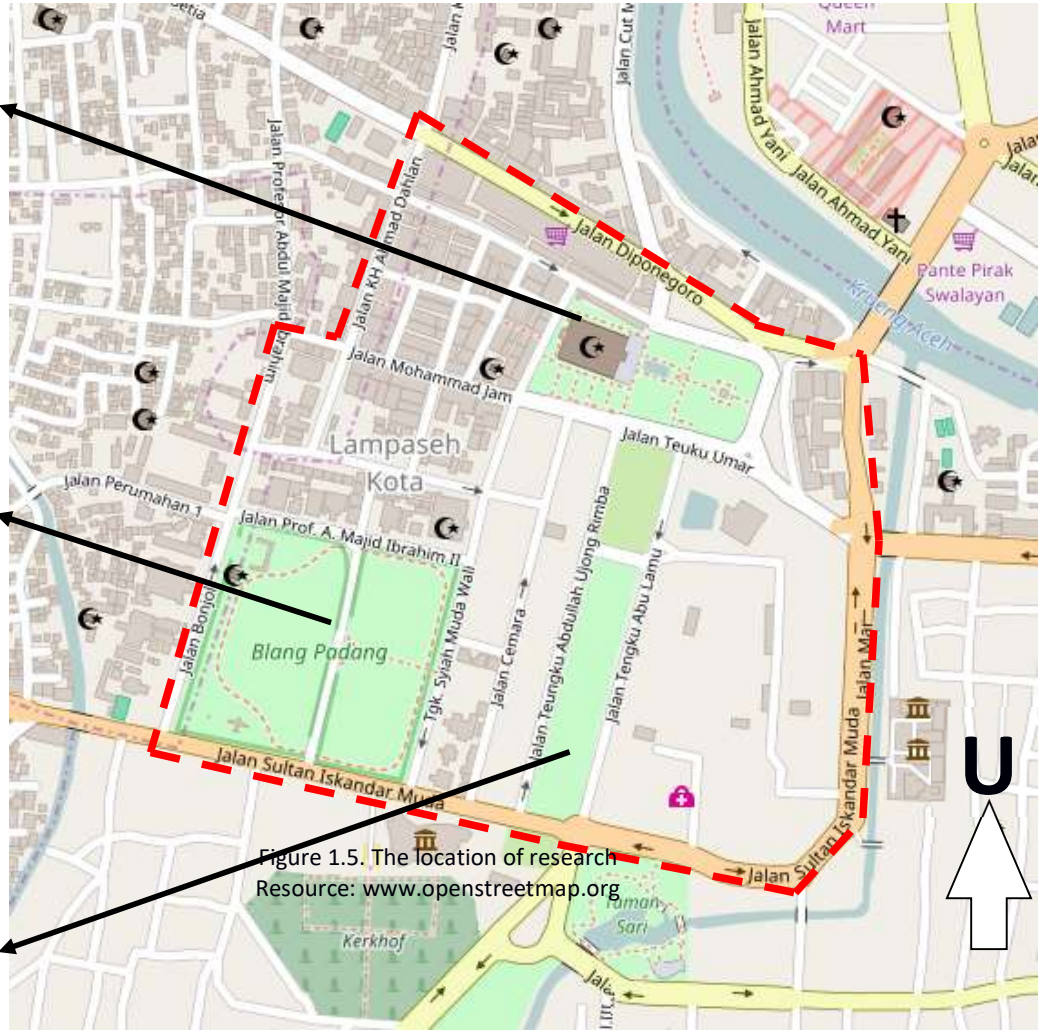


Figure 1.5. The location of research
Resource: www.openstreetmap.org

Chapter 2

Understanding Walkability

Trends in South-East Asian

Air pollution and diseases become big issues in urban life. Pollution mostly produced by industrial and motor vehicle activities can be dangerous for humans because it contains emissions, which in the short-term can affect health, such as eye, nose, throat, and lungs. Long time exposure, scientific studies suggest that this may be associated with increased rates of chronic bronchitis, reduced lung function, and increased mortality from lung cancer and heart diseases (Abdullah & Hafiy, 2016) (Agustin, Santosa, & Bambang, 2014; Azmi, Karim, & Amin, 2012)[1].

Together with this situation, urban life requires high demands for mobility. Every day, people move along the urban corridors as part of their daily activities; some people go by public transportation, and others drive their own vehicles. Cities in developed countries provide convenient public transport to serve the movement while existing infrastructure in cities of developing countries is still not capable of providing service for a high number of people. It leads people living in the cities of developing countries to have a personal vehicle. Furthermore, since the economy in Asia has been getting wealthier during the last decade, owning a vehicle is getting easier. In south-east Asia countries particularly, vehicle sales are set to outpace all other regions of the world during 2017, according to industry research, highlighting surging economic expansion in some parts of the region. But the increasing number of new cars and trucks in urban centers tends to aggravate traffic jams in major cities such as Bangkok, Jakarta, and Manila[2].

A survey by navigation equipment manufacturer TomTom, which was conducted on 390 cities in 48 countries, put Bangkok and Jakarta in second and third rank for the worst traffic jam in 2016. While cities such as Manila and Cebu, together with Indonesia's Bandung and Surabaya occupy, are at the bottom rank on a survey in 2016 regarding driver satisfaction done by Waze, the maker of popular mobile phone navigation and traffic monitoring application.

Diagram 2.1 shows the trend of car and motorcycle ownership in some Asian countries. In Indonesia and Vietnam, it seems motorcycles and scooters dominate the traffic. There are more than 80% of households own a motorcycle, while less than 10% have a car. Also, the household in Malaysia and Thailand have the same trend for motorcycle; however, half of Thai Household has a car, and more than 80% of household in Malaysia owns a car.

Meanwhile, through the advancement of technology, urban society unconsciously tends to undertake a sedentary lifestyle. It is a kind of lifestyle which involves very little physical activity. People living with this lifestyle mostly sit or lie while reading, socializing, watching TV, playing video games, and using a mobile telephone and computer almost all day long. Unconsciously, the sedentary lifestyle can happen everywhere; it is also part of workers' daily-activities-pattern who drives to the office in the morning

[1] Website of New York's Department of Health, accessed on 9 June 2017 [https://health.ny.gov/environmental/indoors/air/pmq_a.htm]

[2] Financial Times News on 29 May 2017, accessed on 9 June 2017 [https://www.ft.com/content/96608536-4204-11e7-9d56-25f963e998b2]

and come back home after work. The pattern could be like waking up, having breakfast and reading the newspaper, sitting in a car or tram on the way to the office, and working all day in front of the monitor. Based on some studies, in the long term, the lack of physical activities can lead to premature death.

Diagram 2.1. Percentage of household that have a car or motorcycle in some Asian countries
Source: https://asia.nikkei.com/Business/Trends/Booming-Southeast-Asian-vehicle-sales-drive-urban-congestion

Walkability: A Definition

It is obvious that Walkability is about the interaction between the Pedestrian as the user and the lane/path as the place where he walks. From these 2 points, urban designers and planners explore the elements to understand the situation, answer the problem, test some theories, and assess the success rate of Walkability based on their expertise. They create tools to measure the level of Walkability's productivity, both from a user and place perspective. At the end of the day, the result is quite identical: evaluate the existing interaction in order to reach sustainable environment development. However, Lo (2009) in Moura et al. (2017) points out that although many researchers evaluate the relations between urban environment and pedestrian behavior, all have a different definition of how to measure Walkability.

Diagram 2.2. Interaction between pedestrian and space forms walkability

Researchers evaluate Walkability from a user perspective, place perspective, or reciprocal relationship between them. Adkins et al. (2012) stated that the success of a walkable environment should not simply be measured by the duration of walking trips but also by the quality of those trips in terms of user experience. In this term, physical characteristics determine the user's perception that influences behavior. He quotes Cervero and Kockelman (1997), who indicate that this micro-scale characteristic, however, has a relatively minor influence on travel behavior compared to macro-scale characteristics such as destination, proximity, density, and connectivity. When micro-scale characteristics are stronger than macro-scale characteristics, the Walkability will refer to the terms tourism, pleasure, and training. On the contrary, when the macro-scale characteristics are stronger, it will equip the environment for mobility. Choi (2014) also highlighted that walking could be seen as physical activity behavior, travel behavior, personal recreation, social activity, and so on. Walking behavior will always emerge through an interplay between conscious decisions, habits, social and cultural traditions, and situations, and the various properties of the built environment.

Micro-scale > macro-scale → tourism, pleasure, training
Micro-scale < macro-scale → mobility

Battista and Manaugh (2018) emphasize that Walkability can, and should, be conceptually adjusted to include social factors shaping travel behavior for two reasons; (1) to more precisely account for travel behavior in the city, and (2) to maximize the number of potential opportunities for residents to meet their needs on foot, voluntarily and satisfactorily, regardless of their socioeconomic constraints. Latterly, social and personal factors are crucial in forming Pedestrian's spatial engagement.

On the other hand, through their research, Jun and Hur (2015) uncovered that physical Walkability is not relevant to social interaction and has a negative relationship with the sense of community. Physical Walkability does not enhance the neighborhood's social environment, but perceived Walkability does because physical Walkability and perceived Walkability do not correlate in the same direction, and a neighborhood with high physical Walkability does not correspond to a neighborhood with high perceived Walkability.

Additionally, most researchers try to understand Walkability by utilizing or building variables to evaluate Walkability rather than to make a clear definition of Walkability. For instance, Winayanti et al. (2015) used parameters from the Global Walkability Index consisting of 9 variables; walking path modal conflict, availability of walking paths, availability of crossings, grade crossing safety, motorist behavior, amenities, disability infrastructure, obstruction, and security from crime. She adapted the definition to indicate that Walkability is the overall support for the pedestrian environment (World Bank, 2008) used to describe and measure the connectivity and quality of walkways, footpaths, or sidewalks in cities. It can be measured through a comprehensive assessment of available infrastructure for pedestrians and studies linking demand and supply (ADB, 2011). Sutikno, Surjono, and Kurniawan (2013) choose parameters from Walkability Audit Tools from the US Department of Health and Human Service Center for Diseases Control and Prevention that are support activity, the pattern of pedestrian movement, important performance analysis (IPA), and Walkability consists of the perception of physical condition, conflict with street/accident, the ease of crossing, maintenance and completeness of supporting facilities, the effective width of pedestrian way, buffer by roads, accessibility to pedestrian way, and pedestrian way aesthetic and shade. They defined Walkability as

one of the key principles to be addressed at the community level (Khalid, 2009) and as a tool used to measure neighborhood ability and support walking function for humans (Abley, 2005).

Rafiemanzelat, Emadi, and Kamali (2017) started defining Walkability by defining walking. Generally, in the urban context, walking is defined as short distance moving from one point to another. Furthermore, Walkability is a concept that is known as the measurement of the Pedestrian friendly's degree of an area. The urban designers and planners have recently focused on these terms to make a sustainable environment for communication, recreation, and shopping by Pedestrian based. Many studies from the earliest terms of Walkability until now worked on the concept of Walkability in various areas such as architecture, transportation, urban design and planning, and public health. They quote Lo (2009), who said Walkability is more than physical activity to health term in a physical environment. It also includes "social environment," "perception of the area," and also "comfort of the pedestrian." At the same time, Moura et al. (2017) adopt the definition from Leslie, Butterworth, and Edwards (2016), which defines Walkability as the extent to which the urban environment is Pedestrian-friendly to address the quality of the pedestrian environment, supporting more objective, effective and comprehensive walking-related strategies, and intervention.

Lo (2011) investigated the definition of Walkability by defining elements shaping Walkability itself. She started explaining the meaning of Pedestrian and path in Indonesian instead of English and concluded that ethnography should become a standard part of urban research, planning, and design because, in her case, for instance, the notion of what is Pedestrian is further complicated by linguistic ambiguity. In the Indonesian language, the meaning of walking (*jalan*) can be defined as a verb or noun and have other meanings when it comes with a prefix, suffix, and both of them. Besides that, planning is a culturally-embedded language that conveys discourse and either deliberately or unknowingly shapes planning parameters such as that of streets, public spaces, and even the "design pedestrian" herself. This shows that planning, or in this term is, Walkability, is quite contextual and tied to culture, geographic location, weather, and climate.

Spoon (2005) underlines that the basic definition of Walkability is an area that encourages people to walk. The definition is obtained from the fact that general variables can be interpreted from potential variables, so these variables are valid to represent other variables. He got it by comparing variables from authors and figuring out the fact that not only between one author to others but even between documents by one author, there a small discrepancy exists. These documents' comparison shows there are similar variables used in two documents and some variables used in one document only.

Based on the above explanations and the research case, there are two principal points that need to be defined: Pedestrian and Walkability. Firstly, a Pedestrian is **anything that moves** at a **certain speed** - including a human, a human with a device (wheelchair and other moving devices) – and a **certain dimension**. Since the development of technology in mobility has significantly grown during the last decade, it is important to consider that the Pedestrian is not only human and disability, but also human with moving devices. Secondly, Walkability is **a degree** that shows the **level of interaction** between the Pedestrian and the space to walk, which can be measured with some **contextual variables**. In this definition, the word "contextual" is emphasized since Walkability can be contextually measured depending on where it takes place.

In addition, the level of interaction in Walkability consists of three matters. Firstly, the existence of Pedestrians in the research site is a crucial point because an interaction occurs after existence. The

existence here is the existence of Pedestrians and the existence of the space where the walking activity takes place. Secondly, the capability of the environment is to accommodate the walking activity. It relates to the physical condition of the pedestrian lane by considering certain variables, where the issues of quality and perception are part of the topic discussed here. Thirdly, after the Pedestrian and the walking space exist and it is capable of providing space for walking activity, Walkability can be measured with various methods as needed.

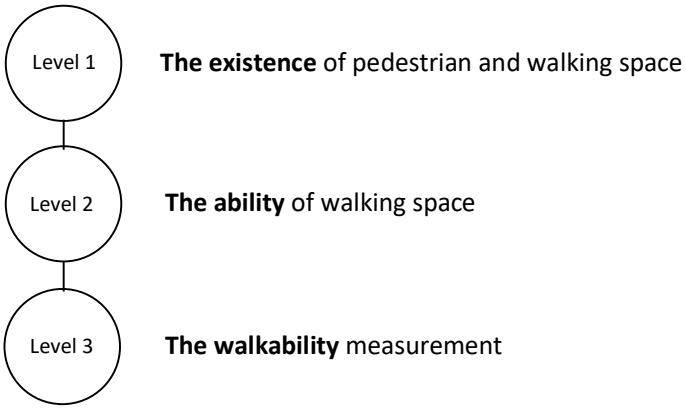


Diagram 2.3. Level of interaction towards walkability

Social Benefits: answering health issues

A walkable environment could be a significant way to answer the challenges of health problems because it brings a lot of advantages to human and urban life. Some of the benefits that walking can slow down the aging process and decrease the risk of heart attack, cancer, osteoporosis, etc. (Mecola, 2015). Besides that, many studies show that people who frequently walk can keep their body fit, improve their respiratory system, maintain blood pressure stability, prevent dementia, and enhance their immune system and sleeping quality.

The walkable neighborhood has much lower rates of traffic deaths compared with car-oriented areas, improve physical activity and encourages healthier everyday life, can promote increased use of sustainable modes of transportation (e.g., walking, cycling, and transit) that are correlated to environmental benefits related to pollution, stormwater runoff, and water quality (O'Hanlon, Scott, West, 2016).

A walkable neighborhood encourages interaction between people. Direct and indirect interaction will create a safe atmosphere where people trust and possibly support each other. A superior level of interaction between people signifies a higher degree of implicit trust, which often leads to breaking down the barriers within different demographic groups (Masjutina, 2016).

Masjutina (2016) also stated that it is empirically proved that a walkable environment can reduce crime in big cities. A city with its high mobile intensity potentially has areas where not many people

pass by. These spaces are the potential place of crime that threats safety. A walkable environment will decrease those spaces and evenly make people flow to all parts of the city.

Economy: mobile cost, wealth vs. walking

In pedestrian-friendly surroundings, people are facilitated to move conveniently and safely from one point to another. Besides health reasons, it is also free of charge. Some economic benefits can be obtained by creating a walkable community (Ryan, 2003), as happened in Silicon Valley, San Francisco, US[3].

Housing values are higher where it is walkable, as shown in a 1999 Study by the Urban Land Institute. It determined that buyers were consenting to pay more to own houses in walkable areas compared to similar ones in surrounding areas. The New urbanism communities enjoy considerably higher housing values than traditional suburban developments. Walkable communities attract "new economy" workers. They offer a mix of restaurants, offices, and housing that promote interaction. This interaction is key since the new economy thrives on accessibility, networking, and creativity, based on a 1998 report of a Silicon Valley think tank that studied the connection between the physical design of communities and the new knowledge-driven, service-oriented economy.

A walkable environment is becoming a business relocation alternative because booming business centers are showing how an overdependence on the car can gridlock economic development, as happened in Atlanta and Silicon Valley. As a result, some major firms around the country are advocating for a pedestrian and transit-friendly environment, according to a 1999 report by the National Association of Local Government Environmental Professionals. Besides that, a walkable environment reduces commuting costs because the construction of a walkable community provides the most affordable transportation system any community can plan, design, construct and maintain.

Since low-density, discontinuation, and automobile-dependent land use patterns can cause higher direct business costs and taxes, and walkable communities can be an answer that costs the taxpayer less. The federal office of technology assessment estimates that a single house built on the urban periphery requires $10,000 more in public service than the one built in the urban nucleus.

In the tourism sector, the walkable neighborhood attracts tourists because communities and their walkable environment capture a bigger share of tourist money as visitors are interested in experiencing community life. Places where visitors and communities alike feel community pride and activity are increasingly likely to be strong economically. It also can capture an emerging "lifestyle" retail market. Nowadays, developers know well that walkable shopping centers offer a "sense of place." The lifestyle centers are developed to replicate many of the community or neighborhood shopping experiences offered by downtowns, is to recreate the downtown's sense of place with small building footprints, multi-story buildings, and an open-air environment. The economic potential of increased sales from the lifestyle segment can be realized in walkable downtowns business expansion and recruitment to create an appropriate mix of retail, entertainment, and service businesses.

[3] Lets Talk Business – Economic Benefits of Walkable Community. Issue 83, July 2003.

Environment: Reduce energy consumption = reduce pollution

Walking and bicycling displace up to 15 percent of passenger vehicle emissions. In the US, the vision of walkable communities has been discussed for decades. Unfortunately, unlike driving, which is measured and analyzed, walking and bicycling have been neglected by most energy experts, economists, statisticians, and transport planners. Most planners are concentrating on cars, highways, and large-scale transit systems. In fact, there are numerous personal and societal benefits of bicycling and walking, ranging from thrift and individual health to community building and personal empowerment (Komanoff, 1993)[4]. walking and bicycling protect roadway and residential space; prevent the need to build, service, and expel automobiles; and save users of public space from the noise, speed, and intimidation that often characterize the usage of the motor vehicle. It also requires far less physical road (or sidewalk) space per traveler than the car. This is due to differences in both "vehicle" size and speed. Furthermore, bicycling and walking add little or nothing to congestion.

In terms of land use, bicycling and walking help solve problems of urban mobility, where motor vehicles have been both catalysts and creatures of dispersed, resources-intensive, nonurban settlement. These buttresses the economic and social vitality of cities; in conjunction with public transport, they enable travel to occur without motor vehicles; bicycling and walking in effect make possible the density that defines urban life and commerce.

Increasing bicycling and walking and decreasing the usage of vehicles tend to improve safety due to some reasons; (1) most bicyclist deaths and almost all pedestrian deaths occur in collisions with motor vehicles; (2) these support reinforce dense settlement patterns in which trips for work, personal business, and pleasure can be confined to shorter distances; therefore, a mile walked or bicycled an alternate for more than a mile driven, which affect in reducing accident rates per trip or per person; (3) road facilities improvement such as traffic signals and road condition problems enhances protection and orderliness of the road users; (4) increases in bicycling and walking also tend to give rise to political demand to reduce motor vehicle speed and frequency; hence growth in pedal and foot traffic can result in declining per-mile casualties, after a period of accommodation.

Commuting by bicycling and walking will produce quite less noise than roadway traffic that generates noise through a variety of mechanical, physical processes, including tires moving over pavement, engine exhaust, operation of engines and related equipment, the friction of brake shoes on drum or discs, operation of airbrakes, and transmission and drive train friction, as well as horns and alarms.

Finding variables of Walkability in in south-east Asia: comparing 17 Journals from Indonesia, Malaysia, and Thailand

17 Journals from 3 countries are compared in order to know how the regional researchers' perspectives and what variables they used to assess Walkability for the study case in these countries. The authors mostly come from the country where their research takes place. They analyze and evaluate the Walkability in relation to the planning practice, which focuses more on the environment's

[4] Transportation Research Record, Issue 1405, 1993.

physical condition as well as the perspective and characteristics of Pedestrians as users, and these journals have been presented at international events and seminars. The journals are six from Indonesia, five from Malaysia, and six from Thailand.

These countries are chosen because there is a similarity in (1) socio-culture and (2) geographical location, which is located in southeast Asia around the equator line. The resemblance is such as the human physical character, behavior, culture, habits, the way of social interaction, interaction with the environment, environment characteristics, weather, and climate. However, since there is still no identical culture between people in these countries, and there is a difference of planning policy in each country, it is interesting to know how the authors of the journals assess or evaluate the topic.

Indonesia

Authors – *Journal Title*	**Parameters/Variables**	**Source of Parameters**
Lana Winayanti **Antoni Tsaputra** **Putu Mandiartha** **Bakti Setiawan & Lukluk Zuraida** [*Walkability and Pedestrian Facilities in Three Indonesian Cities: Padang, Yogyakarta, dan Mataram, 2015*]	- Walking path modal conflict - Availability of walking plan - Availability of crossing - Grade crossing safety - Motorist behavior - Amenities - Disability - Obstruction - Security from crime - Government policy and institutions	Global Walkability Index (GWI)
Danoe Iswanto *[Pengaruh Elemen-elemen Pelengkap Jalur Pedestrian terhadap Kenyamanan Pejalan Kaki, 2006]* *[Translation: The Influence of Complementary Elements on Pedestrian Line for Walkers, 2006]*	- Category and facility - Positioning - Dimension - Material - Supporting elements - Circulation of motor vehicle	Rubenstein, 1987 Highway Capacity Manual, 1993
Sony S. Wibowo **Natalia Tanan** **Nuryani Tinumbia** *[Walkability measures for City Area in Indonesia (Case Study of Bandung), 2015]*	- Pedestrian conflict with other motorized mode - Presence walking facilities - Crossing availability - Safe crossing - Motorist behavior - Walking amenities - Walking infrastructure for disability - Obstruction - Walking secure	ADB Sustainable Working Paper Series, 2011

Fauzul Rizal Sutikno
Surjono
Eddi Basuki Kurniawan
 	
[Walkability and Pedestrian Perceptions in Malang City Emerging Business Corridor, 2013]
	- Support activity
	- Pattern of pedestrian movement
	- Important performance analysis (IPA)
	- Walkability
	  - Perception of physical condition
	  - Conflict with street / accident
	  - The ease of crossing
	  - Maintenance and completeness of supporting facilities
	  - Effective width of pedestrian way
	  - Buffer by roads
	  - Accessibility to pedestrian way
	  - Pedestrian way aesthetic and shade
		Walkability Audit Tool – US Department of Health and Human Services Centers for Disease Control and Prevention

Fritz Akhmad Nuzir **Haris Murwadi**	Online Questionnaire - Mobility choice	

Authors – *Journal Title*	Parameters/Variables	Source of Parameters
Bart Dewancker *[Evaluation of Pedestrian's Profile, Activity, and Environment in the City of Bandar Lampung, Indonesia, 2016]*	- Public transportation usage - Employment and education background - Social cultural capital - Financial income - Gender - Age - Physical condition	
Etty Agustin **Happy Ratna Santosa** **Bambang Soemardiono** *[The Application of Sustainable Urban Street Concept in A.Yani Surabaya Street Corridor Arrangement to Improve the Quality of Corridor Environment, 2014]*	- Mobility - Ecology - Community	- Greenberg et.al (2008) - EPA & Davis (2010)

Table 2.1. Indonesian authors and variables they choose to assess Walkability

Iswanto (2006), Sutikno (2013), and Nuzir (2016) assume that physical condition is one of the important variables that determine the success of a walkable environment. This term includes dimension, material, supporting elements, maintenance and completeness of supporting facilities, the effective width of pedestrian way, and pedestrian way aesthetic and shade.

Winayanti (2015), Wibowo (2015), and Sutikno (2013) have the same idea that conflict happened between Pedestrians and other street users should be noticed as a parameter. The conflict is not only between pedestrians and motorized vehicles but also between pedestrians and other non-motorized vehicles such as bikes or becak (Indonesia rickshaw). In addition, they also agree to use the variable of amenities, although Sutikno (2013) uses a more specific term: the ease of crossing. Furthermore, both Winayanti (2015) and Sutikno (2013) choose similar variables about the availability of walking plans and pattern of pedestrian movement. Sutikno (2013) stated that pedestrian movement patterns are influenced by age, gender, and motives. Based on the age of pedestrians, pedestrian movement can be divided into day and night movement.

In these six journals, it is only Winayanti (2015) and Wibowo (2015) clearly mention that safety is a crucial parameter consisting of crossing safety and security from crime. They also agree that the availability of crossing and walking infrastructure for disability are important to measure Walkability.

Moreover, Winayanti (2015) and her team are the only ones who assess the government policy. She concluded that there are no regulations at the national level that specifically address the planning and management of pedestrian networks. It is clear that private vehicles such as cars and motorcycles are the dominant transport mode and are prioritized compared to non-motorized transport modes. Although local regulations to support pedestrians exist, there are still obstacles in the limited budget, lack of coordination among related agencies, and non-existence of technical guidelines to support appropriate pedestrian infrastructure.

Meanwhile, although it is not specifically mentioned in the table, Agustin (2014) also uses a parameter of ecology and community – that is indeed related to environment and people – as well as mobility that shows the interaction between environment and users.

Malaysia

Authors – *Journal Title*	**Parameters/Variables**	**Source of Parameters**

Shuhana Shamsuddin
Nur Rasyiqah Abu Hasan
Siti Fatimah Ilani Bilyamin
 	
[Walkable Environment in Increasing the Livability of a City, 2012]
	- Pedestrian walkway
	- Destination
	- Safety
	- Pedestrian Facilities
	- Enjoyable element
	- Questionnaire
	  - Public travel pattern (walking, public transport, private car, w-pt-w, pc-pt-w)
	  - Reason for using private vehicle
	  - Reason for not to walk in city center
		Independent study

Juriah Zakaria
Norsidah Ujang
 	
[Comfort of Walking in the City Center of Kuala Lumpur, 2014]
	- Physical attributes and condition
	- Questionnaire
	  - Comfort
	  - Connectivity
	  - Accessibility
	  - Safety
		Independent study

Diyanah Inani Azmi **Hafazah Abdul Karim** **Mohd Zamreen Mohd Amin** *[Comparing the Walking Behaviour between Urban and Rural Residents, 2012]*	- Walking distance - Walking time - Walking speed	- Clarence Perry, 1929 - Clarence Stein, 1942 - Barton, Grant & Guise, 2003 - Green neighborhood guidelines by JPBD, 2011
Jamalunlaili Abdullah **Mohd Hafiy Mazlan** *[Characteristics of and Quality of Life in a Transit Oriented Development (TOD) of Bandar Sri Permaisuri, Kuala Lumpur, 2016]]*	- Population density - Land use - Walkway, open space, and parking - Distance	- Calthrope, 1993 - TOD Neighborhood Guidelines
Norhafizah Abdul Rahman **Shuhana Shamsuddin** **Izham Ghani** *[What makes People Use the Street?: Towards a liveable urban environment in Kuala Lumpur city centre, 2014]*	- Attractions on street - Activities on street - Proximity (commute distance) - Congestion - Supportive factors (public places, greener/trees, public amenities, maintenance and cleanliness and freedom of actions *Note: the parameter was used and developed to determine the design criteria of a liveable street.*	Independent study

Table 2.2. Malaysian authors and variables they choose to assess Walkability

Shamsuddin (2012) and Zakaria (2014) assume that safety and physical factors, such as pedestrian facility, enjoyable elements, physical attributes, and condition, are defining factors in the walkability concept.

Azmi (2012), Abdullah (2016), and Rahman (2014) three of them agree that distance, which could relate to land use, is one of the key points that make people walk. Azmi (2012) reported that in the Malaysian context, based on a planning report on a special development area in Malaysia (Berjuntai Bestari, Selangor), the comfortable walking distance of the various age groups within the duration of five minutes is different. Her earlier study showed that residents tend to walk the maximum distance

of 200 meters or less only to reach their community facilities from their houses before driving. At the same time, Rahman (2014) writes that distance from residence does affect the people's frequency of a visit to the street (location of research). The shorter the distance, the more often they use the street. People are much more likely to walk to a given destination if they perceive that the distance is not too far. The perceived distance can be influenced by the right type of land use and design characteristics. Design elements such as a continuous walking system that connect door fronts with transit stops or other destinations can create good connections. In contrast, Abdullah (2016) said that majority of housing units, especially the low-cost apartments are within 800 meters of LRT stations. Thus, most units are within the recommended comfortable walking distance from the LRT stations.

Only Rahman (2014) thinks that attractions and activities on the street, as well as engagement with public spaces, make people use the street. He said that attraction or desirability is related to the qualities engaged with by eyes, aesthetic values, and entertainment quality. The result of his study shows that functional factors were the strongest form that contributed to the use of the street rather than physical factors. Based on the survey he has done, the functional attraction according to the occasional and daily users on the street were shopping centers and the best place to earn money. It also proves that most people came to this street for shopping. The number of people will increase during festive seasons, especially for preparing for a religious festival. Consequently, when the time of these festivals is approaching, the street will move into high gear with lots of people on the streets and many trade activities. Additionally, the street also indicates a significant function in supporting economic and social activities. Although there are different types of development, the most vital generators are business and commercial activities. The result from the observations survey upon the street activities found that nodes of activities were more focused around shopping areas. Another reason for being on the street was to meet friends. People meet friends together and enjoy themselves in restaurants or shopping together. The presence of outdoor cafés and restaurants that provide wireless internet and air conditioning make the place suitable as a meeting place for people. Other activities such as visiting, relaxing, and entertaining were optional activities that were present on the street.

Thailand

Author – *Journal Title*	**Parameters/Variables**	**Source of Parameters**
Chatdanai Luadsakul **Vatanavongs Ratanvaraha** *[The Study of Walkability Index: a Case Study in Nakhon Ratchasima Province, 2013]*	- Walking path modal conflict - Security from crime - Crossing safety - Motorist behavior - Amenities - Disability infrastructure - Maintenance and cleanliness - Obstruction - Availability of crossing *Note: The study of CAI-Asia decidedly ignored the step of pedestrian count (the number of people walking) of a specific time period and route distance with the reason that such method might have defects since the pedestrians are more likely to unconsciously give information bias if they have a long-distance travel.*	- Clean Air Initiative (CAI) – Asia - Global Walkability Index (GWI)
Pornraht Pongprasert	- Questionnaire	

Author – *Journal Title*	Parameters/Variables	Source of Parameters
Hisashi Kubota *[Switching from Motorcycle Taxi to Walking: a Case Study of Transit Station Access in Bangkok, Thailand, 2016]*	- User: age, gender, status, income, occupation - Car ownership - Access distance - Residential location in CBD - Commuting during peak hours - Frequency of using transit - Commuting with family members - Picking up/dropping-off family members - Acceptable walking time and distance	
Sathita Malaitham **Atsushi Fukuda** **Varameth Vichiensan** **Vasinee Wasuntarasook** *[Measuring Pedestrian Environment in Term of Connectivity under Catchment Area of TOD in Developing Country: Case of Bangkok, Thailand, 2015]*	- Road classification and pattern - Intersection density - Proximity	Independent study
Yardphol Tanaboriboon **Jocelyn A. Guyano** *[Analysis of Pedestrian Movements in Bangkok, 1991]*	- Speed measurements - Sidewalks - Stairways - Siganlized crossings	Independent study
Chalat Tipakornkiat **Thirayoot Limanond** **Hyunmyung Kim** *[Determining an Influencing Area Affecting Walking Speed on Footpath: A Case Study of a Footpath in CBD Bangkok, Thailand, 2012]*	- Walking speed - Influencing area (length) - Pedestrian density	
Craig Townsend **John Zacharias** *[Built Environment and Pedestrian Behavior at Rail Rapit Transit Stations in Bangkok, 2009]*	- Walking behavior - Built environment - Floor space - Road networks - Road density - Road connectivity - Type of destination (that determines both land use and activity)	

Table 2.3. Thai authors and variables they choose to assess Walkability

Among the six journals from Thailand, five of them have their focus that has some similarities one each other. The priority determines the specific terms of their research concern. It is only Luadsakul (2013) that utilizes nine variables from CAI (Clean Air Initiative)-Asia that is based on variables from the Global Walkability Index (GWI).

Both Pongprasert (2016) and Malaitham (2015) use the distance variable to measure the success of a walkable environment. The farther distance from transit stations, the lower the share of walking, but the higher the shares of other modes are presented.

Tanaboriboon (1991) and Tipakornkiat (2012) are concerned about walking speed. Tanaboriboon (1991) measure the walking speed in three different lines; sidewalks, stairways, and signaling crossing. At the end of the research, he and his team found out that Asian pedestrians walk slower compared to their western counterparts, so local design standards are needed for pedestrian facilities in Asian

countries. In the meantime, Tipakornkiat (2012) measured walking speed in the specific length of the journey to know the average density of pedestrians. As a result, an influencing length in the range of 5-8 meters produces the highest correlation coefficient. In the case of high-density conditions, the walking speed of the equally-split flow (50:50) was found to be higher than other proportional flows analyzed.

Malaitham (2015) and Townsend (2009) confirm that it is necessary to consider road networks and patterns. Malaitham (2015) stated that road classification and their patterns had been thought to have an influence on a pedestrian-friendly environment; likewise, arterials were a significant barrier to pedestrian amenity and safety because of the functional features of arterials such as high speeds with high traffic volume (Hutchinson, 2011, in Malaitham, 2015). On the other hand, Townsend (2009) writes that a larger road network could influence the length of walking trips by either increasing the number of possible routes and activities or by creating possibilities for more direct walking routes. If there were many activities, it is possible that people would walk further because there were more possibilities for linked trips, or the experience was more enjoyable. In this way, the built area could provide inducements for shorter trips by clustering activities together or longer trips by creating activity nodes that attract many people walking to shop or undertaking other activities within the area.

Malaitham (2015), Tipakornkiat (2012), and Townsend (2009) approve that density influence the walkable environment. However, there are different focuses on density between them. Malaitham (2015) is concerned with analyzing intersection density. Ewing (2010) and Saelens (2003) in Malaitham (2015) said that on the basis of connectivity, the higher densities of intersections provide the opportunities for people to walk to more destinations with different route choices as well as shorter distances. Instead, Townsend (2009) chose road density and road connectivity as variables by assuming that they would serve as proxies for sidewalk networks. The areas with a higher road network density and road connectivity would offer more options for pedestrians and present a more permeable network that increases the number of choices and reduces pedestrian route length. On the other hand, Tipakornkiat (2012) researched the density of Pedestrians at certain lengths related to walking speed. He found out that pedestrians select their walking speed based on the crowd density in front of them. The group of pedestrians ahead in the influencing area (certain length of area) is the key determinant of walking speed rather than a few people immediately in front of Pedestrian further away.

From the comparison above, it can be summarized that among the six journals from Indonesia, each journal presents study cases in different cities in Indonesia. Although the authors of the journals use different variables to evaluate their study cases, generally, assessed streets are located in the city centers or on the main street. The authors from Indonesia evaluate streets by observing the streets' existing condition and by investigating points related to the utilization of the pedestrians, which associates with the user's level of satisfaction and habit. Five of six journals use walkability tools from literature, and only one journal develop its own parameter. In Malaysia's case, all assessment of Pedestrian is done in the city of Kuala Lumpur. The study cases vary, including Walkability within Transit Development (TOD), the livability of the city, and the comfort of pedestrians. Three of five journals develop their own parameters from their independent study, while the rest use walkability tools from literature. In the meantime, five journals from Thailand discuss Walkability in Bangkok, and another discusses a study case in another province. The journals investigate TOD areas and streets in the city center. One of the journals uses parameters from literature, while the other five journals

practice their own variables. In the end, variables utilized by more than one author from the three countries are 1) variables from Global Walkability Index, 2) environment physical conditions such as dimension, material, size, and aesthetic, 3) distance related to land use, 4) speed, 5) road network, pattern, and connectivity, and 6) density.

Global Walkability Index

The global Walkability Index used by Winayanti et al. (2015), Wibowo et al. (2015), and Luadsakul et al. (2013) is based on the Asian Development Bank (ADB) study on "Walkability and Pedestrian Facilities in Asian Cities." ADB adapted the principles of the GWI method, which was developed by Holly Virginia Krambeck and further developed with the World Bank in 2006. The GWI provides a qualitative analysis of the walking conditions, including safety & security, convenience & attractiveness, and policy support (table 2.4). It consists of a field walkability survey to assess pedestrian infrastructure in four areas: commercial, residential, educational, and public transport terminals. The survey also identified pedestrian preferences and analyzed government policies and institutional setup. The methodology is qualitative, but because it encompasses several key parameters, it provides a good insight into the current state of the walkability environment and enables the identification of areas for improvement[5]. Table 2.5 shows some authors in Asia and the parameters they used in their research based on the Global Walkability Index.

Component	Variable
Safety and Security	1. Proportion of road accidents that resulted in pedestrian fatalities (most recent year avail.) 2. Walking path modal conflict 3. Crossing safety 4. Perception of security crime 5. Quality of motorist behavior
Convenience and Attractiveness	6. Maintenance and cleanliness of walking path 7. Existence and quality of facilities for blind and disabled person 8. Amenities (e.g., coverage, benches, public toilets) 9. Permanent and temporary obstacles on walking paths 10. Availability of crossings along major roads
Policy support	11. Funding resources devoted to pedestrian planning 12. Presence of relevant urban design guidelines 13. Existence and enforcement of relevant pedestrian safety laws and regulations 14. Degree of public outreach for pedestrian and driving safety and etiquette

Tabel 2.4. Global Walkability Index – Summary of components and Variables
Source: Krambeck (2006)

[5] https://walkabilityasia.org/measuring-walkability/

Authors	Journal/Paper	Parameters used based on the Global Walkability Index (GWI)
Winayanti et al (2015)	Walkability and Pedestrian Facilities in Three Indonesian Cities: Padang, Yogyakarta, dan Mataram	1. Walking path model conflict 2. Availability of walking paths 3. Availability of crossings 4. Grade-crossing safety 5. Motorist behavior 6. Amenities 7. Disability
Wibowo et al (2015)	Walkability Measures for City Area in Indonesia (Case Study of Bandung)	1. Pedestrian conflict with other motorized mode 2. Presence walking facilities 3. Crossing availability 4. Safe crossing 5. Motorist behavior 6. Walking amenities 7. Walking infrastructure for disability 8. Obstruction 9. Walking secure
Luadsakul et al (2013)	The Study of Walkability Index: A Case Study in Nakhon Ratchasima Province	1. Walking path model conflict 2. Security from crime 3. Crossing safety 4. Motorist behavior 5. Amenities 6. Disability infrastructure 7. Maintenance and cleanliness 8. Obstruction 9. Availability of crossing
Minhas et al (2017)	Walkability Index by Global Walkability Index Method	1. Carriageway modal conflict 2. Walking path availability 3. Crossings availability 4. Safety of grade crossing 5. Behavior motorist 6. Amenities availability 7. Disabled infrastructure 8. Obstructions and barriers 9. Safety to crime

Table 2.5. Authors and parameters they used in assessing Walkability based on the GWI

Parameters used to evaluate the current condition of Walkability in the study case of Banda Aceh are

1. Availability of walking paths
2. Availability of crossing
3. Walking path modal conflict
4. Motorist behavior
5. Maintenance and cleanliness
6. Amenities (e.g., coverage, benches, public toilets)
7. Disability

Planning and Implementation Instruments in 3 South-East Asian Countries

The research about Walkability cannot be separated from the policy. To understand the role of the policy and planning system in Indonesia, Malaysia, and Thailand, each country is briefly explained

below. The complete comparison based on some planning variables can be seen in appendix chapter 2.

In Indonesia, the National Spatial Plan and the national strategic regional spatial plan are the spatial framework policies under which detailed provincial, regency/city plans are drawn up and regional development plans integrating several sectors and metropolitan spatial plans. The national infrastructure investment plan is a tool for resource allocation, while mid-term development plans are bottom-up instruments.

In Malaysia, the National Physical Plan is produced every five years by responding to the Malaysia Plan, the country's five-year Development Plan, and other national policies such as the industrial Master Plan, Vision 2020, and Agricultural Plan. The Structure Plan is produced every five years regarding the state's development and land use. A local planning authority can prepare the Draft Local Plan before or during the preparation of draft structure plans. Special Area Plans are for a specific area.

In Thailand, at the national level, the national five years plans. There are two types of statutory plans at the local level: a general/comprehensive plan for the entire municipality or a specially designated area and a specific plan for selected areas within the area covered by the general plan, which has not been applied in practice.

Chapter 3

Kaiserslautern: One of Best Practice Examples of Pedestrian Development

One of the important steps in understanding the term walkability is understanding how a system of walkability itself is built and run in the city. This chapter discusses Kaiserslautern as a role model for good walkability or what we know as a pedestrian-friendly city. Kaiserslautern is chosen because, in the last decade, statistic number shows more than 50% of people choose to commute on foot[1] , and this achievement is inseparable from the success of transportation management. Furthermore, below is the result of the investigation of the mobility situation in Kaiserslautern, the development stages of the pedestrian zone as well as public transportation, and the city transportation plan that controls the system.

Mobility in Kaiserslautern

Spatial Situation

Kaiserslautern is in the southwest of Germany, that is in the southern part of the federal state of Rhineland-Palatinate, between the Rhine-Neckar metro-region[2] in the east and the Saarland in the west. The city is in the Kaiserslautern valley and is surrounded by the north palatinate mountains in the north and west and the *Pfälzer* forest in the south and east. Kaiserslautern is a county-level city and the district administration point of the Kaiserslautern district.

In order to organize the transportation system, in considering the environmental protection, tolerable traffic, needs of mobility, and sustainable transportation system development, a set of traffic plans named *Mobilitaätsplan Klima+ 2030* (Mobility Plan Climate+ 2030) is made. This plan is funded by the Federal Ministry for the Environment, Nature Conservation, Building, and Nuclear Safety. The plan was developed as a part of the development of *Masterplan 100% Klimaschutz* (Masterplan 100% climate protection) as a technical sub-concept. It is intended to describe the real guiding principle of the city of Kaiserslautern for the next few years and to show what potential exists in the transport sector for reducing greenhouse gas emissions by 2030. Strategic objectives and guidelines are to define the future traffic development until the year 2030. In addition, it should also be a specialist contribution to urban development planning since urban structure, traffic development, and traffic events are closely linked.

Urban structure and land use

The urban area of Kaiserslautern covers 140 km^2 and is inhabited by a 102,542[3] population (2017). The city structure is characterized by the rather compact city center and the rural, embossed outlying districts very heterogeneous. The ROP (*Regionaler Raumordnungsplan* – regional spatial plan) Westpfalz has designated the city of Kaiserslautern as a regional center with the special functions of commerce, housing, and recreation. The function of the upper center is to be strengthened by the development of the infrastructure and the settlement of further enterprises. It also includes securing and improving public transport as an objective of regional planning. The urban area is divided into city

[1] As shown in diagram 2 and 3 on page 5 and 6.

[2] It is a polycentric metropolitan located in south western Germany, between the Frankfurt/Rhine-Main region to the north and the Stuttgart region to the south-east.

[3] Kaiserslautern city official website

center (*Innenstadt*) and nine local districts; those are Dansenberg, Einsiedlerhof, Erfenbach, Erlenbach, Erzhütten/Wiesenthalerhof, Hohenecken, Morlautern, Mölschbach, and Siegelbach.

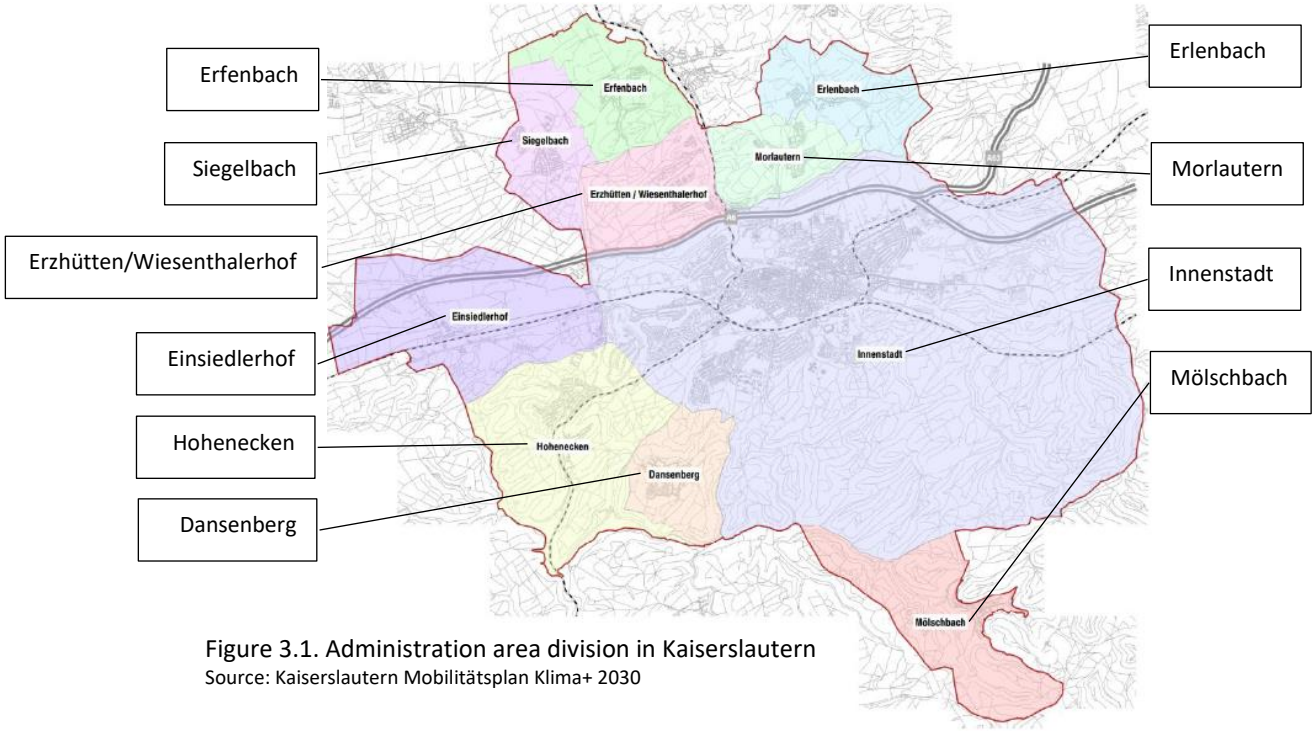


Figure 3.1. Administration area division in Kaiserslautern
Source: Kaiserslautern Mobilitätsplan Klima+ 2030

The outlying districts (9 districts) are predominantly residential areas. The local districts only partially have town centers with small-scale retail and local supply facilities (for example, Einsiedlerhof and Erfenbach). Meanwhile, Hohenecken, Mölschbach, and Dansenberg, are separated from the city center (*Innenstadt*) by extensive forest areas.

Meanwhile, the city center (*Innenstadt*) is subdivided into 9 area; Those are Kaiserslautern West, Innenstadt Nord/Kaiserberg, Bännjerrück/Karl-Pfaff-Siedlung, Innenstadt West/Kotten, Innenstadt Südwest, Innenstadt Ost, Grübentälchen/Volkspark, Lämmchesberg/Universitätswohnstadt.

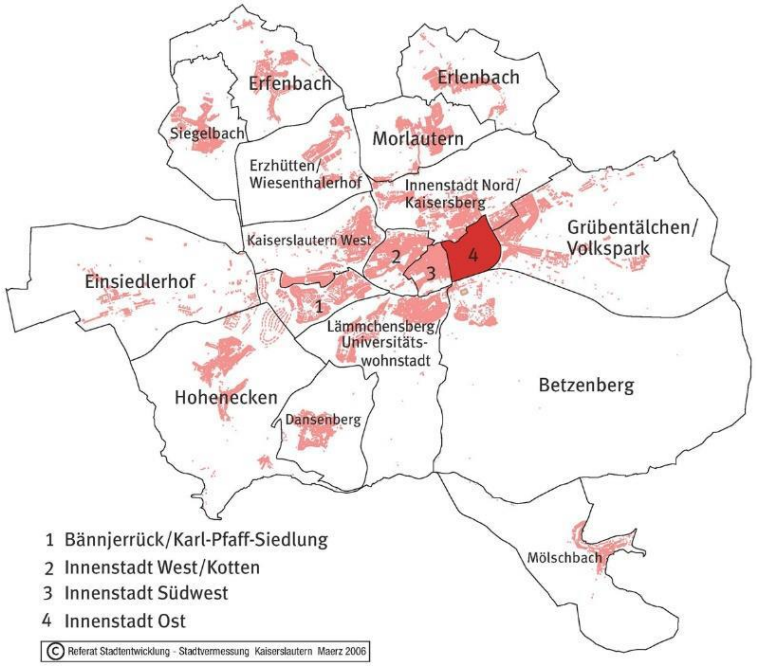


Figure 3.2. Administration area division in Kaiserslautern *Innenstadt*
Source: Kaiserslautern Mobilitätsplan Klima+ 2030

Commercial areas are located in the east (PRE-Park, Hertelsbrunnen-ring) as well as in the west (Gewerbegebiet-West, Einsiedlerhof) near the highway. Additionally, there are commercial settlements in the central area of the core city on the B37 and the industrial area north in the North of Siegelbach.

Due to the use of Kaiserslautern as an important location for the US military, some areas in the city are owned by the US military. The Kaiserslautern Military Community consists of approximately 52,000 military personnel and civilians (2013).

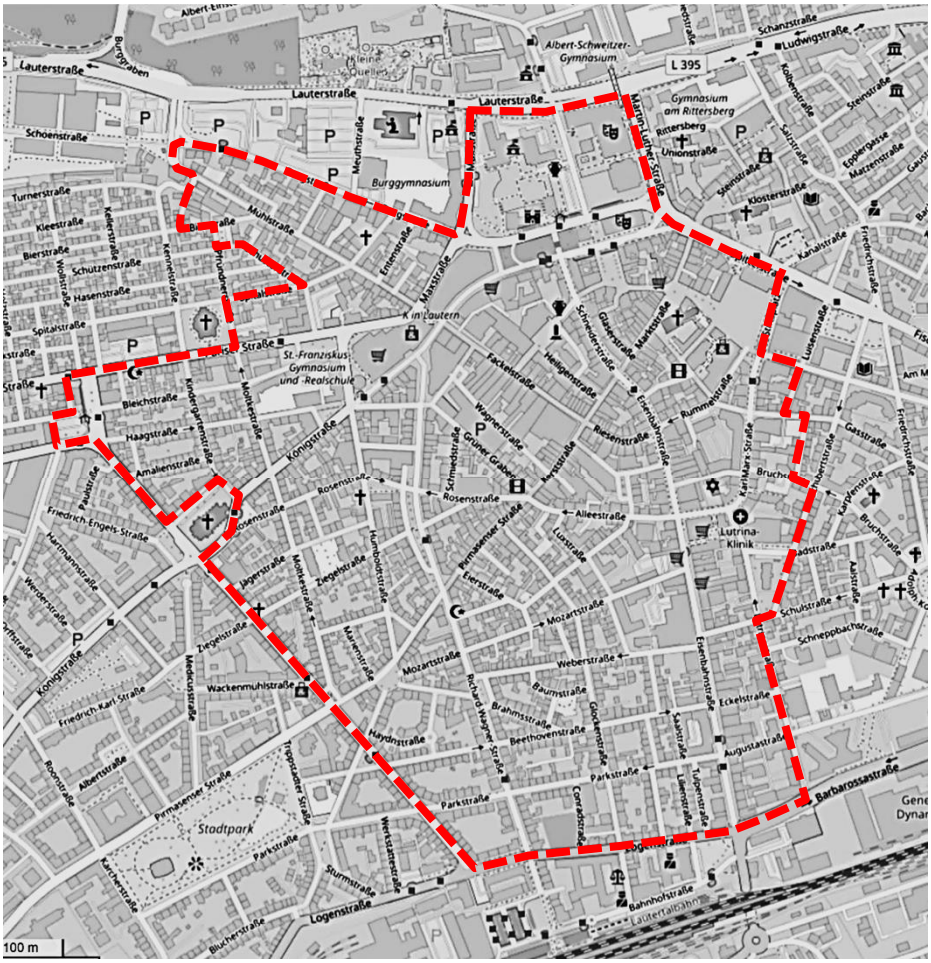


Figure 3.3. Area of the Kaiserslautern city center covered by Active City Center Program
Data source: Official website of Kaiserslautern city, map source: openstreetmap.org

There are two words of *Innenstadt* and *Zentrum* in German that are translated into English as "city center." It is necessary to distinguish and define each word because the meaning of the words is different in the spatial context. According to Duden Online Dictionary, *Innenstadt*[4] means *inner part of the urban area of larger cities, through which most of the main shopping streets lead; City, center*. In Kaiserslautern, as mentioned above, *Innenstadt* is the largest area of the city, surrounded by nine city-area (*Stadtgebiet*) and divided into nine city parts (*Stadtteil*). Innenstadt is the location where city administration and most economic activities take place.

[4] *Innenstadt ist innerer Teil des Stadtgebietes größerer Städte, durch den meist die Hauptgeschäftsstraßen führen; City, Zentrum*.

On the other hand, *Zentrum*[5] means *1) center, middle; 2a) central place, the starting and ... 2b) serving a specific purpose central*. According to the development concept approved by Kaiserslautern city council on 11th April 2011, under the program *Aktives Stadtzentrum Kaiserslautern*[6] (Active City Center Kaiserslautern), *Zentrum* is an area that includes the pedestrian zone, the surrounding area of Eisenbahnstrasse, the Mühlstrasse and the Richard-Wagner-Strasse as important shopping areas of the city as well as adjoining residential and mixed area (Figure 3.3). For the discussion ahead, the word inner city is used to refer to *Innenstadt,* and the city center refers to *Zentrum*.

Additionally, the "Active City Center Kaiserslautern" program is an urban development concept for the urban regeneration area, as an important basis for the development of the city center. With support from the Federal-State Program "Active City Center," urban development measures are to be supported in central service areas threatened by functional losses that are to be maintained and developed as locations for business and culture as well as a place for dwelling, working, and living.

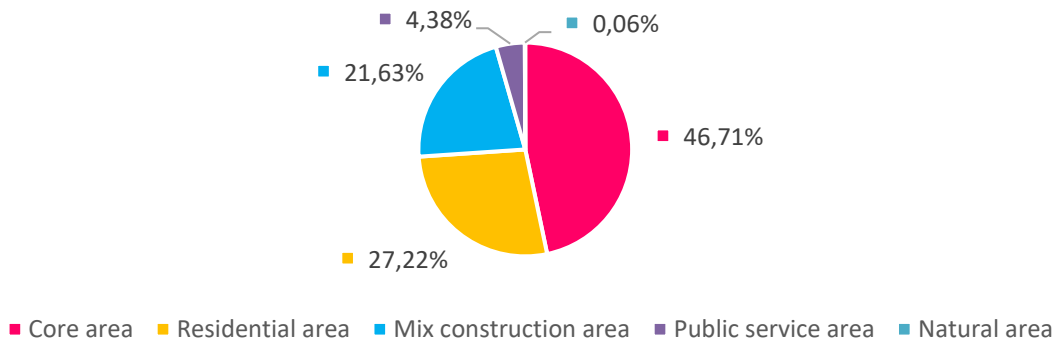
Education and Leisure

In the regional planning status, Kaiserslautern is a regional center (*Oberzentrum*), which has numerous education and training facilities. Secondary schools and vocational schools concentrate as far as possible in the city center. Primary and daycare centers are spread throughout the city.

There are two high-education institutions: Technische Universität Kaiserslautern (TUK), located in the north of the Lämmkesberg, and a college (Hochschule Kaiserslautern) with the former Kammgarn site located in Innenstadt Nord. In 2015, the number of students in HS-Kaiserslautern counted around 14,200, and in TU Kaiserslautern 2,500 students.

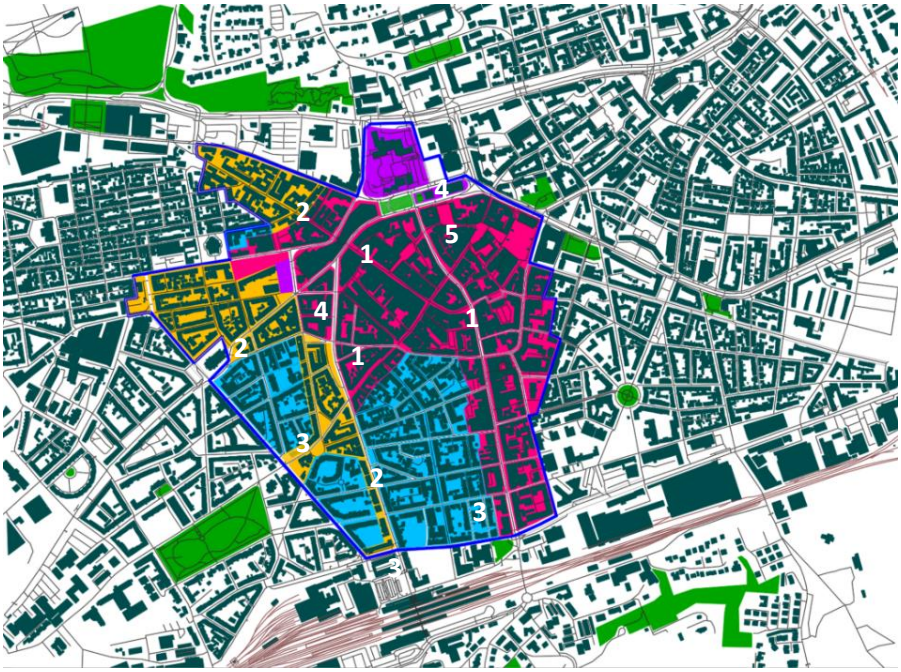
Kaiserslautern is a leisure center for the region Westpfalz. Free time destinations in the city center are the cultural institutions such as the Pfalztheater, the Fruchthalle, the cultural center of Kammgarn, the Pfalzgalerie, the Fritz Walter Stadium, regionally significant parks such as Gartenschau, Japanese Garden, and zoo in Siegelbach. The city center and the Gewerbegebiet West are also shopping locations with a regional catchment area.

Diagram 3.1. Percentage of land use in Kaiserslautern city center



[5] *Zentrum ist (1. Mittelpunkt, Mitte; (2a. zentrale Stelle, die Ausgangs- und… (2b. einem bestimmten Zweck dienende zentrale…*

[6] https://www.kaiserslautern.de/sozial_leben_wohnen/planen_bauen_wohnen/stadtfoerderung/039331/index.html.de



Legend
1. Core area
2. Residential area
3. Mix construction area
4. Public service area
5. Natural area

Figure 3.4. Land use of Kaiserslautern City Center
Data source: Kaiserslautern city's official website

Commuting Characteristic

Huber-Erler (2017), a practitioner who composed the document "Kaiserslautern Mobilitätsplan Klima+ 2030", reports that Kaiserslautern participated in the "Mobility in cities" in 2008 and 2013 in order to gain insight into the transport needs and traffic habits of the Kaiserslautern population. The survey, as a system of representative behavior survey (*System repräsentativer Verkehrsverhaltensbefragungen* - SRV), is used to determine mobility characteristics; for instance, choice of mode of transport, number of routes, etc. The data earned from the survey functions as an important basis data for municipal traffic planning. Every five years, development in the mobility behavior of the population can be recorded.

Route and choice of transport

Below is information about the mode of transport in passenger traffic, according to SRV evaluation results for the residents of Kaiserslautern in the overall traffic. As one thousand residents took part in the survey, a sufficiently large random sample enables representative statements regarding the mobility behavior of citizens of Kaiserslautern in the overall urban context.

Diagram 3.2 indicates that in 2013, 40.4% of all traffic was in non-motorized transport; that is 32.9% on foot and 7.5% on the bicycle. The environmental network (on foot + bicycle + public transport) covers a total of 52.2% of the routes. Compared to 2008, an increase of 6.4% can be observed within the environmental network. With a growth of 5%, the bicycle has the largest share in the changing choice of transport.

It can be stated that within the environmental network, the choice for using public transport decreased by 2.1 percentage points from 13.9% to 11.8%. It can be assumed that public transport users have switched to alternative offers within the environmental network; on foot and bicycle. The environmental network (on foot + bicycle + public transport) is strongly represented in 2013 with 52.2%, which is already considered to be a positive result within the framework of the climate-friendly mobility plan (Huber-Erler, 2017).

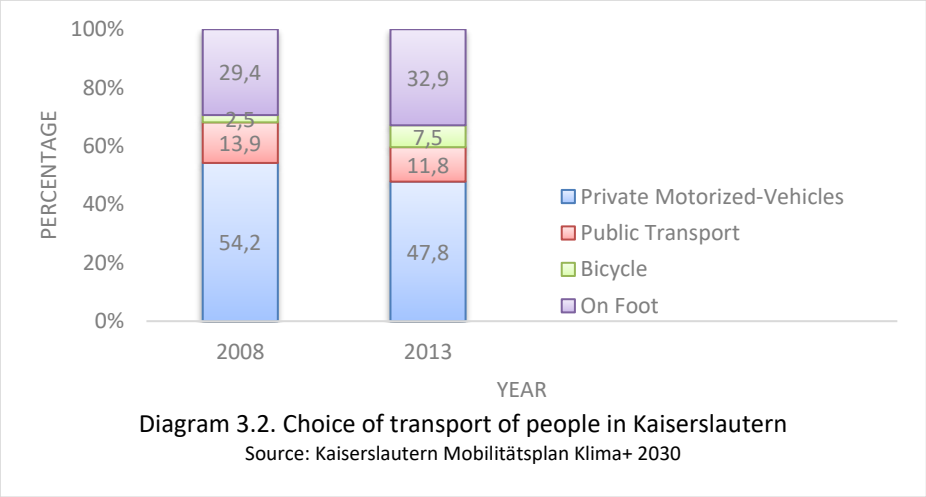


Diagram 3.2. Choice of transport of people in Kaiserslautern
Source: Kaiserslautern Mobilitätsplan Klima+ 2030

Type of traffic

Based on Kaiserslautern Mobilitätsplan Klima+ 2030, the traffic is distinguished based on the origin and the destination.

- Transit traffic (*Durchgangsverkehr*), journeys that pass through the urban area without stopping.
- Target traffic (*Zielverkehr*), journeys that start from the surrounding area and end in the urban area.
- Origin traffic (*Quellverkehr*), journeys that start in the urban area and end outside the city boundary.
- Domestic traffic (*Binnenverkehr*) journeys that take place within the urban area.

Diagram 3.3 shows that domestic traffic takes 83% of all traffic routes in Kaiserslautern. Obviously, going on foot is a trend, of which up to 38% of people walk to move within the city. As the second trend, up to 42% of people drive or go along with private vehicles. On the contrary, using public transport and bicycles is less favorable for commuting inside the city.

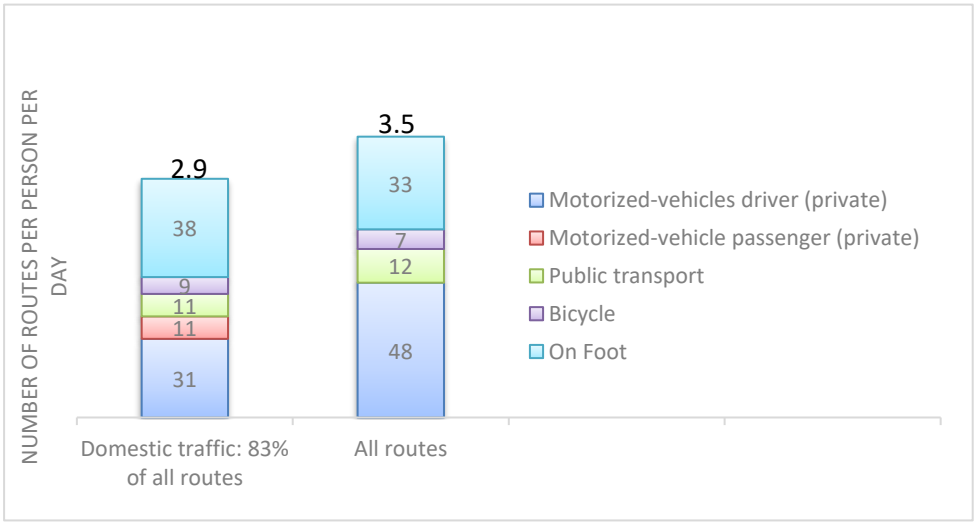


Diagram 3.3. Choice of transport according to specific traffic volume
Source: Kaiserslautern Mobilitätsplan Klima+ 2030

Purpose of trip

Diagram 3.4 illustrates the difference in the trip purpose of the Kaiserslautern inhabitants, which are separated into females and males.

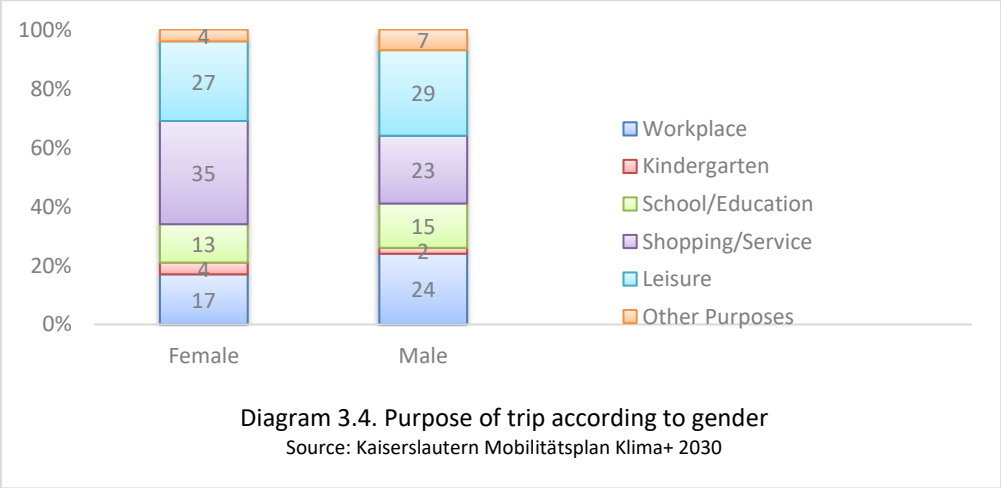


Diagram 3.4. Purpose of trip according to gender
Source: Kaiserslautern Mobilitätsplan Klima+ 2030

It can be seen that 34% of females commute for a job or education; of which 17% go to work, 4% go to kindergarten-take&drop, and 13% go to school/education. On the other hand, the overall share for males is 41%, of which 24% for ways to work, 2% for ways to/from kindergarten, and 15% for school/education. In addition, more females (35%) have the trip to go shopping than males (23%). In contrast, fewer females (31%) than males (36%) make the trip for leisure and other purposes in the city.

Availability of Means of Transport

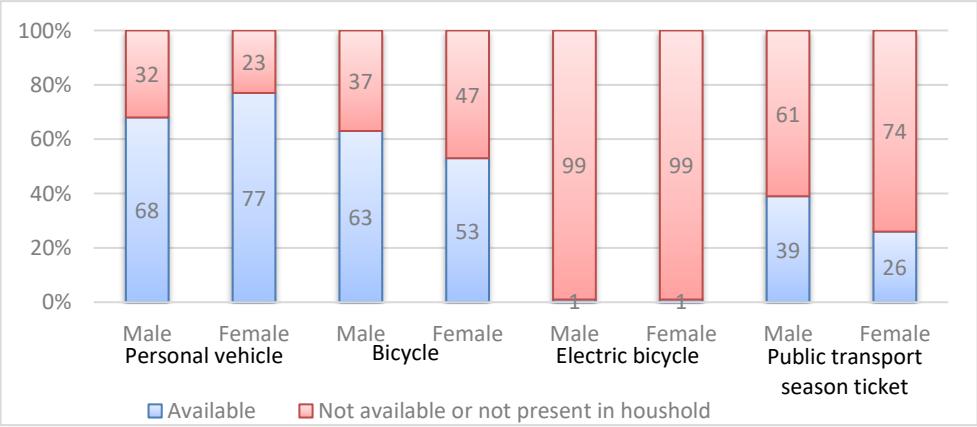


Diagram 3.5. Availability of means of transport according to gender
Source: Kaiserslautern Mobilitätsplan Klima+ 2030

Diagram 3.5 displays the percentage of various kinds of transport modes according to gender. More than two-thirds of female and male respondents in Kaiserslautern own one or more cars. In addition, 63% of males and 53% of females have a bicycle. The fact shows that electric bike plays only a 1% role in the population in Kaiserslautern. Furthermore, the public transport season ticket is also of secondary importance, with 39% of male and 26% of females respondents owning it.

Pedestrian

Kaiserslautern has a dense footpath network in the center. It is essentially formed by the sidewalks running along the streets. It is supplemented by separate walkways or combined walking and biking trails outside the road network.

The main idea of the pedestrian system development is the city center should be reached by walking as possible without detours from the adjacent area. The limit for a high acceptance of footpaths is usually about 1.5 km, which is equal to about 20 minutes walk. If this radius is placed around the middle of the pedestrian zone (city center), the center will have a catchment area that includes almost the entire core city as far as the main station (*Hauptbahnhof*). (appendix chapter 3, map 1)

Figure 3.5. Mozartstrasse

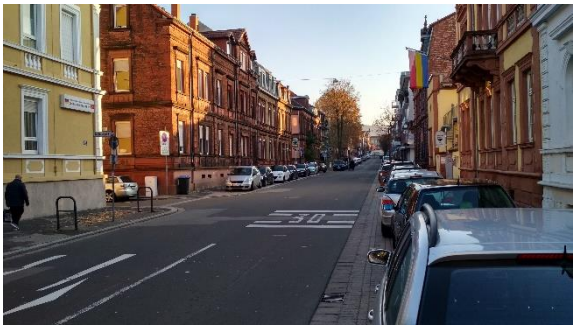


Figure 3.6. Richard-Wagner-Strasse

Source: personal observation

In Kaiserslautern, the width of sidewalks is distinguished according to the development and the traffic volumes.

- Residential and mixed areas: 2.1 – 2.5 meters.
- Mixed-use with high density and high traffic volumes: more than 3.0 meters.

On most of the important footpaths in the core area of Kaiserslautern, especially school and kindergarten paths, there are protective facilities on the roads for crossings, such as a pedestrian signal system (*Fußgängersignalanlagen* - FSA), pedestrian crossings (*Füßgängerüberwege* - FGÜ), and other crossing aids, such as center islands (*Mittelinseln*).

The center (*Zentrum/Stadtmitte*) with different destinations – leisure destinations as well as numerous shops and gastronomic offers – a pedestrian zone is established. In pedestrian areas and low-traffic areas, pedestrians have priority over other types of traffic. An exception is made in the pedestrian zone; delivery traffic is allowed from 19:00 to 11:00, and cyclists are from 19:00 to 9:30. The areas of the pedestrian zone in Altstadt and Bahnhofsplatz are generally open for cycling.

Public transportation

A Hundred Years of Public Transportation in Kaiserslautern

In order to investigate the development stage of public transportation in Kaiserslautern, a book titled *Einhundert Jahre öffentlicher Personennahverkehr in Kaiserslautern* (One hundred years of public transport in Kaiserslautern) written by Gerhard Westenburger is used as reference. This book is released by TWK Technische Werke Kaiserslautern Verkehrs-AG in 2005. Westenburger explains the development steps of public transport in Kaiserslautern between 1905 and 2005, from the traditional horse-omnibus to the current diesel-power bus.

- The tradition of Passenger Transport in the Kaiserslautern Region

Occasion and opportunity correlated to the tradition of passenger transportation in Kaiserslautern Region was a weekly market. The ever-popular Kaiserslautern weekly market, a fruit and vegetable market, was established in 1774. Due to its regularity, it opened Kaiserslautern to the region and vice versa. Mode of transport for people, animals, and materials was more and more in demand. In 1771, the society arranged that a fruit market was permitted to take place where the Fruchthalle is now standing. This fruit market was, by modern measures, a wholesale market. Without this important regional market, the Fruchthalle would not have been built in 1843. Since the end of the 18th century, vendors from the Electoral Palatinate region, especially Mannheim, were coming to Kaiserslautern to buy agricultural products from the area around Kaiserslautern on the fruit market and later in the Fruchthalle. Besides the market in the area of the Fruchthalle there was a badly equipped "Evening Market" where the townspeople could go shopping after work. Because customers from Kaiserslautern could not shop at the well-outfitted wholesale market, the "Physikalisch-ökonomische Gesellschaft" sought to upgrade the "Evening Market." The society circumvented the city council by directly contacting the Electoral Palatinate government in 1773. On the 24th of June 1774, the government decreed that a "Weekly Market" was to be established in Kaiserslautern. This caused a massive boost to goods and passengers' urban and regional transport. Farmers from the region around Kaiserslautern now come to town on a weekly basis. At first, the market only took place on Tuesdays. These regular trips offered, despite the loaded carts, rides into town. The "passengers," mostly only 2-3 people, rode back to their villages with the farmers in the afternoon.

The "city people" used this method as well to visit relatives in the countryside. The system continued to be in use even after 1848, when Kaiserslautern gained access to the railway. In the mid-1920s, some people made the cart as a business in transportation and served weekly trips to the market, where the ride into town took around 5 hours. The departure was in Steinbach am Donnersberg took place at 2 am. Passengers went shopping in the city, went to the doctor, or visited relatives.

There is an even later clue about the upcoming public transport within Kaiserslautern, namely in the city guide from 1902. This city guide mentioned that "omnibuses" were positioned near the main station for "arriving strangers." Research shows that apparently, these were "passenger carts" operated by private entrepreneurs who would occasionally wait for arriving trains and passengers at the station.

- Kaiserslautern as an Exhibition and Trade City

At the beginning of 1900, Kaiserslautern was a city of the exhibition center and was described as a wealthy and magnificent city. The industrial and trade event "Palatinate Trade Museum" had the exhibition built around the "Trade Museum," which nowadays is known as Palatinate Gallery. The newspaper said that the city had been "accommodating"; the museum street was opened, and it was equipped with a water line and leveled roads. As in the previous exhibition, the traditional names of the local industry were represented again, such as Pfaff, Pfeiffer, Zschoke, die Eisenwerke, die Gebrüder Kayser, Schuck, Marhoffer, and many others.

Within the 4th Exhibition, some entrepreneurs were interested in the transportation business in the form of horse-omnibus. The horse-omnibuses commuted people between the exhibition and the main station. The route went through the Eisenbahnstraße, Fackelstraße and Fackelrondell.

The demand for transportation leads to the addition of routes. The most profitable routes were to the graveyard and the new barracks in the east of the city. The horse buses did not have a timetable; however, they drove per appointment, e.g., for funerals or on Sundays to the Waldschlösschen, the starting point for strolls. Other points of reference were the trains' arrival and departure times at the main station.

Horse buses kept running until the end of World War I. In the first years of the war, there was a lot to do because of the significant need for transportation in the direction of the barracks. From September 1916 onwards, the horse buses stood in competition with the municipal tram.

Figure 3.7. Market in Stiftsplatz in 1903
Source: One Hundred Years of Public Transport in Kaiserslautern

- The Born of Municipal Tram

In 1911, the city council agreed the city take over the tram for a fixed price. It was an offer from a business which are ready to build and operate the tram. After two years, the company Hecker & Co signed a contract to build a “tram for the city center,” and a stock company was established. This was the beginning of publicly funded public transport in Kaiserslautern.

After the completion of the plan in 1914, the operation of the tram was not possible because of the lack of material needed to build the infrastructure. At this time, everything was focused on the war against the “arch-enemy” in the west.

The first wagon arrived in the city in the middle of the year, but It started to serve passengers after two years. There were three lines operated.

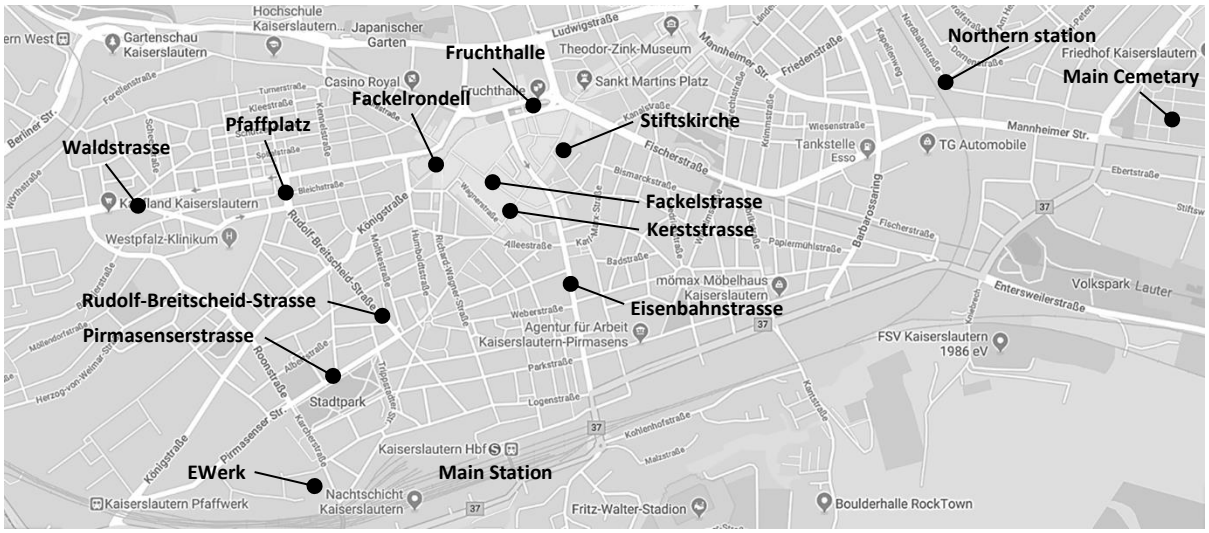


Figure 3.8. Places passed by trams in 1916
Data source: One Hundred Years of Public Transport in Kaiserslautern, map source: openstreetmap.org

Line 1	:	Main Station – Wittelsbacherplatz (Pfaffpaltz) – Fackelrondell – Northern Station
Line 2	:	Main Station – Eisenbahnstrasse – Westernstrasse
Line 3	:	Pariserstrasse near Waldstrasse – Wittelsbacherplatz – Luitpoldstrasse (Rudolf-Breitscheid-Strasse) – Pirmasenserstrasse – Kerststrasse – Stiftskirche – Cemetery

In 1925, there was some modification to the three tram lines. The old line 1 drove from the main station over the Wittelsbacherplatz (Pfaffplatz) to Fackelrondell; line 2 drove from the main station through Eisenbahnstrasse and Riesenstrasse to Fackelrondell; and line 3 drove was the "circular line" from the main station over the Wittelsbacherplatz, Fackelrondell, and Eisenbahnstrasse, back to the main station. In the same year, the line Tripstadterstrasse (EWerk), the main station to the northern station, was open. The tram now was at its longest expansion with a rail network of 9,3 km, while it was 4,5 km long in 1918 and only 3,98 km were still being used in 1932, which is line 1 from the main station to the cemetery.

Although Kaiserslautern city center had crooked and narrow streets, the tram company laid wider tracks (railway tracks) instead of the smaller ones which were used in other cities. The background of this situation was the planners wanted a direct connection to the railway system that made freight wagons could also drive through the city. The width of the tracks would have been right, but the track profile made it impossible.

Figure 3.9. Strassenbahn in Kaiserslautern
Source: One Hundred Years of Public Transport in Kaiserslautern

- Tram-Network Development

The idea to connect the Lautertal with the city center was discussed because it was a prospective business, and the electricity plant company would like to fund the project. The line planned was to go from Lampertsmühle to Otterbach and Katzweiler, with a junction to Otterberg. All the communities along the planned route approved it, but the Mayor of Kaiserslautern did not agree. He preferred the expansion of lines within the city. The post then gradually took over the connection to the surrounding villages. Furthermore, the year 1925 was the year of the tram. The first World War destruction was forgotten and repaired, and Lautern had come out of it well. The city was thriving in the "Roaring Twenties."

The Kaiserslautern started to operate three tram lines that were equipped for one-man operation. A significant push for the tram was caused by the opening of the exhibition park on the 1st August 1925 in the east of the city. Revenue surplus was invested into the renovation of the system. Even though

the line from the main station over Fackelrondell to Stiftsplatz was extended to the northern station, enthusiasm for the tram was dwindling. From 1926 onward, the operation was limited. Nevertheless, the tram company still bought four new engine wagons. Based on files and news reports from 1925 to 1926, it becomes clear that the track layout should be desirable. A favorable layout was also not found in the next nine years until the closure of the lines. Route tests were always established, discontinued, and then used again.

At the start of 1928, the city started to handle the tram management, of which the condition of the tram system had continually worsened. 150.000 German Mark needed to be raised immediately for repairs, but this sum could not be provided. The city only made repairs where it was most necessary. The traffic to an exhibition was improved because *Kerwe* was supposed to take place there starting May 1928. No new tracks needed to be bought because existing routes were being dismantled.

The tram got ever more unpopular at the end of the 1920s, and the timetable was already unreliable in the 1930s. The vehicles derailed often, and 2-3 hours delays were similar to the initial years of service (1917).

Furthermore, the route of the tram through the narrow streets in the city center caused a lot of problems. People felt restricted in their freedom of movement by the trams. Undoubtedly, the route layout in the city center was a planning mistake, and it was apparently very hard to keep to the calculated speeds. For example, the tram drove through the narrow street at the Spinnrädel to get from Schillerplatz to Marktstraße. The corner from the Fruchthalle in the direction of Schillerplatz was so tight that the wheels squeaked and screeched in their tracks, and this happened every 15 minutes. There was so much strain on the tracks in this corner that they needed to be replaced every six months.

In a statement by the tram company in 1929, it was announced that a few lines would not be operated anymore. In the summer of 1931, only Line 1 from the main station to the cemetery remained, the old "Cemetery Line / War Line." Two years later, the city had a report about the profitability of the tram, in which the result showed "unprofitability." In August 1934, the city council decided to abolish the tram and replace it with buses.

- Bus system development

The city bus started to operate in July 1935 with seven vehicles with diesel engines to serve five lines. The lines can be distinguished through differing colors. The seven buses are stored in the municipal vehicle park in the Augustastraße.

Line 1 (Red)	:	Reichsbahn – Ausbesserungswerk (Einsiedlerhof) – Main Station – Cemetery (as a shuttle service)
Line 2 (Blue)	:	Gaswerk – (on Königstrasse) – Cemetery – Main Station – Mannheimerstrasse – Benzinoring – Fackelrondell – Gaswerk (as a ring line)
Line 3 (Yellow)	:	Pfaffenbergstrasse – EWerk (Karcherstrasse) – Schillerplatz – Main Station (as a shuttle service)
Line 4 (Green)	:	Wiesenthalerhof – Fackelrondell – Steinstrasse – Northern Station (as a shuttle service)
Line 5 (Brown)	:	Reichsbahn – Ausbesserungswerk – Fackelrondell – Steinstrasse – Northern Station (as a shuttle service)

In 1939, there was an important change in the structuring of the company. The "Kaiserslauterner Omnibusbetrieb" (KOB), which was part of a municipal vehicle fleet, gained independence through a change in law and now had its own administration. This is the hour of birth of the Municipal Transport Services.

Figure 3.10. City bus of Kaiserslautern in 1947
Source: One Hundred Years of Public Transport in Kaiserslautern

During the early World War II, buses were being used more than ever. Petrol was being rationed shortly after, and drivers, especially motorcyclists, switched to buses. From 1941 to 1943, the Municipal Transport Service manage to acquire six more trailers. In 1944, they added another high-capacity trailer.

In August 1944, the city center of Kaiserslautern was bombed. Kaiserslautern didn't no longer become a magnificent city as described at the beginning of the 20th century. The shops and garages of the city's vehicle fleet in the Augustastraße are destroyed by mainly fire bombs. Despite all the damages caused by the war, the Municipal Transport Service was closed.

In 1946, 12 buses and one trailer were functional again. Although the bus traffic within the city has not yet resumed, the Municipal Transport Service immediately instated an intercity-commute line at first between Kaiserslautern and Pirmasens and got extended in the following years. Using this commute system, 1000 workers get into the city every day. Other lines drove to Kottweiler-Schwanden, Siegelbach, Mehlbach, Niederkirchen, Hefersweiler, Nußbach, Gehrweiler, Sembach, Morlautern, Erlenbach, and Otterberg.

The Year 1947 was a historic year for the Municipal Transport Service because the buses within the city started driving again, and the bus system continually expanded. During the year, they calculated the cost and developed concepts and plans before the council to convince them about the trolley bus. The problem that occurred was financial and infrastructure matter. The council decided only to buy two instead of 10 buses from Daimler-Benz.

Finally, the last phase of infrastructure construction was finished in 1949; the power supply system and the overhead wires were all installed. Besides that, the destroyed garages and workshops in the Augustastraße were rebuilt. Five old trailers that had been bought during the war were functional again.

- Trolley Bus in Kaiserslautern

In October 1949, the first two trolley buses drove on Line 1 from Vogelweh to Panzerkaserne. The number of passengers rises continually. On average, 13 million passengers are now being transported annually. In the first annual report, the number showed the accomplishment of the Municipal

Transport Service for line 1. The buses drove 270.000 km and transported 1,797 million passengers. The trolley bus line from Vogelweh to the cemetery operated at full capacity from the beginning and provided a significant amount of transport within the city. Later, the Municipal Transport Service extended the route to Panzerkaserne as a single lane. Because of rising demand, the trolley buses now drove with trailers. In times of little traffic, the trailers were left at Panzerkaserne and docked on again as needed.

In addition, in the early 1950s, Kaiserslautern got the “golden time” as there was activity everywhere. At this time, people had no difficulty finding jobs. In the later years, everyone who doesn’t have a “Käfer” (VW Beetle) takes the bus. Mainly on Line 1 from the Barracks to Vogelweh, the buses are constantly “booked out” not only during rush hour but all day long. Although the Americans had left and had handed Kaiserslautern over to the French in July 1945, a few had returned in October 1950, and in April 1951, the first official American units were stationed in Kaiserslautern. In October 1950, the first apartment blocks were being built in the Vogelweh area. This disposition of the pentagon was in accordance with the geopolitical situation at the time. The long valley from east to west in the middle of the forest, behind the Rhine, promised a lot of strategic advantages. The city’s bus traffic profited as well. Hundreds of workers commuted between their homes in the city and the Vogelweh every day. The Americans may drive their big cars, but some American families were to take the bus as well.

In 1952, the Municipal Transport Service started to use its first high-capacity bus and eight trailers. Until the beginning of the 50s, 43 new buses had been bought. All the parking spots in the Augustastraße were occupied, and a new bigger depot was needed.

In 1954, the vehicle encompassed 21 omnibuses, ten trolleybuses, and 16 trailers. In the following year, the staff has grown to 240 employees, which consist of technical and administrative staff. It shows that there was a completely different approach to the organization and the bus network. Meanwhile, the area of the city was not significantly bigger in 1955 than it was in 1935. The American residential area on Vogelweh had been added, but nothing else. The big city expansions, new challenges for public transport, happened in the 60s: Auf dem Seß (1960), Sonnenberg (1962), Bännjerück (1963) and Betzenberg in 1966-1967.

Unlike, in the beginning, the network this time was not solely focused on bringing people to their place of work anymore. There is now a need for normal transport of passengers within the city. All-important ending points were included, from Vogelweh to the barracks in the east of the city and from the main station to the Waschmühle. The lines to Bännjerrück, Eselsfürth and from Casimirring to Lindenhof are set up.

The economic miracle was already in full swing, and the Municipal Transport Service contributed its part to a working infrastructure in Kaiserslautern. In 1955, ten years after the end of the war, statistics show around 12,5 million passengers had been served. In addition, the east-west axis was opened this year. The Municipal Transport service used this opportunity to get a new wider road system. One year later, the first bus bays were constructed, mainly along Line 1, which was on the new east-west axis. There was one more renewal: The stops received new nameplates, timetables, and bins. They own an impressive fleet of high-capacity buses.

In 1968, 28 omnibuses and 13 trolleybuses were in use to commute as public transport within the city. Three years later, the payment system was changed from a section fare to a zone fare. This was a simplification, and the possibility of ticket machines could be considered.

Figure 3.11. Trolley bus in 1956
Source: One Hundred Years of Public Transport in Kaiserslautern

In 1972, New buses arrived at the depot. The buses got equipped with radio communication systems and have switched to the operation without a conductor (one-person operation). The Municipal Transport service has come up with a new marketing slogan which is supposed to attract more passengers in the days before Christmas: “We drive you shopping.” Simultaneously, Park+Ride facilities were established in the company car park of Pfaff and the Messeplatz.

In a paper from the 7th February 1977, that was portably written to be presented to the city council, there was a short balance from the Municipal Transport service with some interesting numbers: Since the end of the war to February 1977, 353 million passengers have been transported, 58.5 million km were driven, and the network has grown to 111 km.

Since the trend of trolleybuses decreased due to the cost and environmental issues, the city council 1985 decided to break down the trolley bus system. At this time, only three of 58 cities in West Germany were still using trolleybuses that is Esslingen, Solingen, and Kaiserslautern. In addition, the more advanced diesel technology also becomes an argument for abolishment. The last trolley buses drove in the first week of January 1986 until the diesel bus traffic was ready. In the second week, the overhead cables were turned off the wiring was dismantled.

Special bus lanes were started being used. The trouble with car drivers, who up until then could park on parts of the route, was defined. Only buses are allowed in this lane; even taxis and delivery traffic were not permitted. The city paid for the construction of this special lane, and the police proposed it. In official reports, it was mentioned that in police analysis, they found the right lane was being used relatively little in this area. That is how the idea of a bus lane came up.

In the same year, the new Line 14 drove to Uni-Wohngebiet was inaugurated by the mayor. The speech by the mayor shines a light on the current situation of public transport, especially bus transport in Kaiserslautern. The mayor stated that the characteristic of bus traffic in Kaiserslautern and the whole country is chronic unprofitability. The tariffs would lead to a further drain of passengers from buses towards cars. Despite the cheap tariffs, there has been a reduction in passengers in the last years in Kaiserslautern as well; it can be ascribed to growing unemployment rates, the lower number of school-aged children, and probably also the very low price of petrol in the last few months. From experience, it can be said that the price is not the dominating factor in the acceptance of public transport. What is more important is whether the overall conception of the bus transport is accepted by the populace. That means that timetables need to be constructed with the demand in mind. There is currently an examination by the municipal services concerning this topic. The first consequence of this examination

is the institution of Line 14, which supports the main line on the east-west axis until Rauschenweg and then continues straight on to the Uni-Wohngebiet.

Furthermore, Technische Werke Kaiserslautern organizes a street festival in the Uni Wohngebiet in celebration of the opening of Line 14. Three vintage buses drove between the stop Rathaus and the Uni Wohngebiet all day long. During the exhibition "Pfälzer Land" on the Messeplatz the next year, the Municipal Transport service presented a new ticket printing machine. In 1988, the first electronic ticket printing machines started being used. In addition, the student ticket was introduced, and a new Line 15 was established in 1992, which runs from Uni-Wohngebiet to Schillerplatz.

In the year 1991, there was again a significant change in the structuring of the company. At the end of the year, the city council made the following decision: The "independent" Stadtwerke Kaiserslautern gets converted into the "Technische Werke Kaiserslautern GmbH," which means the company got released from the care of the administration into the free market. The decision by the city council was valid retroactively from the 1st of June onwards. Factually, the change gets implemented in January 1992. At the same time, the TWK GmbH gets split up into the Versorgungs-AG (supply) and the Verkehrs-AG (traffic).

The TWK Verkehrs-AG starts an experiment in 1991 with the "rapeseed-oil bus". The Ministry of Agriculture in Rhineland-Palatinate has given the mission to the Institute for Engines and Machines from the TU Kaiserslautern to develop a new concept for rapeseed-oil engines. The TWK, in turn, declared itself to be ready to test out the buses powered with rapeseed oil. The project started with two buses and only ran for one year, from April 1991 to Mai 1992, due to some technical matters and price.

In December 1993, a report about the "Management of the traffic system in Kaiserslautern" is published. The evaluation was started a year earlier by the state government. The result: More bus lanes need to be constructed, and a priority system for traffic lights must ensure a smooth run for buses. During the year, there were 28.000 people commuting in and 6.000 people commuting out of the city every day.

In 1994, line 17 to Erfenbach is established, and in 1995, the bus line gets extended from Lothringer Dell to Pfaffplatz. In 1996, "One ticket price for all of Kaiserslautern" was implemented that replaced the zone system. Additionally, eight traffic lights that give priority to buses were installed.

As a joined subsidiary by RSW and TWK, the "Westpfälzische Nahverkehrs-Service GmbH" is founded in 1997. Its tasks are the maintenance and cleaning of the buses. The RSW depot is transferred to the TWK site in Stiftswaldstraße 4.

In the year 2001, the driving staff of the municipal transport service did ecological training for energy-efficient driving in partnership with Mercedes Benz. The drivers had been taught how they could affect fuel consumption through careful driving. Before the course, the route was set. Then the route was driven, and the fuel consumption was recorded. The effect was convincing, of which an 11% reduction in fuel consumption could be achieved. In daily operation, where situations are often more complicated and unpredictable, a reduction was observed by 3-4%.

Verkehrsbund Rhein-Neckar (VRN)

The VRN is an association of local authorities and transport companies for the joint and coordinated implementation of local public transport in the network area of Rhein-Neckar and was founded in 1989. It is based on the cooperation of the ZRN (Zweckverband Verkehrsverbund Rhein-Neckar), which has 24 districts, urban districts, and independent cities and the three federal states of Baden-Württemberg, Rhineland-Palatinate and Hesse, and its subsidiary VRN GmbH (VRN company) with more than 50 transport companies operating traffic, of which Kaiserslautern is part of the association.

The transport association aims to increase further the attractiveness of public transport in the network area by securing, improving, and expanding it.

In its implementation, the local transport in each city is managed by the city's government/institution. The function of the VRN, in this case, is to determine the tariff and the service range related to the tariff.

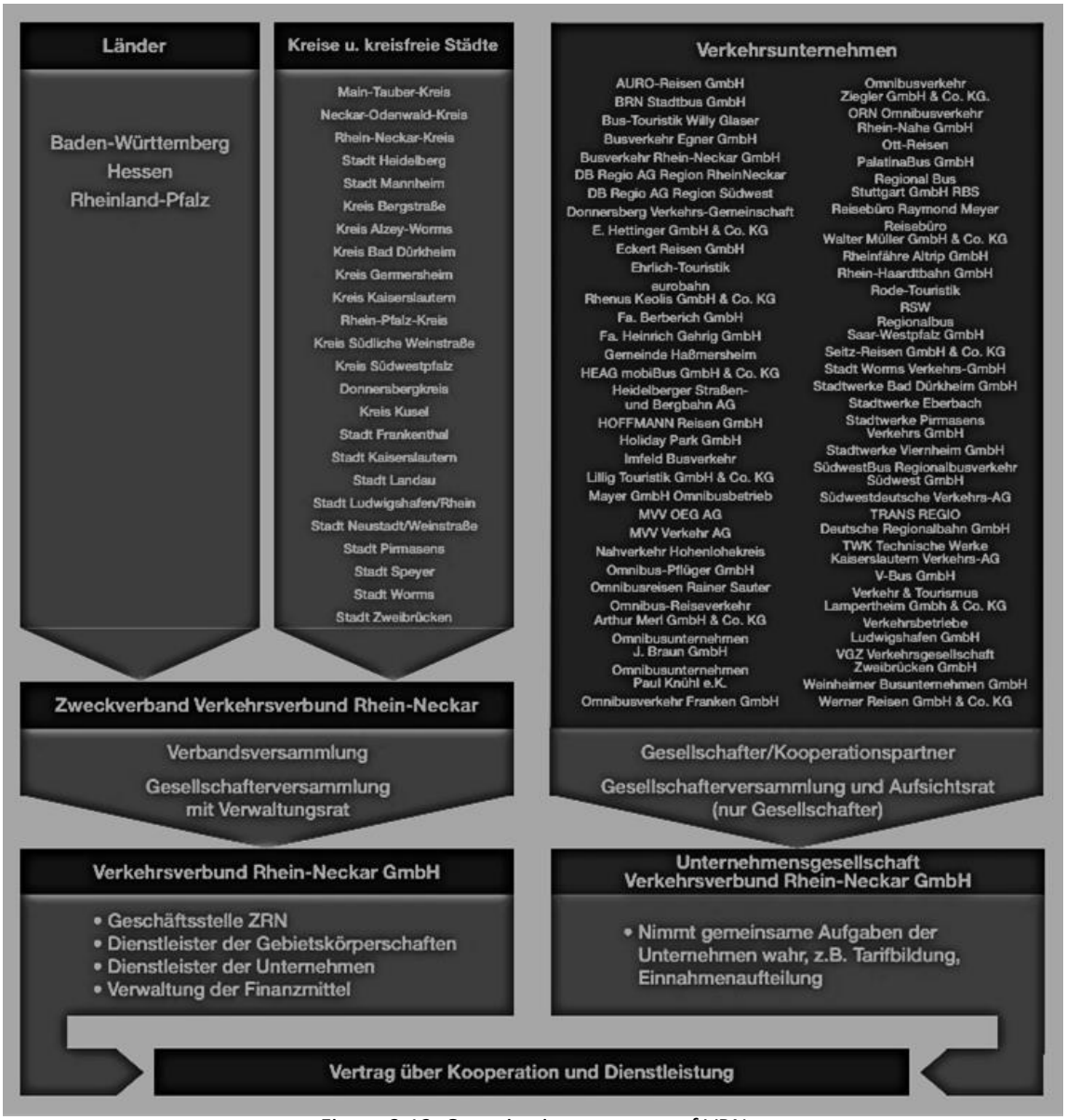


Figure 3.12. Organization structure of VRN

Source: VRN Verbundbericht 2006

https://www.vrn.de/service/downloads/verbundberichte/dokumente/verbundbericht_2006.pdf

The city Bus

The city of Kaiserslautern is served by 14 city bus lines, which is operated by Stadtwerke Kaiserslautern Verkehrs-AG (SWK). The 14 lines are 101-108, 111, 112, and 114-117. The 13 lines connect the districts (*Stadtteile*) with the city center; line 116 is a supportive line between the main station and the university. The linking point (connection hub) of all lines is the Stadtmitte stops in Burgstraße and Fruchthallstraße.

The main lines of the network are the lines 101, 102, 104, and 105/107, which open up as the diameter lines in 15-minute intervals, in the neighborhoods of the city center (*Innenstadt*). The lines 101 and 104 runs in an east-west direction through the city, the lines 102 and 105/107 north-south direction. Due to the location of the main station in the south of the city center, only the north-south lines have a direct connection to the main station.

In the outskirts of the city center, the lines for an improved area development in sub-lines are divided into 30-minute intervals. For line 105/107, this is indicated by the different line numbers 105 and 107; in the other lines, different destinations are approached with a line number. Line number 101 also includes the radial line Stadtmitte - Einsiedlerhof, which, together with line 114, reinforces the 15-minute basic line of line 101.

Lines 103, 106, 108, 111, and 112 connect the local districts (*Stadtteile*) with the city center. They are radial lines without direct connection to the main station and are served in 30- or 60-minutes intervals. Lines 114, 115, 116, and 117 serve as radial lines for additional functions in the development of the university and PRE-Park/Hertelsbrunnenring industrial area. The local district Siegelbach is served in daily traffic from Monday to Saturday by the regional bus lines 140 and 141, Eselsfürth by the regional bus line 137, and Espensteig by the regional bus line 160. The route of the city bus lines and the supplementary regional bus service in the local districts can be seen in appendix chapter 3 map 2.

The bus service's adaptation to the changing demand for daytime traffic Monday to Friday and lower demand periods in the evening and on the weekend is achieved by a lower frequency of operation and by the number of lines of the operated lines.

In the low-demand periods, essentially, the four diameter lines and the lines 106 and 112 are served. The local districts are served in different ways by the main lines. This makes the comprehensibility of the offer partly difficult. The district Hohenecken, for instance, depends on the time of day via lines 101, 104, or 111 accessed on different routes. The extension of the main line in the local district significantly extends travel time.

On nights at weekends and before public holidays, SWK provides a night bus service. In this way, city and regional bus lines are linked to form a separate line network. Within the city of Kaiserslautern, the lines and line names are based on the lines of daily traffic.

At the Stadtmitte bus stops, the transfer is supported by a “Rendezvous” system. Every 15 minutes during the day, every 30 minutes in the evening, and every hour in the night bus service, common departures of several lines take place. There is connection security given that the buses are waiting for each other. The timetable provides for a three-minute transfer time. The timetable also includes buffer times in the driveway to the Stadtmitte bus stops to enable connection even in slight delays.

All lines are served by low-floor and diesel power buses. On lines 101, 104, 105, 114, 115, and 116, articulated buses are used as a rule. Due to the regular procurement of new vehicles, normal operation can largely be carried out with vehicles compliant with Euro 5 and 6 emission standards. Older emission standards are still used for the school bus and other supportive vehicles.

Due to the high number of bus stops in the city, the accessibility in the urban area of Kaiserslautern is good. Central and densely populated areas are sufficiently developed with a 300 m catchment radius. The local districts also have several stops, which ensure a good area development. In addition, nearly all major infrastructure and leisure destinations have some bus stops at a reasonable distance.

Hurber-Erler (2017) stated that in the evaluation of the public transport service, the travel time ratio to other means of transport plays an important role in addition to the frequency of operation. It examined how the travel time of the city bus to those with the car behaves. The city center and the main station were considered targets in the city area. To determine the travel time, arrival and departure time, i.e., car park-seeking, were not taken into account.

He also added that the travel time ratio of the public transport/motorized individual-vehicle (ÖV/MIV) in Kaiserslautern is less than 1.5, which can be regarded as positive or attractive. Meanwhile, the travel time ratio of more than 1.5 is considered a significant obstacle to the use of public transport. Additionally, the influence on the attractiveness of public transport by the necessary frequency of transfer to the respective destinations is also considered.

The bus stops

The equipment of bus stops is different. Numerous stops are barrier-free, especially the direction to the city, and have weather protection with a showcase for timetable, route network, and tariff information. In many cases, however, there is only one basic set consisting of a stop sign with a timetable. As a central transfer stop for rail and regional bus services, the stop at the main station was rebuilt as a bus station in the run-up to the 2006 FIFA World Cup. The central stop, Stadtmitte, is to be redesigned as part of the redevelopment of the city center and has therefore not yet been developed barrier-free.

The Stadtmitte and the central station (Hauptbahnhof) are two transit points for public transport. The Stadtmitte stop functions as the central transit for the bus in Kaiserslautern, and the central station function as the central transit to the regional bus and train.

Car Traffic

Road network

Kaiserslautern, as the regional center of the West Palatinate, is well connected to the national road network. The highway from Mannheim and to Saarbrücken traverses in an east-west direction through the northern city of Kaiserslautern, as shown in appendix chapter 3 map 3. The A63 towards Mainz is linked to the A6 and the urban road network in the Kaiserslautern interchange and the Kaiserslautern city center junction. The B270 links Kaiserslautern and the A6 at the junction Kaiserslautern-West with the Lautertal in the north and the Pirmasens area in the south. To the east, towards Bad Dürkheim and Neustadt an der Weinstraße, the highway and urban areas are connected via the B37.

Speed control

According to Kaiserslautern *Mobilitätsplan Klima+ 2030*, the speed allowed in residential areas is 30 kmh. Collective roads of the residential areas are usually included in the zone regulation as Tempo 30. In some parts of the city, besides the pedestrian zone, there are free-traffic-area (appendix chapter 3 map 4).

Road safety

Road safety in Kaiserslautern is assessed based on the basis of the accident events in 2013, 2014, and 2015. For this purpose, the accident statistics of the police Inspectorate Kaiserslautern with regard to the number of accidents, accident severity (fatalities or serious injuries, minor injuries, property damage), type of accident (for example, turning), and persons involved in accidents (in particular pedestrians and cyclists) were evaluated and examined for accident-prone areas.

Accident accumulation points are defined as follows[7]:

- Areas where at least four similar accidents have occurred in one year (injuries and property damage)
- Areas where at least five accidents involving personal injury occurred in 3 years (minor and serious injuries)
- Lines where at least three serious personal injury accidents occurred in 3 years

Accident clusters/distances are shown in appendix chapter 4 map 5.

It should be noted that both the accident clusters and the accident clusters mainly occur at major junctions and stretches of the main road network. Here, the northern and southern Tangent as well as the commercial area around the Merkurstraße are primarily affected.

	2013	2014	2015
Lightly injured	470	478	493
Seriously injured	67	49	66
Fatality	4	2	1
Total	541	529	560

Table 3.1. Accident severity in Kaiserslautern
Source: Kaiserslautern Mobilitätsplannung Klima+ 2030

Table 1 shows the development of the accident severity of the years 2013 to 2015. The total number of accident victims in three years increased by about 3.5% (19 persons) by 2015 compared to 2013. Meanwhile, the increase mainly reflects the lightly injured. The number of seriously injured victims decreased in 2014 but rose again in 2015. In contrast, the number of fatal accidents has fallen by 75% from 2013 to 2015.

Parking

Parking with tariff in the inner city of Kaiserslautern is valid from Monday to Saturday from 08:00 to 19:00. There are three different zones of parking, and each zone offers different tariffs for a different duration. From east to west, the zone 1 is area between Salzstrasse-Friedrichstrasse-Schubertstrasse-Lutrinastrasse and Rudolf-Breitscheid-Strasse. In this zone, the tariff is 0.50€ per 25 minutes with a maximum parking duration of 2 hours and 55 minutes. For zone 2, located in the east and west of zone 1, the parking tariff is 0.50€ per 50 minutes. The drivers can buy a one-day parking ticket for as much as 3€ if they want to park their car for a longer time. Zone 3 is the parking in the area of Messeplatz. In this area, the car driver must pay 0.50€ per 3 hours of parking (appendix chapter 3 map 6).

Parking space offer

In Kaiserslautern, the management is organized according to the mixing principle, with which the public parking stands can be used either for residents with parking permits or for users with parking tickets. The exception includes disability parking stands, parking stands with parking meters, and pure resident parking stands.

[7] Research Association for Road and Transportation, Leaflet for the Evaluation of Road Accidents, Part 1, 2003

In zone 1, the distribution of parking is as follows:

- 2,313 parking lots with a parking ticket or resident pass
- 169 parking stands with resident pass
- 23 parking stands with the parking meter
- 88 parking spaces for disabled people
- **2,593 parking spaces in total**

From the total number above, a total of 60 parking spaces (with parking spaces reserved for parking spaces within the parking facility) are permanently leased.

The Bicycle Rental System (VRNnextbike)

The bicycle rental system is an addition to the transport system within the city of Kaiserslautern. It is also provided in some cities in VRN (*Verkehrsverbund Rhein-Neckar*) service area. VRNnextbike stations are located close to bus and train stations to optimize the combination of various means of transport.

The rental system of the bicycle uses registration which can be done in its station terminal, via a mobile application, hotline calls, and on the website. The tariff of the rent is 1€ per 30 minutes. Interestingly, students can use the first 30 minutes of service for free, and the bicycle can be hired and returned at all VRNnextbike stations in participating towns and cities. In Kaiserslautern, there are 15 stations spreading out in the city, of which four stations are located in the city center; Stadtmitte/Fruchthalle, Stiftsplatz, Richard-Wagner-Strasse/Königstrasse, and on Rummelstrasse.

Development Stage of Pedestrian Zone and its Surroundings

Methodology

In order to understand how the city center of Kaiserslautern develops regarding the pedestrian system, this research utilizes newspapers as a source of information. The newspapers were published by a local publisher from 1934 to 2016 and were found in the Kaiserslautern's city archive (*Stadtarchiv*). The articles chosen were all related to the city center and pedestrians. From the chosen 354 articles, there are 172 articles taken as reference. These chosen articles were reported mostly about city center construction, traffic, commerce, society, cleanliness, people's opinion, etc.

A challenge found in taking newspapers as a reference is that some topics in the newspapers are un-continued stories that make readers have no clue about the end of the discussed topic.

The Physical Change

During the 1950s, the city of Kaiserslautern started to fix its appearance. New plaster on the buildings and new paving on the streets was conducted in Fruchthalle, Theater, Eisenbahnstrasse, and Mühlstrasse. Lighting matter also got attention from the city government. Lights were everywhere in the city center, making the night feel like a day, and people had parties everywhere.

The trend to make some parts of the city center pedestrian zone appear in the 1960s, but in Kaiserslautern it was just started at the beginning of 1970. The construction was divided into some phases, and the government said that the life in the city will not be disturbed by this construction process. The first phase of the construction of the pedestrian zone took place in Fackelstrasse and

Riesenstrasse. Along the 350-meter paving was renewed, and the street was equipped with benches, lights, plants, and fountains. During the construction, the city center was still accessible for pedestrians. In 1973, the first phase of the construction was finished, and a celebration was held as an opening of the pedestrian zone.

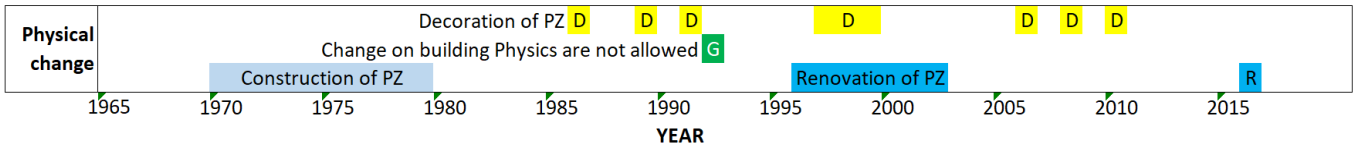


Diagram 3.6. The physical change in the pedestrian zone from time to time

So as to succeed in the pedestrian zone, the city government limited the access of cars in Fackelstrasse and Riesenstrasse from 11:00 to 19:00. It was not fully closed, considering the people living inside the pedestrian zone. After two months, the streets were officially closed for cars.

At the end of the year, the second phase of the pedestrian zone construction was started, which took place in Marktstrasse and Kerststrasse and would be completed with some street furniture. No one complained about this construction, and everyone expected good results from it.

After 2 years of construction, asphalt construction in the pedestrian zone was finished. As complained by the council members, something missing was the absence of a public toilet in the city center.

In the middle of 1975, the expansion of the pedestrian zone was continued, and it focused on the area around Stiftskirche. As part of the third phase of pedestrian zone construction, the ground in front of the Stiftskirche would be lower and planted with grass that functioned as a good view. Besides that, the city government redesigned the old-city house (*am alten Stadthaus*), gave street lights, and covered the street with little stone paving.

At the end of the year, the third phase that took place in Marktstrasse, Schneiderstrasse, and Fruchthallstrasse was finished, and the street was officially opened. A car exhibition was held in the pedestrian zone a year after the opening to make the pedestrian zone more alive. Four years later, the phase of pedestrian zone construction was situated on Pirmasenserstrasse, Kerststrasse, and Grüner Graben.

After the completion of the construction, the city government concentrated on how to make the pedestrian zone the core of the city center. In 1986, some benches were provided in some locations within the pedestrian zone. The government said shop owners should design the façade of the building by considering the uniqueness and harmony of the neighborhood. Meanwhile, in order to make the square in the zone livelier, street furniture such as benches, fountains, and plants was added. They also encouraged restaurants to put some tables outside but prohibited billboards for advertisement. During the process, the government promised that they would repair some damage in the pedestrian zone.

Since there were some complaints related to material and safety, paving was repaired, traffic lights were put on for safety, and some stairs or footsteps were changed to the ramp.

In late 1995, the city government planned to renovate the pedestrian zone in some phases. The main reason for this plan was that building materials were mainly damaged, some old design was not attractive, the concept of street lights was unclear, and the damage to the paving. The first phase was in Fackelstrasse: renewing the paving, augmenting more street lights, adding more benches and new plants; the second phase was in Marktstrasse, Eisenbahnstrasse, and the corner of Riesenstrasse: improving the attractiveness of the existing squares; and the third phase was the redesign of Scheinderstrasse and Eisenbahnstrasse: widening the street, make boulevard, and plant trees.

Schneiderstrasse and Eisenbahnstrasse would be made pedestrian zone and be provisioned with bus lanes. Parking spaces, which were lost due to the change of function, could be addressed by constructing underground parking. Moreover, the government would put different trash can models to see which one is more favored.

The new streets in the pedestrian zone will have different materials. The materials chosen for paving were granite concrete and sandstone because they look good, durable, and considerably inexpensive. In addition, during the construction phase, building facades in Kerststrasse and the square between Kerststrasse – Allestrasse – Eisebahnstrasse were also renovated, and Maurergasse would be part of the pedestrian zone.

At the end of 1997, construction in Fackelstrasse, Maurerstrasse, and Schneiderstrasse was finished, and they had a new paving style.

Two years later, the government considered the different materials and models of the benches for the pedestrian zone; they should be comfortable, not too expensive, easy to clean, and homeless people should be able to sleep on them. There would be 15 benches added for Fackelstrasse and Riesenstrasse, and there were 11 different models of the bench to be considered; the most important in choosing them was the uniformity of the street furniture to create harmony. The Association of older people wanted to participate in deciding the benches models chosen for the city center. They assumed that the current chosen model was too futuristic, and they were worried that this would not fit older people. After two months, the model was decided, and there were more than 20 units will be spread in the city center. The next step was to make the whole furniture more harmonic; the street light and the trash bin. Some trees will be planted on the ground, and a fountain will be built on the corner of Esienbahnstrasse and Riesenstrasse.

Apparently, the construction of pedestrian zone was not always fully funded by the government. As reported in August 1999, the government asked people who live in the pedestrian zone to fund the streets' construction because the streets' construction would benefit the property/business owners. But people complained and requested the government to pay 50:50. They said that the government is responsible for the street as a public space. One month later, the complaint of house owners in Fackelstrasse and Riesenstrasse was rejected by the court, so they must pay 70% of the new paving construction.

In the year 2000, Raiffeisenplatz was changed from a parking space to a square, and its paving was also changed to the paving in Fackelstrasse. It was equipped with benches and street lights, and a bronze strive was put on the ground to show where the old city wall used to be. The same paving was also constructed on Marktstrasse. Besides that, public toilets were built near the theater, Pfaffplatz, on the corner of Scheniderstrasse and Riesenstrasse, and in Richard-Wagner-Strasse.

Before 1980, the plants in the pots combined with different benches made the look of the city unorganized. But afterward, the pots were removed, and the trees were planted. Flowers were also planted at the beginning of spring, and they bloomed at the beginning of summer. As a whole, nowadays, it has good harmony.

The government is still working on maintaining the pedestrian zone. In 2016, they renovated the paving again in Fackelstrasse and in other streets due to some dislocation of the materials.

Traffic Organization

In 1957, it was reported that the city center was more accessible. Post-war reconstruction was almost finished in the city center, and a street connecting the main station to Fackelrondel was widened. Vehicles could drive more conveniently; the axis was made from east to west.

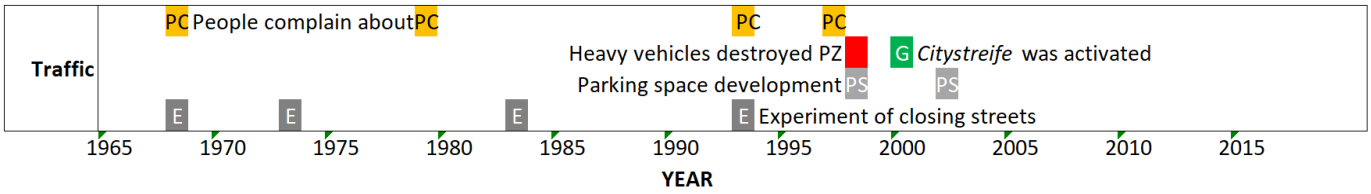


Diagram 3.7. The traffic change in the pedestrian zone from time to time

However, In early 1963, the extension of the city to the newly opened areas – such as Bännjerück, Betzenberg, Morlautern, Dansenberg, and Siegelbach – was quite problematic related to traffic and its integration into the city. There were traffic jams at some points, not enough parking places, and noise pollution. Five years later, when shopping in the city center became more attractive, the construction of the pedestrian zone in the city center was complained about by the people related to traffic issues. In realizing the pedestrian zone, some streets – Schlossstrasse, Fackelstrasse, Marktstrasse, and Kerststrasse – were closed permanently, and the government applied probation on the other streets, where personal vehicles were prohibited from accessing from 10:00 to 19:00. Not only taxi drivers were complaining about this off-street, but also people criticized that this system doesn't work for them because they have to walk from their car to the city center. It is nice for shopping, but not a permanent solution because those, who live in the city center, especially in the pedestrian zone, should drive to the streets before 10:00 in the morning and leave their car on the streets. Moreover, 90% of the shop owners suggested that the free traffic in the city center should be set only on Saturday because they get lower sales income.

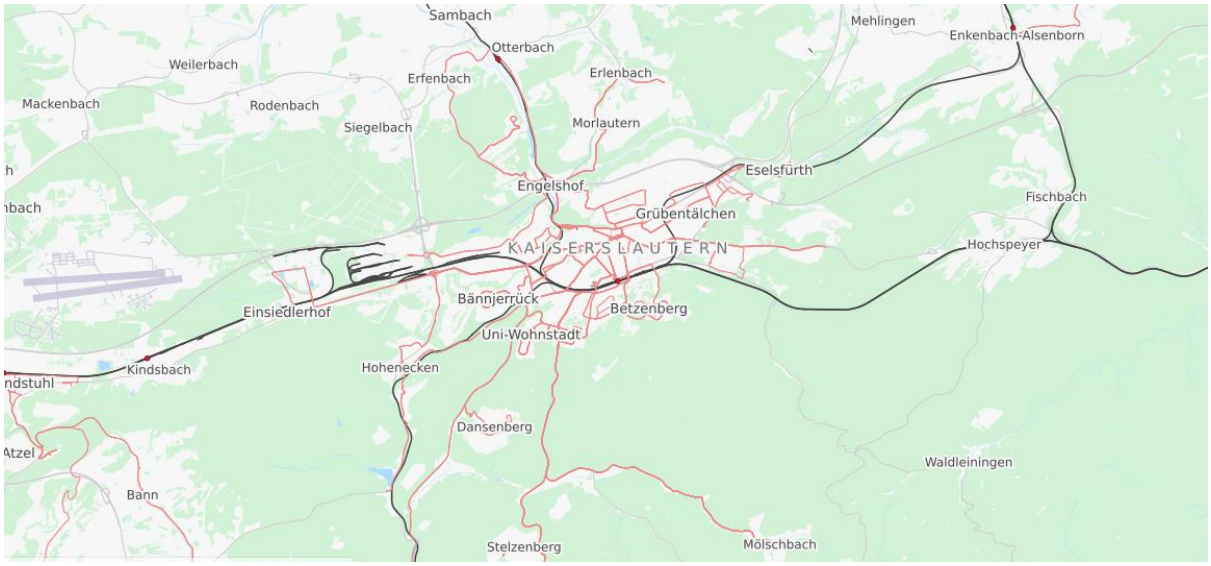


Figure 3.13. City of Kaiserslautern and its surroundings

Source: openstreetmap.or

After ten years, park-and-ride still became an unsolved problem; It was difficult to park in the city center. The government suggests visiting the city center by bus or with the scheme of driving-parking-continuing by bus. It is especially recommended for people who come from the surrounding area of Kaiserslautern to avoid the booming need for parking in the city center, particularly before Christmas.

Besides that, considering people living in the area, the government gave limited access for cars to Fackelstrasse and Riesenstrasse. It was not fully closed and was accessible from 19:00 to 11:00.

In the middle of 1979, the complaint about pedestrian zone was heard again. It was hard to reach destinations, and there were many forbidden signs that made drivers confused. Answering this matter, the government opened Steinstrasse for vehicles with limited speed. The shop owners supported it because they didn't agree with the idea of making Steinstrasse a full pedestrian zone because they got fewer buyers.

In 1993, the government experimented a few times with closing some streets for vehicles in order to realize the pedestrian zone. Due to this closing, people criticize that the government does "planning without concept." The shop owners said that there would not be enough parking space if the streets were closed, and the head of the trading association said the same thing and added that there should be better public transportation. Four years later, it was reported that there were some traffic jams caused by the bus and finding a parking space on the weekend still became an issue in the city center.

In 1994, bikers were allowed to drive in the pedestrian zone. In five years, a council member suggested controlling them because the bike riders drove too fast and were potentially harming the pedestrian. There would be mix-control involving police and *Politessen*[8]. In the following year, *citystreife*[9] began to do his job. he controlled the bike riders and traffic in the pedestrian zone from 10:00 to 16:00. He also handled beggars and vandalism.

Figure 3.14. Fackelstrasse (left) and Marktstrasse (right) were under construction
Source: Kaiserslautern's city archive (*Die Rheinpfalz, 31.05.1995*)

In 1998, it was found that heavy vehicles destroyed the paving in the pedestrian zone. Due to this matter, the government limited the access for heavy vehicles up to 13 tons. Four years later, they gave special permission to *Handwerker*[10] to park their official vehicles in the pedestrian zone. They are allowed to move the vehicles until 11:00 and make no movement afterward.

[8] officer who is responsible for parking control in Germany

[9] policeman who controls the pedestrian zone in the city center

[10] Plumbers, electricians, etc.

In 1998, the government tried to give more space for parking. A parking space that used to be used only by court officers will be opened to the public. They also put signages that show directions for parking spaces in the city center. The fact that it was only 10% of the needs of parking available made the government introduce parking fees to make people consider about duration when parking their cars. However, the biggest problem still happened on Saturday, when the parking fee was free. The situation in the city center became chaos.

One year later, the situation was still not in good order. People get annoyed because of the stack of construction materials used for pedestrian zone renovation. Besides that, the closing of Esienbahnstrasse, the traffic light that changed so quickly and not in proper duration led drivers to go around through smaller streets that created traffic jams and noise pollution.

Commerce

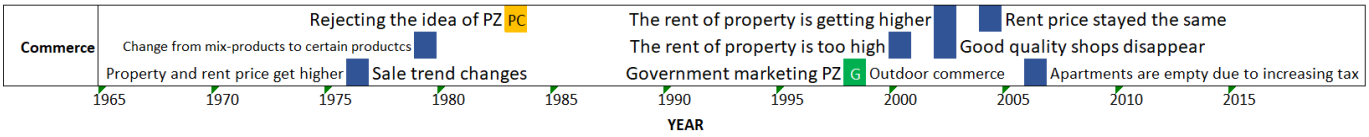


Diagram 3.8. The commerce change in the pedestrian zone from time to time

It was not easy to answer if the pedestrian zone benefited the shops in 1976. In terms of sales, not so much different than before. However, the fact is the price of the property, and the rent was getting higher. The people who benefited from the pedestrian zone were indeed the property's owners. In this period, there was a change in the trend of sales. Old shops that sold food products (daily needs) were closed, and new shops selling secondary needs (i.e., clothes) appeared. Each shop sold "certain products" and not mixed products; only clothes, only shoes, only games, along 1.450 meters of the new pedestrian zone.

In 1983, it was reported that some shop owners in Steinstrasse rejected the construction of a pedestrian zone. They stated that there were accidents in the pedestrian zone, their customers lessened, and they required the streets to be opened again for vehicles. On the other hand, in 1997, shop owners in Fackelstrasse welcomed the renovation of Fackelstrasse. The situation on-site was adjusted, so along with the construction, it is still accessible for pedestrians, and people will still be able to shop.

An idea emerged in 1998 to make the city center more attractive. A marketing initiative suggests developing a parking system, supporting the shops that sell special products, and surveying the street to know how people see the city center and how people think about the product sold within. For the leader of the trading association, it is quite interesting because there are many different things in the city, for instance, different kinds of shops and restaurants on the street. Some things need to be fixed, such as parking space and the design of Stifftplatz. He recommended the government analyze the shopping system in order to develop a new concept for the city center in its relationship to the parking system. Besides that, there was also an idea that customers will get some coins (DM 50 pfennig money-back) when they shop. The coins can be used for the bus or for the parking fee.

During the renovation in the same year, the government does some marketing in the city center to give people a better understanding of the construction process and lower complaints from people. Some banners were put at some point inside the city center.

At the beginning of the year 2000, the rent of property was high, that was DM100/m^2. Some stores were closed, new shops were opened, but closed again after some months. A few small private companies have gone, while a big company comes. Only in 2 months did the rent price shift to the

range of DM90-160/m^2. On the contrary, Kemper's Verlag & Agentur GmbH, which did an analysis, stated that the increase in property rentals in the city center is a positive signal. It shows that the city center is getting more attractive. In 2004, it was reported that the land price in Fackelstrasse costed DM1.400/m^2.

In the same year, some restaurant owners in the city center were collecting signatures for a petition to get permission for opening on the weekdays until 23:00 and on the weekend until midnight.

In 2006, due to the increase in tax, some apartments in the city center were empty. The rent price was considered high, and the residents must pay for the cleaning service on the street. At the same time, the cleaning fee increased 40% more than two years before due to adaptation to the current price.

Schließt zum 31. Januar seine Filiale und zieht in die Riesenstraße: das Unternehmen Benetton.

Hat am 31. Dezember zugemacht: die Buchhandlung Montanus. Demnächst zieht die Kette Werdin ein. —FOTOS: VIEW

Figure 3.15. A shop will be closed (left), while new shop will be opened (right)

Source: Kaiserslautern's city archive (*Die Rheinpfalz, 21.01.2000*)

In the following year, the shop owners wanted to see a definite concept about how retail will be handled in the city center. There was an idea from the city administration to construct a large retail area, but the shop owners rejected it because it would be bad for their business and for the city center as a whole.

Attractiveness and Challenge

The construction of the pedestrian zone has made the city center become more attractive. In 1995, it was reported that more people came to the pedestrian zone and spent time there. There were street musicians there, and some flowers were planted in front of Stifftkirche and Fruchthalle. Even though some people complained about the quality of street artists who did cheap tricks in their performances, the pedestrian zone was often utilized as a place to conduct events. The events were also for children, such as puppet shows, sports, music on stage, magician shows, etc., that used to be shown on weekends.

Along with the development of the city center, especially the pedestrian zone, the suggestion to construct a bike lane and provide space for the teenager (i.e., a skating place) was written in the newspaper in April 1999. At that time, teenagers usually hang out at the bus stop. A report even said that some teenagers are hanging out in front of Stifftkirche, drinking alcohol and making noise.

Additionally, a children's center should be available in the city center, where people can put their children when they are shopping. The government supported this idea.

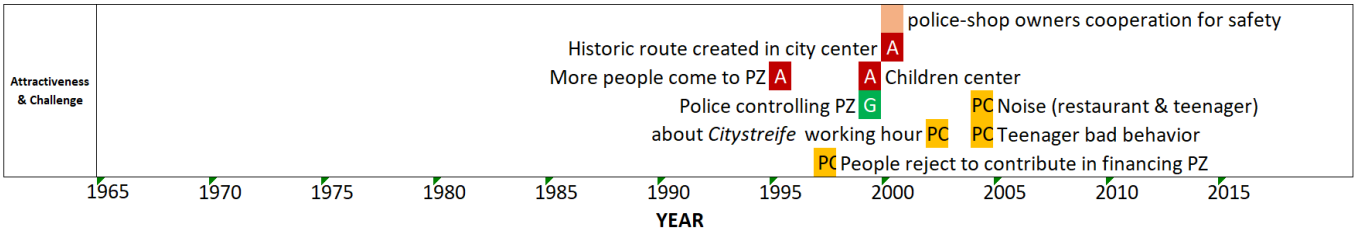


Diagram 3.9. The attractiveness and challenge in the pedestrian zone from time to time

However, besides the achievement, there was a challenge related to the financing of the renovation project in the pedestrian zone. Since the government asked the house owners to pay part of the construction cost, the house owners wanted to create an organization to protest the amount of money they must pay. They said even they get less income during the construction period. Many people supported to form of the organization. Twenty-six property owners living in Fackelstrasse will have a meeting to talk about the issue of payment. In the end, the organization was formed and consisted of 30 people from Fackelstrasse, Riesenstrasse, and Maurerstrasse. Two years later, the court decided that they must pay 70% of the construction cost of the streets.

In the year 2000, a historic route (crown-shape) was put in the city center, near the Rathaus, Fruchthalle, Theater, Spinnrädl (old restaurant near Schillerplatz), Stifftkirche, and some points in Steinstrasse. Leaflets were made to explain the story. Six months later, a *Bronzeplakette* (bronze plaque) was put on the pedestrian zone. It shows the old city walls and at the same time invites people to be more interested in visiting the city center.

To make sure the orderliness in the pedestrian zone, *citystreife* patrolled for two hours between 09:00 and 17:00. Although the people asked the patrol to be more active, the *citystreife* rejected the request and said that they didn't have enough people to do that. They have a problem in finding a workforce to work at night. *Ordnungsamt* also speaks that *citystreife* cannot be on the street for 24 hours because their task is basically not patrolling all day but doing patrol when many people are on the street.

Figure 3.16. People enjoy sitting in Martins-Platz, Kaiserslautern city center

Source: Kaiserslautern's city archive (*Die Rheinpfalz No.240, 17.03.1995*)

Cleanliness

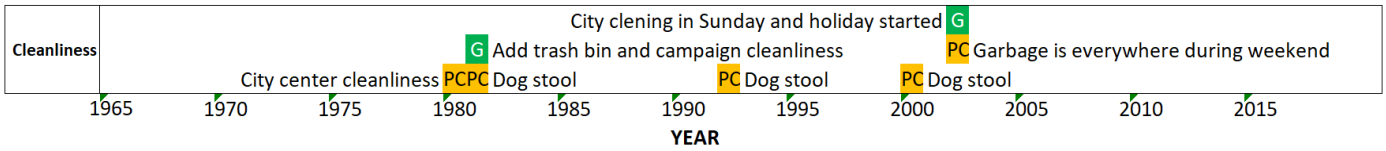


Diagram 3.10. The cleanliness development and challenge in the pedestrian zone from time to time

Along with the development of the pedestrian zone, in 1980, people started to complain about cleanliness matters. The complaint was not only about the garbage but also about the dog's stool. Responding to the complaint, the government then put more trash bins, campaigned about cleanliness to raise people's awareness, and increased the tax. Two decades later, the problem seems to have emerged again. At this time, people suggested that the dog should be forbidden in the city center because even after the tax was increased, the cleanliness was still bad. The awareness of the dog owners was also low; they didn't clean up their dog's "pollution."

In 2002, the shop owners requested the city cleaning service to clean on Sunday because there was garbage everywhere in the city on weekends. 2/3 of the garbage in the city center was the fast-food packing. At the end of the year, the city government decided that the city center must also be cleaned on Sundays and holidays. They also promised to make the city center cleaner and safer and did coordination with the police department and cleaning service department.

Lighting

Lighting is an important factor in supporting the attractiveness and safety of the city center. The government had realized it since the rebuilding period of Kaiserslautern in 1935, after world war II. Lighting was installed to illuminate the city center during the night. At this time, it was reported that night became day, and people had parties everywhere.

In order to brighten the area, in 1963, there was an announcement for traders that they should put lights on the windows of the shop when the dark fell until 22:30 when the Theater closed. Six years later, more lighting was added to make the city center livelier and to improve traffic safety.

Along with the renovation of the pedestrian zone in 1997, the government started to think about the harmony between street furniture. It was reported that there was three alternative design for the street lamps that should be chosen and installed in the city center. One chosen design was then uniformly applied to all lighting in the city center.

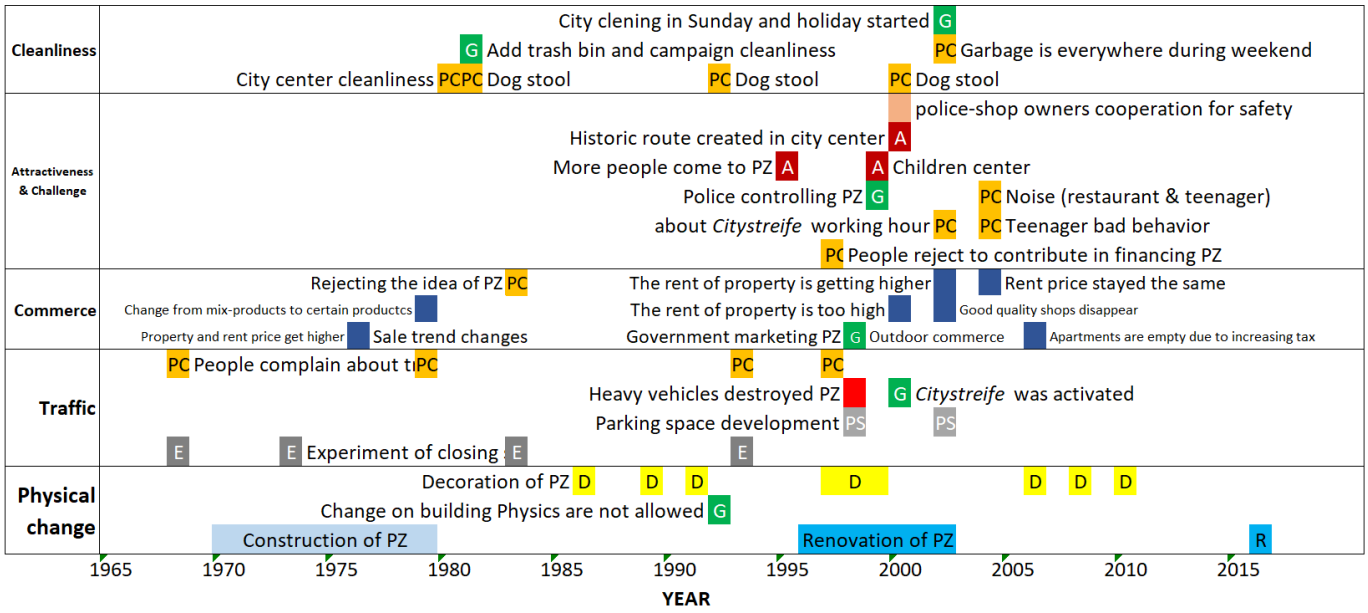
Correlation between physical change – traffic – commerce – social – cleanliness

From the timeline graph above, it indicates that there are three phases of the pedestrian development; the construction phase and two renovation phases. During the realization of the pedestrian zone, Government did a trial to close some streets every decade. The streets closing results in the complaint from people. The complaints were written in the newspaper during the development phase of the area. Meanwhile, the price of rent and property got higher, which is also followed by the change in trend in sales.

It was reported that the city center started to be more attractive 25 years after its first construction. While making some physical improvements for the beauty of the area, the government also started to maintain the pedestrian zone related to safety and cleanliness. It also encouraged restaurants to

provide outdoor tables to create a lively environment. Besides that, some parking points and signages were added to help drivers find places to park and to decrease traffic jams.

In summary, the notion of a pedestrian zone in Kaiserslautern city center has been successfully implemented after 38 years since it was constructed. Based on an article in the local newspaper in 2008, it was written that all street furniture is in good harmony and everybody like the city center. Although there were a lot of complaints about the construction and noise, and the shop owners were complaining that they would get less money, in the end, everything is just good; people like it, and the shop owners get more money than they get before.



Timeline of Stage of Development of Kaiserslautern City Center
Source: personal analysis

Diagram 3.11. Correlation between physical change – traffic – commerce – social – cleanliness

In addition, some important aspects that determine the success of pedestrian zone development in Kaiserslautern city center are:

1. The material of the street pavement is related to the comfort of the pedestrian zone.
2. Lighting for attractiveness and safety.
3. Availability of bus (public transportation).
4. Street furniture for attractiveness, comfort, and safety.
5. Signages to direct traffic.
6. Management of traffic during the construction of the pedestrian zone.
7. Cleanliness.
8. Maintenance.
9. Consideration of people's opinion

Those aspects will be considered to compose the concept of the pedestrian lane in the study case of Banda Aceh.

Local Transportation Plan of Kaiserslautern City

1. Status of implementation and transportation concept

The first local transportation plan for the city of Kaiserslautern was developed in 1999 for the planning period 1999 to 2003. It contains the status analysis of the traffic of the city of Kaiserslautern and the district Kaiserslautern as well as the offering conception. The authorities for public transport in the Westpfalz region have transferred the task of updating the local transportation plan to the Zweckverband Westpfalz Verkehrsverbund (ZWVV) in 2005. The updates are developed in close cooperation with the city of Kaiserslautern and with the participation of the transport companies and the public authorities.

For the period from 2008 onwards, the local transportation plan directs the framework for the development of local public transport. The local transportation plan contains the frequency of service, key figures concerning driving performance, and minimum standards for the quality of the transport performance and the traffic infrastructure. The measures necessary for the achievement of the desired traffic conditions are described in a concept of measures. One of the important goals is the optimization and extension of the existing offers in compliance with the defined service and quality standards.

The region Westpfalz and therefore the city of Kaiserslautern is part of the Verkehrsverbund Rhein-Neckar (VRN) (transport association Rhein-Neckar) since 2006. The association meeting of the Zweckverband Westpfalz Verkehrsbund (ZWVV) has decided for the integration of the ZWVV into the VRN in 2005. The ZWVV was disbanded in 2007.

The former ZWVV has developed the framework specifications for the making and updating of the local transportation plans in the ZWVV, in consultation with the responsible local authorities, and passed it in December 2002. Since the framework specifications of the ZWVV were in accordance with the requirements of the ZRN-work plan, they remain the basis for the local transportation plans in the Westpfalz.

The 1st local transportation plan of the city of Kaiserslautern was decided by the city council in 1999 and made for both the city and district of Kaiserslautern. It measures the connection reliability and the development of the local transportation network and various investment measures, for example, the design of connection points, which are named as implementation goals for the whole period of validity of the local transportation plan. In general, the local transportation plan intended 34 measures. 13 of which could be implemented wholly or in part.

No.	Applied Work	Financial source
1.	Connection development for the industrial parks Hertelsbrunnenring and PRE-Park	Technische Werke Kaiserslautern AG (TWK)
2.	Connection development for the industrial park Nord (IG-Nord)	TWK and subsidy from the city Kaiserslautern
3.	Night bus	TWK and subsidy from the city and district Kaiserslautern
4.	Connection reliability in Rathaus/Schillerplatz	TWK and Deutsche Bahn (DB) Regio
5.	Evening connection to Siegelbach	TWK

No.	Applied Work	Financial source
6.	Regional bus through Schneiderstrasse/Eisenbahnstrasse	Regionalbusverkehr Saar-Westpfalz GmbH (RSW)
7.	Bus acceleration program – Priority at the traffic light (LSA - Lichtsignalanlagen)	State Rhineland-Palatinate and Gemeindeverkehrsfinanzierungsgesetz (GVFG)
8.	The opening of Eisenbahnstrasse for bus traffic	-
9.	New construction of the bus station at the main station	The city Kaiserslautern and GVFG
10.	Waiting hall program (bus stop furniture; seats, bins, maps, timetables, and tariffs)	Private company (advertisement purpose)
11.	Bus stop program	Part of bus acceleration program (LSA) project
12.	Train stop program	The Regionalisation Act or through GVFG, and the city Kaiserslautern
13.	Modernizing the vehicles	TWK

Table 3.2. Transportation's applied work and its financial resource
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

Evaluation for application of transport plan

No.	Measurement	Indicator
1.	Connection	Transit time in the city center (bus-bus) and in the main station (bus-train)
2.	Network concept	Connection of new line and night bus
3.	Connection points and investment	Redesign of the transit point in Schillerplatz-Rathaus and the accomplishment of bus station at the main station

Table 3.3. Evaluation in application of transport plan
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

There are eight measures related to the actor responsible for.

No.	Measure	Responsible institution
1.	Adherence to the service standards and quality features	City, transport carrier
2.	Complementation of the service: especially on the bus line 101 (Hohenecken and Siegelbach including IG-Nord), 106 (Mölschbach), 108 (Erfenbach), 112 (Erlenbach and Otterberg), 115 (University)	City, transport carrier
3.	Optimisation of the routes; especially on the bus lines 101/111 (Hohenecken), 102, 104 and 105	City, transport carrier

No.	Measure	Responsible institution
4.	Improvement of service on the lines 101, 102, 104 in the time between 6 pm and 9 pm (extension of the operation in intervals)	City, transport carrier
5.	Improvement of the infrastructure of bus stops (especially in the city centre)	City
6.	Improvement of the connection to the "Rheinland-Pfalz Takt" and the S-Bahn (especially new stop Hohenecken, connection of bus and S-Bahn at the stop Vogelweh)	City, VRN, ZSPNV (Zweckverband Schienenpersonennahverkehr (Süd))
7.	Realisation of the City-Bahn/Bachbahn	City and district, VRN, ZSPNV
8.	Securing and demand-based extension of the night bus system	City, District, and transport carrier

Table 3.4. Measures and responsible intitutions
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

Operational standards and quality features

Essential quality features and standards of operation are determined for the city of Kaiserslautern through the framework for local transport as well as through the determinations by the VRN concerning the equipment of the connecting stops. At the same time, these determinations only build the framework in the sense of minimum standards or minimum operation. The city of Kaiserslautern, as the responsible authority for public transport, can define specific local transport operations which go beyond these. The city of Kaiserslautern has defined standards in the first local transport plan, which are mostly identical to the existing offer of services. For the length of existing updates, the following operational standards and quality features should now be applicable:

- The city of Kaiserslautern takes over the quality features as described by the association as long as no derivations are derived from the following.
- Building standards:
  The catchment area for regional rail stops is 1000 meters; for bus stops, it is a 300m linear distance radius around the individual stop. It is to be desired that all settlement areas are reached by one of these catchment areas.
- Connection standards:
  All destinations within city limits should be reachable with a maximum of one vehicle change.
  The bus time tables are to be synchronised with the "Rhein-Pfalz-Takt" or rather the S-Bahn Rhein Neckar. The transfer time at the connecting points should not exceed 15 minutes.
- Operational standards:
  Fundamentally, interval operation needs to be ensured in the bus service of Kaiserslautern. Stops in the city center should be serviced at 15-minute intervals on weekdays, the periphery of the core city and the residential and industrial areas near the city center should at least be serviced in 30-minute intervals. For the districts (with the exception of Mölschbach and Einsiedlerhof) 30-minute intervals should be aimed at, at least during rush hour.
  The interval traffic of the lines 101, 102, 104 should at least be continued until 9 pm.

On Saturdays, the service will be operated until 2 pm by the standards of weekdays, afterward by the standards of Sundays and holidays, in individual cases, e.g., the line 105, the operation can be switched later.
On Sundays and holidays, the operation can be markedly reduced. But normally, 60-minute intervals should be reached. Exceptions to this are line 101 with 15-minute intervals and line 104 with 30-minute intervals.
On weekend nights between 12 am and 3 am, comprehensive operation through the night bus system needs to be ensured.

- Vehicle standards:
  The vehicle standards of low floor buses (exception electrical buses for school transport) are to be used in the city of Kaiserslautern. All buses used in city traffic have to be equipped with the technology traffic light prioritization, a stop display and announcement, and the possibility of establishing a radio connection to the control center. New vehicles need to be bought with a folding ramp for wheelchairs and at least have the EURO 5 emission standard.
- Standards of passenger information:
  A manned helpdesk as well as a 24-hour occupied traffic control center need to be established for the route bundle Kaiserslautern and the Lautrer-night bus.

Line conception

The line network conception results in line-respective product profiles. The product profiles are made for licensed regular service, and they describe the extent of service and different quality features and decide the following determinations:

- Line number.
- Route of the line and important, minimally serviced stops.
- Categorization as regular service or on-call service.
- Function, main traffic function.
- Minimal operational standards with a timeframe of operation, connection, and resulting from this the average kilometers per year.
- Vehicle standards.

Moreover, the product profiles contain statements about

- The type of licensing and duration.
- Particularities.
- Primary demand.

Concerning the stated duration of operation, the following determinations are also decided:

- The stated beginning and end times describe the hour in which the first or last trip has to take place; therefore, it has to be filled out in such a way that +/- 30 minutes before/ after the stated start/end time of a trip that can be made.
- All other particularities or additions to the traffic described in the product profile are marked under “particularities” in the respective product profile.

Quality management and information

The local transport plan for the city of Kaiserslautern is especially focused on a definition of quality features and minimal standards for operation, among those the improved connection between local bus and rail traffic and the additions to the line network. The desired quality of public transport can only be ensured if there is quality control and information about quality changes is open to the customers but also the transport association. It means:

- Controls – at least on a random basis – are about the adherence to operation times and defined standards (e.g., vehicle standards, transfer synchronization). If those are not fulfilled, the transport association needs to be informed, and adherence to the quality features needs to be demanded.
- The systematic surveying of demand for the night bus to be able to justify possible adjustments.
- The guarantee of the possible adjustments to local transport is in accordance with the local transportation plan and the established lines bundles.

Content of the local transport quality	**Determined in**	**Responsible Institution**	**Degree of detail**
Minimal standards	Framework guidelines	ZRN (taken over from ZWVV	Increasing level of detail and legal obligation ↓
Quality management	Framework guidelines, Local transportation plan of the Zweckverband	ZRN (taken over from ZWVV)	
Quality standards	Local transportation plan	Local authorities	
Product profiles	Local transportation plan	Local authorities, ZRN	

Table 3.5. Quality features
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

Implementation of the local transportation concept

In order to perform the local transportation plan, some steps are necessary to do.

- Negotiations with the companies responsible for the operation of the traffic.
- Specifying the planning of the infrastructural measures and anchoring the individual measure in the city's budget.
- Participation in the design of the concept inter-district lines that service the city as well.
- Development of a control system, especially about the actual realization of the operational timeframes and quality defined in the product profiles. Cooperation between the local authorities in the transport association is desired.

The service concept builds a basis for planning with the goal of preserving and improving the public transport in Kaiserslautern. The implementation of the measures needs to happen regarding the financial means during the time of validity of the local transport plan. Changes and possible new planning are to be decided as an addition to the valid local transport plan.

The local transport plan needs to be considered, according to PBefG (*Personenbeförderungsgesetz* - Passenger Transportation Act), by the licensing authority as the basis for issuing scheduled line traffic permission. As the responsible authority, the city of Kaiserslautern must ensure that approved lines are in accordance with the contents of the local transportation plan.

Funding

The bus traffic within the city of Kaiserslautern is operated by the TWK Verkehrs AG, with a few exceptions. It is part of the TWK company, which is the property of the city. As in many other cities, losses from the transport department can be made up by the profits from the supply area (electricity, water, and district heating) thanks to multi-utility. Thereby there is no need to subsidize the city from

the city's budget. Keeping this financing system for public transport is of the highest priority, considering the strained financial situation of the city of Kaiserslautern.

For the implementation of the measures of the line network concept, there are currently no funds from the city's budget available. The implementation, therefore, depends on the ability of the TWK Verkehrs AG to realize individual measures through the multi-utility.

As the local authority and/or responsible for the construction of streets, the city is required to open the necessary funds from the city's budget to realize the measures for the traffic infrastructure improvement. Though these measures get supported by the federal and state level through the GVFG, the currently valid funding rate for public transport measures is 85%.

2. Spatial structure

Population and settlement structure

According to the statistics of the State Statistical Office, there are extensive commuter relations between the city, the administrative district, and the places of work subject to social security contributions; the constant number of commuters is around 27,000 annually, of which around 13,500 (50%) commuters are from the district of Kaiserslautern. The city of Kaiserslautern recorded approximately 9,000 people as commuters in 2006, with the proportion of the district at 31%, significantly lower than that of the commuters.

Since Kaiserslautern is also an important school location for the surrounding area, traffic flows in training traffic play an important role. From 20,000 pupils in the 2006/2007 school year, 8,700 or over 40%, did not come from Kaiserslautern. Half of these were divided between vocational students and pupils from general education schools. Even though, since 2004/05, the number of students has decreased by about 450 (3.3%), the number of students from outside Kaiserslautern remains relatively stable at about 4,100.

Furthermore, the percentage change values of the population development in the city of Kaiserslautern correspond exactly to those under 20 and 20 to 60 years old, as shown in Table 6 below. However, the increase in the over-60s is below average, that is 7%. Overall, this leads to a significant decline in demand for school transport and commuters. The relatively small increase in the proportion of over-60s will only partially compensate for this declining demand, especially as the nationwide increase in the degree of motorization of older people is unlikely to result in increased public transport demand in this age group. The trend of decreasing potential demand for public transport could therefore increase.

	2004			2010			Change in %		
Age	**Under 20**	**20-60**	**More than 60**	**Under 20**	**20-60**	**More than 60**	**Under 20**	**20-60**	**More than 60**
Kaiserslautern	18673	55591	23432	16450	52937	25175	-12%	-5%	7%

Table 3.6. Population change based on age classification
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

Economic structure

The development of the PRE-Park as leisure and shopping facilities has created more than 2,300 jobs, which consist of 75 companies, mainly in the service and technology sector. As a follow-up project, the PRE-Uni Park has been under construction since 2003 on the site of a former marshaling yard in the immediate vicinity of the Technical University.

Flier has meanwhile settled the Fraunhofer Center Kaiserslautern with the Institutes for Industrial Mathematics (ITWM) and Experimental Software Engineering (IESE). Further institutes at this location are the Institute for Surface and Layer Analytics (IFOS) and the German Research Center for Artificial Intelligence (DFKI).

The fact that more than half of the approximately 49,000 employees subject to social security contributions in Kaiserslautern do not live in the city, for instance, commute to the Kaiserslautern from outside of the city every day, shows that commuter links with the surrounding area are very important. From approximately 30,500 employees subject to social security contributions in Kaiserslautern, around 70% work in the city.

Structure forecast

According to the forecasts of the State Statistical Office Rhineland-Palatinate, two trends will continue in the city of Kaiserslautern by 2015:

- The decrease and
- the aging of the population.

According to the forecast of Plannersocietät[11], a decrease of the total population by 3% is expected by 2010. In addition, there is a change in the proportions from the younger to the older population groups, as shown in Table 3.6 above. At the same time, a steady decline in natural population development can be observed. A decline in the relative proportion of the population under the age of 20 and a declining overall population is also expected to lead to a decline especially in the number of pupils. However, from 2016, it is recorded that the number of populations increased, as shown in diagram 3.12.

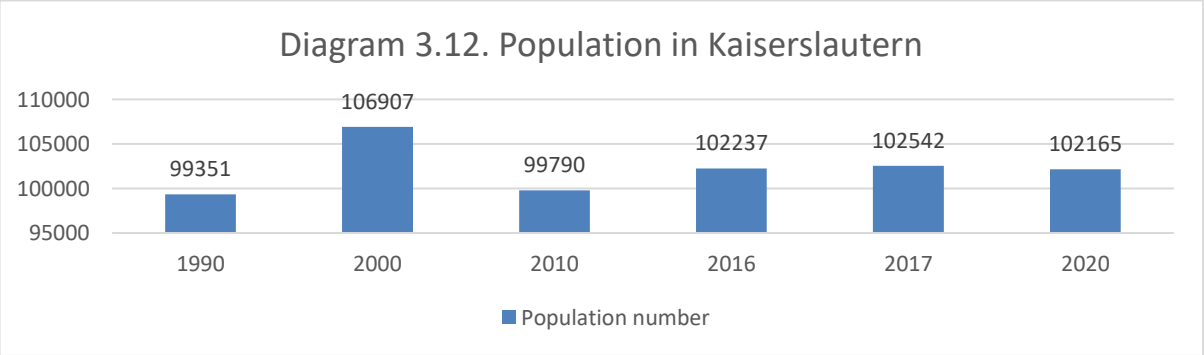


Diagram 3.12. Population in Kaiserslautern
Data source: Kaiserslautern city official website

Development axes and user-relevant structures

Development axes are spaces, in which traffic and supply components and settlement concentrations are bundled. The LEP IV (*Landesentwicklungsplan* – Regional Development Plan) has the following functional networks with supraregional function for the city of Kaiserslautern;

- Kaiserslautern - (Mainz)
- (Mannheim / Ludwigshafen) - Kaiserslautern - (Saarbrücken)

[11] The prediction and model calculations of the firm Planersocietät are based on information provided by the State Statistical Office of Rhineland-Palatinate on demographic change (the so-called mean prognosis variant was used), supplemented by data from the city of Kaiserslautern, as these are differentiated in age groups. The input base is the population with 97,696 inhabitants for the year 2004.

Furthermore, the following regionally important axes are listed in the spatial plan of Westpfalz:

- Kaiserslautern - Lauterecken - (Idar-Oberstein)
- Kaiserslautern - Rockenhausen - Alsenz - (Bad Kreuznach)
- Kaiserslautern - Pirmasens
- Kaiserslautern - Neustadt/Weinstraße

These functional networks or axes essentially follow the regional and national rail connections as well as important road connections. The following subsections are particularly relevant for the district of Kaiserslautern and its immediate surroundings:

- Kaiserslautern - Einsiedlerhof - Landstuhl
- Kaiserslautern - Otterbach - Lautertal
- Kaiserslautern - Enkenbach-Alsenborn

In addition, there are individual structures and areas in Kaiserslautern that are of particular relevance for the operation of public transport. In addition to the city center with pedestrian zone, these include the schools, the University of Applied Sciences, and the Technical University. Particularly noteworthy are the following facilities:

- Schulzentrum Süd (with about 2,000 students),
- school center north on the Kaiserberg (with approx. 3,700 pupils),
- schools in the area of town hall / Pfalztheater (Burggymnasium, Albert-Schweizer-Gymnasium, Rittersberg-Gymnasium, vocational school II) and Franziskaner-Gymnasium and Realschule (with a total of about 7,000 students),
- University of Applied Sciences Location I and II (with approx. 2,100 students in WS 2006/07) and
- Technical University (with approx. 7,200 students in winter semester 2006/07)

Further structures with particular operating relevance for public transport are:

- Kaiserslautern Central Station,
- Westpfalz-Klinikum and
- PRE-Park (including recreational uses and cinema)

3. Quality standards

The local transport plan sets out the framework for the quality of service and the transport crew, thus specifying the VRN framework, quality standards; on the one hand as the measure by which the public transport offer is assessed, and on the other hand, the standards set by the transport authority are planning objectives wherever they are not be complied with. In addition, quality standards should be measurable and thus controllable so that a review of the plan implementation and the desired performance of the transport service could be guaranteed at. The standards presented are, therefore the target standards imposed on the task-bearer as a self-obligation.

For the transport companies, the standard in connection with the product characteristics is the basis for the support with transport services. The following are the relevant standards of local transport quality according to the VRN framework, which is to be pursued and implemented by the local authorities in local traffic planning in terms of minimum standards.

Networking of transport systems

The traffic axes of the rail transport and the regional lines shape the backbone of local traffic in the West Palatinate, which is the responsibility of the ZSPNV.

Development standards and operating standards are to be defined in line-related product characteristics. The various local transport products (rail transport, regional lines, development lines, city traffic, and light rail as well as special forms and demand traffic) are to be coordinated temporally and spatially at defined points of connection.

According to the specifications of regional planning and the technical planning, the following goals must be observed[12] at least:

- the timetable of the bus traffic will be coordinated with the Rhineland-Palatinate clock,
- Within 45 minutes, the work or school location can be reached,
- do not exceed the total travel time to the respective nearest community center or district town by 45 minutes,
- the respective district town can be reached with a maximum of easy change,
- for the development of the areas, the bus lines are designed so that all places receive a direct connection to the respective central place and/or to the rail traffic and
- in settlement units (districts, municipalities) with more than 300 inhabitants (EW), a minimum service of at least three pairs of trips per day to the nearest center (municipality community seat) is guaranteed.

Spatial development standards

The spatial quality of accessibility is determined by the length of the footpath from the residential location to the entry stop or from the exit stop to the destination. The determination of reasonable footpaths should be made depending on the local conditions

In particular, when a location is connected to the regional rail network in areas with a rural structure, longer access routes are accepted, or feeder buses are accepted because of the higher quality of the service. Therefore, railway stops are not listed separately, as in the immediate settlement area, a distance up to 1000 meters to the railway stop is considered sufficiently developed. For road-bound public transport, the following guide values should apply for a reasonable walk to the nearest stop (air-line radius):

1000 meter	Municipality/City; Development in the area
400-600 meter	Small and medium-sized centers, urban outdoor areas in regional traffic
250-400 meter	Urban traffic

Table 3.7. Spatial development standard
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

Connection standards

Connection standards related to the temporal link and the total travel time can be differentiated in entry and exit times, which are better defined on the reasonable amount of footpath length, the travel times that are defined on the frameworks of spatial planning, the waiting or transfer times and the punctuality.

Frequent changes significantly reduce the comfort and the acceptance of public transport use. Therefore, the nearest municipality community seat with a maximum of one change, but if possible,

[12] Landesverkehrsprogramm Rheinland-Pfalz 2000; Regionale Raumordnungspläne

directly and be reached without change. More than a two-way change for a routing chain is usually not accepted by the customer.

The transfer time between arrival time and onward journey consists of the pure travel time between exit and entry as well as a safety buffer of 1-2 minutes. The transfer period at points of intersection of public transport should not exceed 6-12 minutes in order not to jeopardize the attractiveness of the total route chain.

Transit times are set at important connections:

- the link points with large existing or potential passenger numbers that must fit in both directions,
- transfer relationships, which should last for a longer period (several timetable periods),
- Transit link on a line with which bus sequence is greater than 60 minutes and more.

Especially with attractive transitions to the connection line, the requirement of punctuality can become a problem because, in practice, even with careful product planning, delays cannot be completely ruled out. In addition to unpredictable incidents during operation, there are passenger and external influences that lead to minor or major delays. If it is predictable that punctuality cannot be met, the connection line shall be informed of the delay by radio so that a connection can be guaranteed for the passenger, at least in the drop-off service. This requires appropriate equipment for the vehicles or the driver with a radio.

For the transition from road traffic (motorized individual traffic, bicycle) to public transport, the assessment of the B + R and P + R places themselves and their proximity to the breaking point plays an important role. In general, the travel time is decisive here regarding the connection quality.

Standards of operation

In the standard of operation based on the bus network, the frequency per day in a predominantly rural area with intermediate centers, as in the West Palatinate area, is set as follows:

Jede Ortsgemeinde	mind. 3 Fahrtenpaare täglich

In addition, the following connection standard should be realized[13]:

Residents per sub-area	(Minimum) rides per day and direction
200-1,000	3
1,000-3,000	3-6
3,000-5,000	6-12
>5,000	>12

Function
Demand-oriented operating mode in the call-taxi system or in individual cases AST / ASV; possible as an extension of a line.
Shortcut
With the rail transport as well as at the on-line link points of regional traffic.

[13] Note: Every local community should be connected by public transport with at least 3 pairs of journeys, regardless of the number of inhabitants. Thus, a general connection from 50 inhabitants could be standard.

Contributor to events or infrastructural facilities.
Operation period Frequency of journeys: as required (demand).
Transport task Provision of public transport as a supplement to the regular service.
Demand Especially leisure traffic; Single trips, with line extension at evenings.
Vehicle type Taxi (car, large-capacity car), midibus, the standard bus with line extensions. A possible addition to fold-out bike racks for wheel transport.
Sub-net [to name individually]
Special features (other agreements) Comfort supplement for breakpoint front door - transport as a surcharge to the combined tariff Operation of the respective municipality or district Individual contracts with transport companies, taxis, etc.

Table 3.8. Standard of operation
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

The information refers to a school-free working day, as the minimum number of trips must also be available to public transport users during holiday periods. Regarding the distribution of travel time over the course of the day, it is recommended that two-thirds of journeys are made for vocational and training traffic and one-third for shopping and other private transport.

Each operation (line) is to be presented in detail in a product profile in the transport plan of the transport authorities with the respective details:

- the function
- the route
- the possible links
- the operating period
- the timing
- the number of trips
- the vehicle types
- the main traffic task and connections (possibly with a priority)
- a brief explanation of the demand
- special features.

In the West Palatinate, the product "ExpressBus" is currently not used in public transport, and if an ExpressBus is introduced, a product profile will also be required for this product.

Stops and connection points

Breakpoints are the business cards of local traffic. They decide on the attractiveness of the public transport system just as significantly as on an adequate travel offer and good connections. Breakpoints must therefore be easily accessible, safe and clean, and be able to offer a pleasant stay. In principle, aspects of passenger information, as well as objective and subjective safety, must be taken into consideration when designing stops. The minimum equipment for stops is regulated in § 32 BOKraft[14]. After that, the entrepreneur must stop at the bus stop:

- attach the line number and the name of the entrepreneur,
- in local and neighboring town line traffic clearly indicate the stop name on an additional sign, and
- Attach containers to drop off used tickets at busy stops of local transport.

The operation at a breakpoint should be able to be handled as smoothly as possible so that the time required for entry/exit is minimized. For this purpose, in addition to a suitable location in the room, it is desirable to get in and out as level as possible, for example, by increasing pavements in the stop area.

In order to ensure smooth traffic flow and operation at stops, attention must be paid to optimizing space requirements, efficient entry and exit areas, and unhindered access to the stops. Furthermore, the conflict points with pedestrians, cyclists, and individual motorized traffic should be minimized, which means that the route guidance is clearly and easily recognizable and a possible necessary crossing must be marked and secured. The above-mentioned relationships and requirements apply in principle to breakpoints of rail-bound, such as road-bound public transport. Functionally, the stops of the rail-bound public transport are differentiated according to the products RE, RB, and S-Bahn. A definition of requirements for the design results in addition to the function of a linkage content rail-bus.

Functionally, the road-bound public transport stops are classified into five categories, which are different and depend on the importance and customer potential in the design and the extent of equipment. The following characteristics are used for the classification of stops;

- Passenger traffic
- Link function (Bus / Rail, Regiobus / Bus, Bus / Bus)
- Frequency of operation
- Operating times and duration
- Station’s location

In particular, the passenger volume regarding the newcomers is the decisive feature regarding the function of linking a stop. The number of changeovers requires an appropriate dimensioning of the set-up and shelter area. Therefore, the categorization of the stops for buses is shown below according to the meaning of the function of linking, not according to the position in space (region or city):

[14] Regulation on the operation of motor vehicles in passenger transport (BOKraft), BGB! I, 8. 585ff.

Interest	Connection points bus / rail	Connection points bus / bus with high switchover values	Stops of several bus lines with low transit values	Bus stops without linking function	Stops in demand traffic
Explanation (assignment of products)	Feeder rail	Link to regional traffic, linking points in the city bus system or city traffic	Linking the traffic systems, including the light rail with bus, with low entry / exit or transit values	Easy stop without change	Easy stop, possibly low transfer values as a carrier of rail or regional traffic
Link function	high	high	low	none	low
Number of stops per working day	>15	8-15	4-8	4-8	
Operating duration	10-16 hours	10-14 hours	10-14 hours	10-14 hours	9-10 hours
Operating frequency Mon-Fri	at least every hour	at least every 2 hours	irregular	Irregular, not in low load periods	Every hour

Table 3.9. Standards according to the linking function of a stop
Data source: Nahverkehrsplan Stadt Kaiserslautern 2009

Depending on the category and requirements for the quality of stay, which results from the entry / exit potential and the transfer or linking function, the stops and connection points should have the following features:

Category 1: Link point train / bus

Depending on the situation in the room (approached from one side or from the front and back) two 4-unit illuminated standard waiting halls with 3-feldrigen benches[15], 3-4 waste container, separate information and timetable showcase, covered *Fahrradabstellanlage*, mailbox, telephone, toilet (or at least personal toilet), service providers and ticket sales (eg kiosk), ticket machine[16].

Category 2: Connection point bus / bus or bus / light rail with high conversion values:

Two 3-unit illuminated standard waiting areas, separate information and timetable display, waste bin, bicycle storage, emergency call.

Category 3: Connection point as stop of several bus lines as well as stop of light rail with low changeover values

A 2-unit illuminated standard waiting hall with timetable and information showcase, waste bin (at least the central stop of a place should be so designed).

Category 4: easy stop of a bus line (or *Stadtbahn*) without change:

Station sign, timetable information, waste bin (legal minimum standard), in addition, especially for the direction of travel "in the city" a waiting hall for weather protection, deviations from the standard, for example, with low passenger demand are possible.

Category 5: Stop in demand traffic

Station sign, timetable information, waste container (legal minimum standard), in some cases a weather protection.

[15] Standard waiting halls are divided into 1-meter segments, in modern versions the "benches" are multi-part seats and can accommodate up to 2-3 people

[16] Ticket vending machines are set up only at railway stops with linking function, not on simple train stops, especially when the rail lines are served by rail vehicles with ticket machines on the train.

Depending on the local circumstances, it is possible to deviate from these equipment features, but care should always be taken to ensure the transparency of the equipment. So, the social control and the subjective sense of security of the passengers is increased. An operational benefit lies in the driving time savings, since the driver recognizes waiting customers in the waiting area at an early stage.

Attention must be paid to a handicapped-access structural design (including tactile guidelines), to ensure barrier-free accessibility and to include the surroundings of the bus stop in the design. It is a total of a level entry through appropriate height of the curbs or platforms and appropriate vehicle material to ensure.

For P+R (Park-and-Ride) systems, the range of shelves must be dimensioned according to a needs assessment. B+R (Bike-and-Ride) systems are to be roofed and illuminated. In individual cases, it should be checked whether lockable bicycle boxes should be additionally installed.

The dimensioning of the waiting area depends on the type of linking and is to be aligned accordingly in the waiting area and in the dimensioning of the roofing.

Vehicles

Basically, the low-floor of the vehicles in the scheduled traffic is required. Due to local conditions, such as narrow intersections or driveways and topographical conditions, however, there may be restrictions on the possibilities of using low-floor vehicles. However, a good entry and interior comfort should be guaranteed, these include:

- as close to the same level as possible (possibly by vehicle lowering option),
- at least one double-width door without center post,
- multi-purpose surfaces opposite this double-width door for loads, bicycles, pushchairs, wheelchairs or similar,
- ticket validator and ticket printer,
- information boards with network, route, and tariff information,
- use of optical and/or acoustic information systems (bus stop announcements or indications),
- equipped with radio (radio or mobile phone) or other technical systems for connection protection as well as
- uniform and clear signage with line number and destination (outside).

In the call-taxi-traffic (*AnrufSammelTaxi* or *Ruftaxenverkehr*) also midibuses, large-size passenger cars and passenger cars of the taxi industry are to be used.

Passenger information and mobility advice

In the stops, beside a timetable, sufficient fare and transfer information, a line network plan, and an environment plan should be provided. Here, aspects of easy readability and clear layout must be considered, as well as the installation of the information in accessible heights for children and wheelchair users. In the dark, these information systems must be adequately lit (e.g., street lighting near the bus stop).

A uniform design of the information carrier is very important for simplified recognition, which should stand out clearly from advertising and other information carriers. A uniform composite layout is to be striven for.

Personal advice to passengers should occupy a special position in the information system. This is of importance not only for regular public transport users, but also for the customers, who mainly use other means of transport and find here an important starting point for individual advice. In the long term, individual public transport advice with regional mobility advice for all road users should be set

up in cooperation with different agency (transport companies and local authorities) in the sense of mobility centers.

Other standards

Other standards include customer service, which is primarily ensured by the driver, and the controlling of quality standards.

The staff in contact with the customer must be proficient in the German (local) language in writing and in the word; in case of non-compliance, further training must be carried out. The care, operating and security staff is characterized by well-kept uniforms and name tags. The employees of the transport companies receive training to give necessary knowledge with a friendly and customer-oriented behavior; as well as network and local knowledge, tariff knowledge, driving operations/obtained in traffic, communication with the customer and situation-dependent, and responsible behavior for the benefit of the customers.

Chapter 4

Mobility in Banda Aceh: The Lost Pedestrian

This chapter explains the investigation of the research site of the old city center of Banda Aceh. It comprehensively discusses three principal aspects of the no-pedestrian phenomenon: changes in the physical environment, human behavior, and policy. Four methods used to understand the situation are site observation, questionnaire, interviews, and literature study.

Post-Tsunami's Stage of Development in Banda Aceh

Emergency Response Phase

The tsunami wave and the 9,0 Richter scale earthquake that hit Banda Aceh on 26th December 2004 was the sixth deadliest recorded disaster in history (Johnson, 2019)[1]. People in Sumatra, Bangladesh, India, Malaysia, Maldives, Myanmar, Singapore, and Thailand could feel the earthquake. The death toll was 227,898, of which about a third of those were children. In Aceh province, the disaster caused more than 170,000 people to die. Out of the 2.8 million people directly or indirectly affected, 2 million needed support. Over 700,000 were homeless and displaced as their houses were destroyed or severely damaged and required major construction or clearing of debris. The homeless had to seek refuge either in camps established by the government with the support of partners or in temporary shelters, such as schools, mosques, and other buildings (WFP, 2012)[2].

Masyrafah and McKeon[3] (2009) reported that soon after the disaster, the president of Indonesia declared it a national tragedy. He ordered line departments and ministries to mobilize available resources for the emergency response and recovery processes and assigned an existing government emergency mechanism, the National Coordinating Board for Disaster and Refugee Management (Bakornas PBP), to deploy all its resources in Aceh. The agency was mainly charged with providing immediate support to Tsunami survivors in the form of search and rescue, food, shelter, medical help, and burying the dead. Some 15,000 Indonesian military personnel in Aceh participated in the humanitarian relief operation, and an additional 12,000 to hasten the burial of bodies and clearing of debris.

It is a fact that international support played an essential role in Aceh's relief effort, providing relief to hundreds of thousands of Tsunami victims and helping to prevent a far higher death toll. Three days after Tsunami, access to Aceh province was opened for international non-government organizations (NGOs) and foreign government relief teams. BAKORNAS-PBP[4] led the programs, and by coordination with UN-OCHA[5], a wide range of activities was instantly commenced by numerous agencies that focused on emergency operations. It is to ensure all basic needs such as food, medical supplies, clean water, and temporary shelters, to immediate income generation activities, for instance, the "cash-for-work" program. More than US$500 million was poured out during the relief phase, with some United Nations agencies and international NGOs taking the lead in the process. The humanitarian system initiated initial support in the form of distribution assets, such as small boats and fishing nets, as well as cash for work. Livelihoods in the form of trading, labor farming, and fishing were re-established.

[1] https://www.thoughtco.com/worlds-worst-tsunamis-3555041

[2] The Past, Present and Future: Aceh Tsunami Response, Recovery, and Preparedness. A publication by World Food Programme, 2012.

[3] Post-Tsunami Aid Effectiveness in Aceh. Working paper 6, November 2008. Wolfensohn Center for Development at Brookings.

[4] *Badan Koordinasi Nasional Penanggulangan Bencana dan Pengungsi* (National Coordinating Board for Disaster and Refugee Management).

[5] United Nation Office for Coordination of Humanitarian Affairs.

At the same time, several institutions, in cooperation with international bodies, participated in developing the Master Plan. Apart from reviewing the redevelopment needs in the area affected by the disaster, the Master Plan also outlined the need to establish an agency responsible for coordinating and implementing the rehabilitation and reconstruction plan in Aceh and Nias. The presidential decree no. 30/2005 regulates master plan for rehabilitation and reconstruction in physical and law aspects, as well as restoration of civil rights and community dignity done by BRR. The establishment of the Agency for Reconstruction and Rehabilitation (BRR) demonstrated that a new phase in Aceh's Tsunami assistance had begun.

Based on the presidential decree, there are some stages of reconstruction. In the early stage of 2005-2006, funding was allocated for the recovery of disaster emergencies. In 2005, the government released up to IDR2,492 trillion equals 62.83% of the state budget. IDR639.26 billion was used for the following year, which equals 6.65% of the state budget. The accomplished projects covered the reconstruction of new settlements, schools, health facilities, worship houses, roads and bridges, seaport, and airport, as well as micro-business development and rehabilitation of ponds, agricultural land, and plantation. From 2007 to 2009, it focused on the accomplishment of settlements construction, rebuilding of regional facilities and infrastructure, recovery of economic conditions and improvement of the welfare of disaster victims' communities, and strengthening of local government institutions and communities. In 2007, the Tsunami refugees were moved from tents to temporary residential houses, and in the following year, the ongoing infrastructure development focused on physical and regional development to support the development of the service and industry sector, as well as the beginning of the revitalization of potential tourism area, including business and commercial areas. In 2009, recovery projects were accomplished, and the ongoing process was the capacity building and assets transferred to local government to continue the development (Yusriah[6], 2016).

The reconstruction in Aceh was the largest reconstruction program in the developing program at the time. Aceh hosted around 2,200 projects implemented by more than 400 actors across all sectors. Total infrastructure (including housing, transport, communication, energy, water, sanitation, and other infrastructure) was recorded at US$3.1 billion, or almost half of the total reconstruction funding, surpassing the core minimum needs recorded at US$2.6 billion.

- Coordination Mechanism

In Aceh, three lead bodies provided the broad coordination framework for the reconstruction program. First, the Agency for Reconstruction and Rehabilitation (BRR) become the central body for government activity. Second, a Multi-Donor Fund (MDF) was created to enable bilateral and multilateral donors to coordinate funds. The MDF also acted as a forum to bring together funding agencies (bilateral and multilateral agencies and key NGOs with significant funding of their own) to allow open dialogue. Third, the United Nations created the United Nations Office of the Recovery Coordinator (UNORC) primarily to coordinate United Nations agencies and provide a single access point for BRR to the UN system.

- Government Coordination

Following the end of the emergency response phase, the government assigned the National Development Planning Agency (Bappenas) to coordinate the establishment of a rehabilitation and reconstruction plan for Aceh and Nias, developing the Master Plan in cooperation with international Bodies. Apart from reviewing the needs for the redevelopment of the areas affected by the disaster, the Master Plan also outlined the need to establish an agency responsible for coordinating and implementing the rehabilitation and reconstruction plan for Aceh and Nias. It led to the formation of

[6] https://medium.com/planologi-2015/keadaan-infrastruktur-kota-banda-aceh-pasca-gempa-bumi-dan-tsunami-78776755d714

BRR in 2005. BRR managed and coordinated the rehabilitation and reconstruction program in the post-disaster regions.

BRR had wide-ranging responsibilities, including the management of the rehabilitation and reconstruction program's implementation. It establishes working relationships with other stakeholders to coordinate rehabilitation and reconstruction projects that are not financed by the central government's budget; and facilitation, coordinating, supervising, and collaborating with international parties participating in rehabilitation and reconstruction projects directly financed by foreign aid. BRR's mandate is for four years only and expires in 2009, which means that it focuses on reconstruction and less on promoting longer-term development.

One of the most important milestones in reconstructing Aceh was the signing of the peace accord in Helsinki between the government and the Free Aceh Movement (GAM) on 15th August 2005. The signing ended a 30-year conflict and led to the first democratically held direct elections in Aceh. These resulted in many newly elected *bupati* (district heads) and *walikota* (city heads), many with only very limited experience in public administration or development. Nevertheless, making local governments effective partners in the reconstruction program was an important goal for BRR, not least because when BRR and the international community leave Aceh, local governments will be relied upon to maintain public facilities and deliver basic services (BRR and Partners, 2005a). However, the involvement of local governments in the relief and reconstruction effort has been largely symbolic. This is mainly due to their previous weaknesses rather than the Tsunami.

	Number	
Destroyed house	120.000	Units
Broken house	70.000	Units
Destroyed/broken seaport	14	Units
Broken Bridge	120	Units
Inaccessible/broken road	3.000	Km
Broken government buildings	1.052	Units
Teachers died	2.500	Persons
Destroyed/broken medical service	114	Units
Destroyed fishponds	20.000	Units
Damage of agricultural land	60.000	Ha
Loss of Small & Medium Enterprise	100.000	Units

Table 4.1. Challenge in rehabilitation and reconstruction after Tsunami
Source: Post-Tsunami Aid Effectiveness in Aceh. Working paper 6, November 2008

Development of Governmental Sectors

- Transportation development

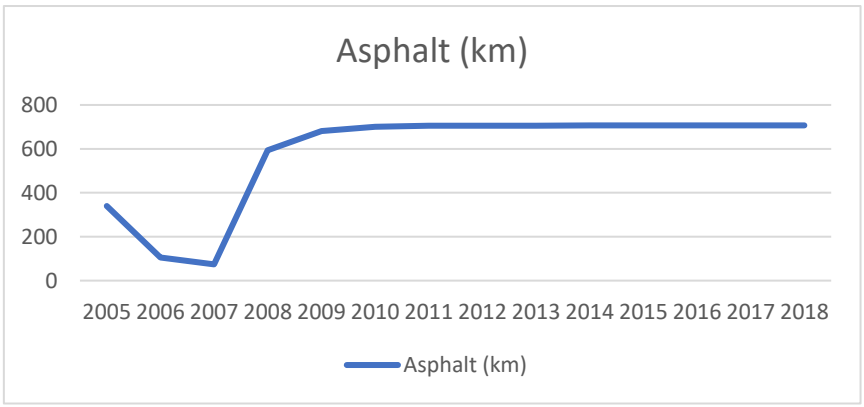


Diagram 4.1. Length of asphalt road
Source: Annual report Banda Aceh in Figure; from 2007 to 2019

The condition of asphalt road after Tsunami was getting worse three years after Tsunami. Since 2007, the some rehabilitation project of the roads were finished and it was totally finished in 2009. The government control the quality and maintain roads well.

- Tourism development

Since 2009, the government of Banda Aceh has started to implement Banda Aceh's tourism visiting year. They have beautified the city and fixed tourism objects to become one of the income resources and directly benefit the citizens. It will increase the growth of the local economy in the service sector. There are several kinds of tourist objects in the city, such as nature tourism, tsunami tourism, spiritual tourism, and historical and archeological tourism. Besides that, a traditional dance called "Saman" is a treasure of regional culture that is appointed by UNESCO as one of the world's heritage from Aceh.

In the following year, Banda Aceh started to collect data related to tourism. In the annual book of "Banda Aceh in Figures, 2010," there are basic data about the list of tourism objects, restaurants, hotels, accommodation, gastronomy, and travel agents. Along with its development, the annual book added new data about the number of souvenir shops and tourist visits. In 2016, it started to add data about the number of tourist visits, which is more comprehensive than the previous years.

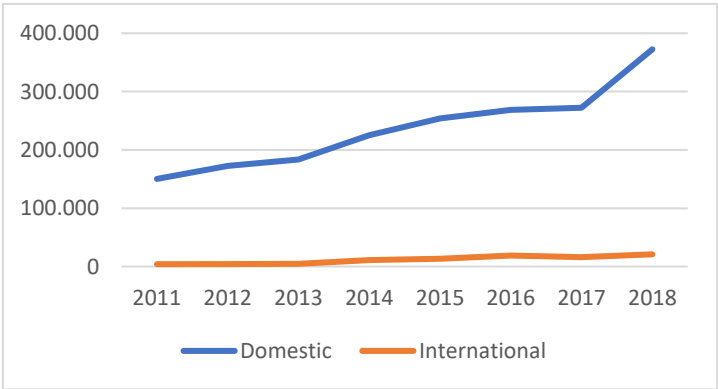


Diagram 4.2. Number of tourists in Banda Aceh
Source: Annual report Banda Aceh in Figure; from 2010 to 2019

Since the city government enacted a tourism visit year, the number of tourist visits in Banda Aceh has increased year by year. From 2011 to 2017, the average increase in domestic tourist visits is 11%. In 2018, the growth of domestic tourist' numbers went up to 37% compared to previous year. Meanwhile, foreign tourist visits number show “up and down,” which have an average increase of 9.5% annually from 2011 to 2013, and in 2014 went up to 134% compared to the prior year. This increase gradually continued and at last fell by 12% in 2017 compared to the previous year, and then grew again by 28% in 2018.

Meanwhile, the growth of budget-hotel shows that this business has a promising prospect in supporting tourism, where the numbers of non-star hotels grow significantly from 2011 to 2018. In contrast, 1-star hotels tend to decrease every year and reach their lowest in 2014; however, they slowly increased until 2018. Furthermore, there was only one 4-stars hotel from 2011 to 2014, but in 2018, the city had four 4-stars and one 5-stars. Additionally, Banda Aceh had 56 non-star hotels, ten 1-star hotels, six 2-stars hotels, and three 3-stars hotels in 2018.

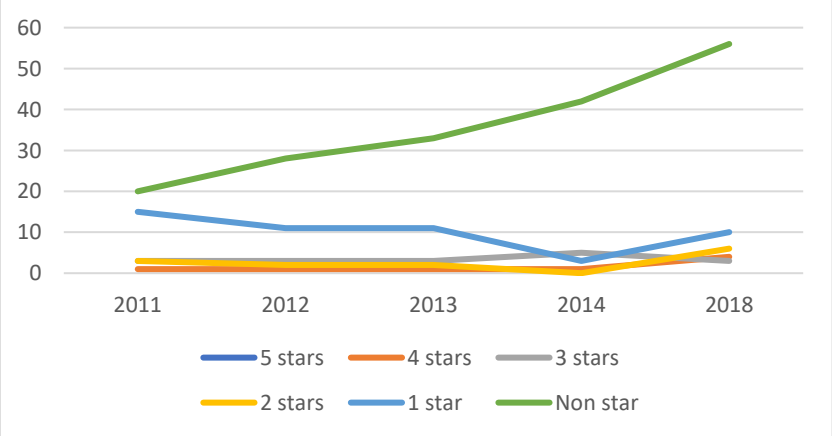


Diagram 4.3. Number of hotels in Banda Aceh
Source: Annual report Banda Aceh in Figure; from 2002 to 2019

Since 2011, the number of food service businesses has grown and reached its peak in 2015. In the following year, the numbers decreased and were stable for a year, and slightly went up in 2018. On the other hand, the number of travel agents as tourism service providers regularly went up from 2015 to 2018. Dance workshops function as a supporter in performing and introducing local culture slightly grew every year. Souvenir shop's number was still in the same amount but increased in 2018. lastly, the number of tour guides within four years reached its peak in 2017; however, it decreased in the next year.

Diagram 4.4. Number of food service (Restaurant, café, and coffee shop)
Source: Annual report Banda Aceh in Figure; from 2012 to 2019

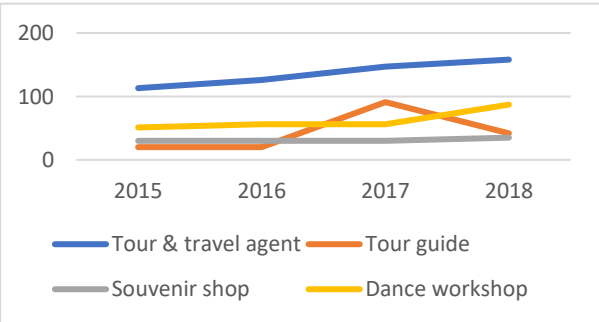


Diagram 4.5. Number of Tourism facility in Banda Aceh
Source: Annual report Banda Aceh in Figure; from 2016 to 2019

Mobility in Banda Aceh

Spatial Situation

Population

As the capital of Aceh province, Banda Aceh has the largest number of inhabitants among other cities in the province. The population in Banda Aceh before Tsunami was 230,828[7] , and after Tsunami, it remained at 177,881; 25.61% or 61,265 vanished (lost or died). Due to this loss, the density also decreased from 38 to 29 inhabitants/ha. The Regency of Meuraxa, Kuta Raja, Jaya Baru, and Kuta Alam have the biggest population loss. Meanwhile, the regency of Ulee Kareng, Banda Raya, and Lueng Bata did not have any changes in density or the impact of the Tsunami.

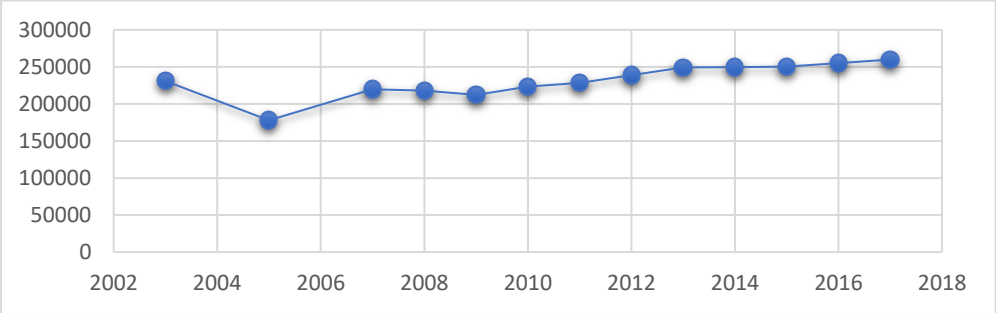


Diagram 4.6. Number of populations in Banda Aceh
Source: Annual report Banda Aceh in Figure; from 2004 to 2017

The number of populations reached 219,857 and had an annual increase of 11.8% from 2005 to 2007. In 2008, it was noted that the city lost 0.88% and reached 2.61% in the following year. One of the reasons for this situation is that the reconstruction and rehabilitation of the Tsunami disaster officially ended in 2009, and thousands of workers involved in the post-Tsunami projects gradually left Banda Aceh. Afterward, from 2009 to 2017, it shows a positive trend, where the average growth of the population was 2.29% and reached 259,913.

- Number of members in a family

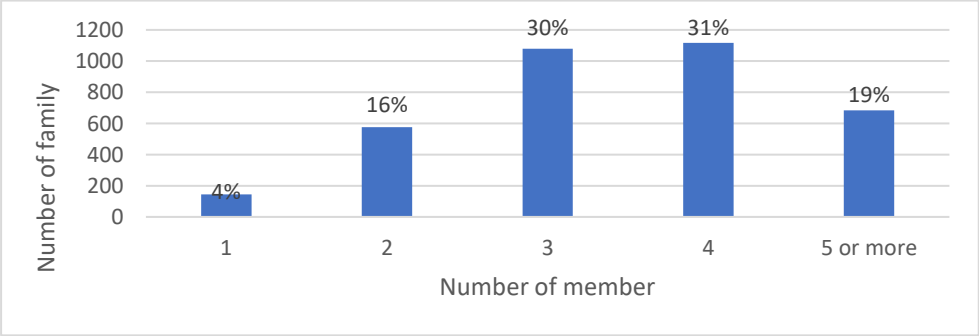


Diagram 4.7. Family grouping based on number of its members
Source: Banda Aceh Bust Rapid Transit Network Improvement, 2017

Based on Figure 4.7 above, 20% of households in Banda Aceh consist of 1 to 2 members, while 61% of the interviewed families consist of 3 to 4 members. On the other hand, the rest households consist of 5 or more family members.

[7] *Banda Aceh dalam Angka Tahun 2001-2003* (Annual report Banda Aceh in Figure; from 2001 to 2003)

- Household income

Based on Figure 4.8, the average income of a household in Banda Aceh is Rp4,100,000. Less than 5% of households have an income of more than Rp10,000,000.

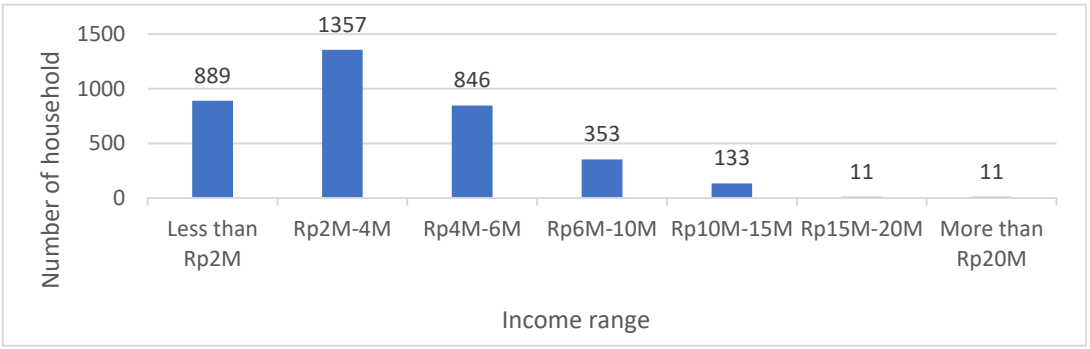


Diagram 4.8. Family grouping based on income
Source: Banda Aceh Bust Rapid Transit Network Improvement, 2017

Economy

After recovery from Tsunami, Banda Aceh rapidly grew thanks to the support from worldwide in the reconstruction and rehabilitation process.

The biggest contribution comes from the transportation and communication sector, service, and trade. The increase in Gross Domestic Product (GDP) influences people's welfare. The number of upper and middle-class citizens significantly rises and affects the demand for a minimum standard of public service, including provision for public transportation. For instance, the service of *labi-labi* considered "uncomfortable" leads people to drive personal vehicles rather than go by public transport. Besides that, the amenity of buying a motorcycle encourages low-class citizens to own one.

A survey conducted by TNP2K[8] in 2012 shows 63-84% of the low-class citizens own motorcycles. For this class, the use of motorcycle to commute reduce their expenditure for their daily needs and can be shifted to other primary needs, such as food, clothing, and housing. As a result, the number of labi-labi's passengers progressively decrease during the last decade.

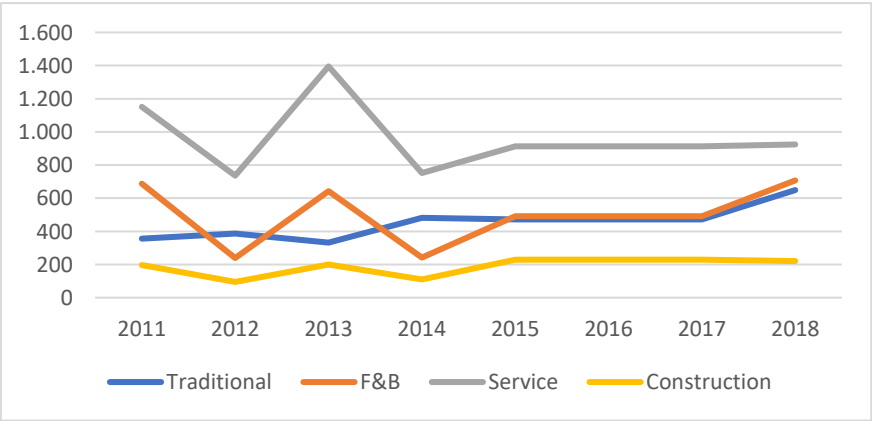


Diagram 4.9. Number of industries based on type of product
Source: Annual report Banda Aceh in Figure; from 2012 to 2019

[8] Tim National Percepatan Penanggulangan Kemiskinan (*The National Team for the Acceleration of Poverty Reduction*)

Furthermore, the industry in Banda Aceh is dominated by small-scale industry or home industry. Since the monetary crisis in 1998, the home industry has endured in the cities in Indonesia. Based on the graphic above, the industry in Banda Aceh faced up and down from 2011 to 2014. Service has become the largest industry since 2011. It covers vehicles repair, tire patch, publishing and photocopy, electronics repair, welder, goldsmith, dental worker, watch repair, and bridal's make up. In the second place, food and beverage (F&B) had significant growth in 2015 and 2018. Meanwhile, traditional industry, which produces Gold threat embroidery, broom craft, saltern, rattan weave, and hammersmith, seems to gradually decrease from 2014 to 2017 but increase in 2018. After facing unstable numbers from 2011 to 2015, the number of the construction industry that produces brick, block, wood frames, and furniture tended to be stable and at last weakened in 2018.

Land Use

The dominant land use in Banda Aceh city is for settlement area; meanwhile, in the city center is for commercial space.

Before Tsunami, the city development centralized on the coastal area in the north part of the city. However, the huge destruction caused by Tsunami in 2004 forced the city government to adopt a master plan on the basis of disaster mitigation. The master plan is explained in Banda Aceh's Spatial Plan 2009-2029.

One of the main development strategies is to direct the city's growth to the south area to secure the office affairs and settlement area from future disasters. A new city center has been developed, located in two urban villages of Lamdom and Batoh, in Lueng Bata sub-district. In order to hasten the growth, the government accelerates the development of its supporting infrastructure in the new city center, such as arterial- and ring roads, bus stops, and other public facilities. The acceleration is expected to trigger the growth of economic and service sectors as well as settlement in the area. In 2018, the main road of this new center has been inhabited by shops and offices.

In addition, the government plan to build Banda Aceh Outer Ring Road (BORR) around the city, including the coast in the north. The road is also connected to the Tsunami evacuation area and connects the new city center with Aceh Besar Regency, airport, and seaport.

The master plan of Banda Aceh city emphasizes the development of sustainable public transportation, which links city centers to other parts of the city because it is a crucial matter that can invite people or traders to come and enliven the area.

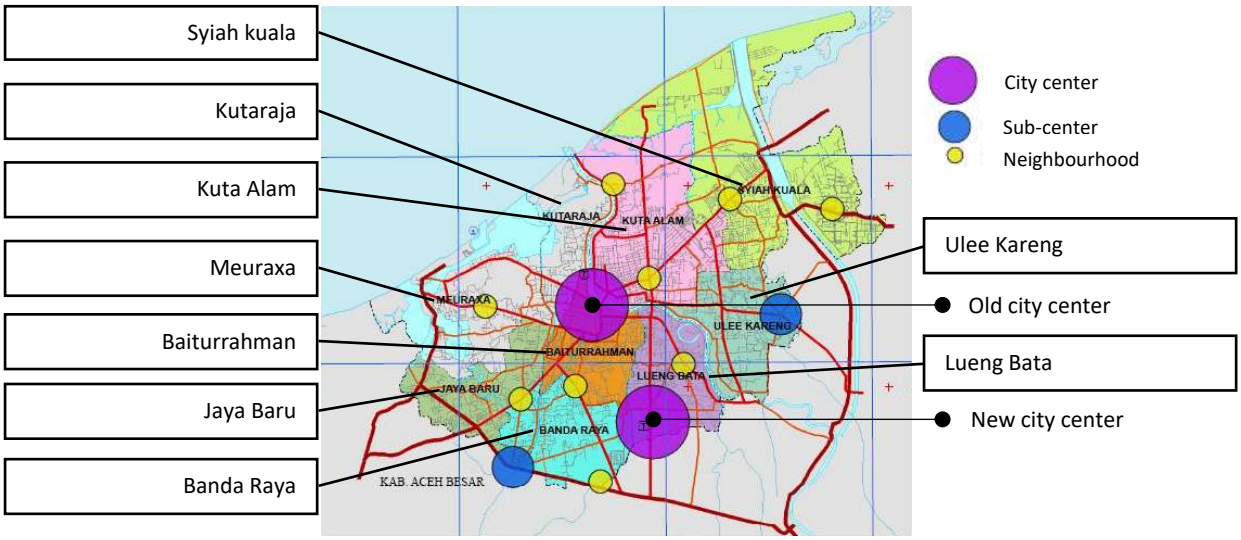


Figure 4.1. Space structure map plan of Banda Aceh 2029
Data source: The spatial Planning for Banda Aceh City Area 2009-2029

Commuting Characteristic

Methodology

In order to understand the mobility matter in the city, it is necessary to know how the characteristics of the people movement are. The commuting characteristics source is the document "Banda Aceh Bus Rapid Transit Network Improvement," which was released in April 2017. The document is made under the cooperation between the government of Banda Aceh municipality and the Cities Development Initiative for Asia (CDIA). This document is made as an assessment of the conditions in Banda Aceh in the context of a proposal for a Bus Rapid Transportation (BRT) lite direct service model system. It focuses on updating an earlier Pre-Feasibility Study report prepared by the Government of Banda Aceh with a summary analysis of the raw data from the household survey and cordon counts and supplemented with supplementary field survey data obtained by the study team during this study.

Household interview

In 2015, the Banda Aceh city government conducted an interview on 3,600 households and a screen line survey on 12,000 trips in 9 subdistricts in the city. The survey aims to gather information on improving and developing urban transportation. The interview result was used as basic consideration for Banda Aceh bus rapid transit network improvement, which was then published in April 2017 under cooperation between the government of Banda Aceh and the Cities Development Initiative for Asia (CDIA).

Population

- The expense for transportation

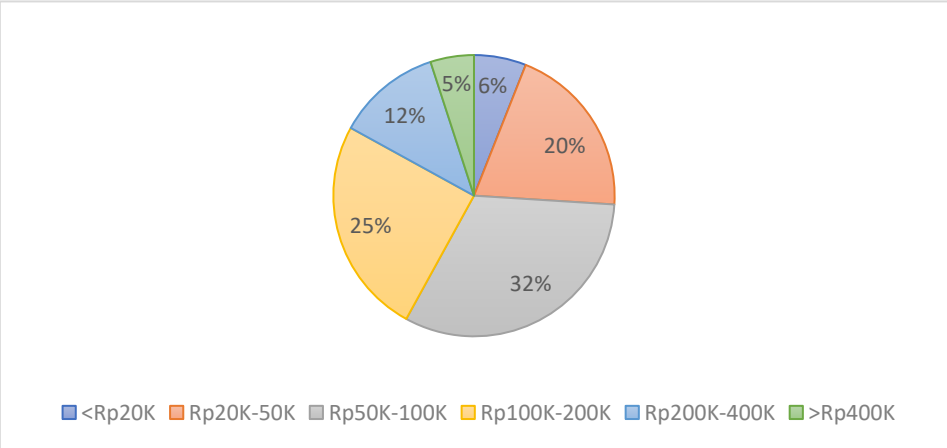


Diagram 4.10. Weekly expanse for transportation
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Diagram 4.10 shows that 6% of households spend less than Rp20,000 for weekly transportation. Meanwhile, 52% of households spend between Rp20,000-100,000 every week. The average expense of all households is Rp126,000.

- Vehicle ownership

Based on figure 4.11, up to 59% of households own motorcycles, and 17% have a car. It means 76% own motor-vehicle, while 20% have a bicycle. The rest of the household have other types of vehicle.

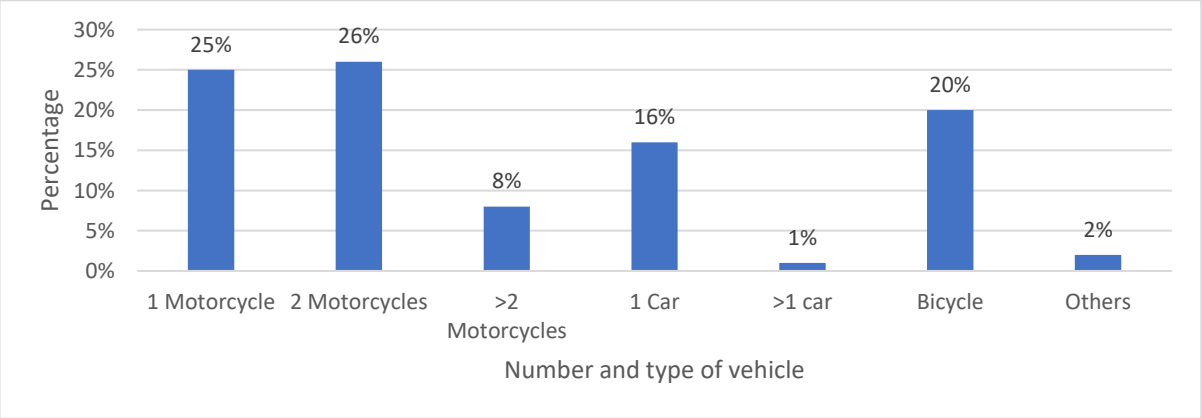


Diagram 4.11. Number and type of vehicle
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Commuting characteristic

- Origin

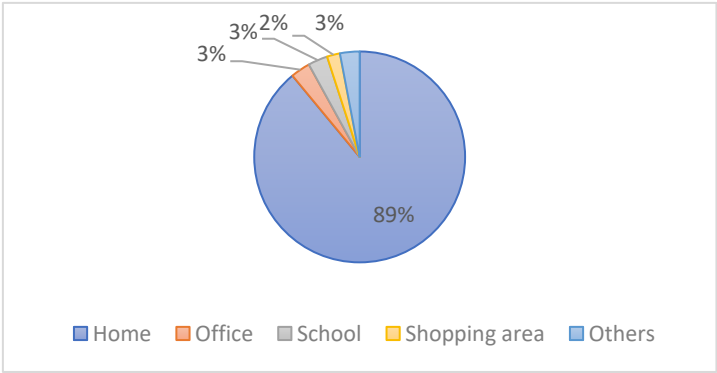


Diagram 4.12. Trip origins
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Figure 4.12 shows the origins of the trip in Banda Aceh. 90% of travel in the city starts from home, while the rest are from office, school, shopping areas, and others.

- Destination

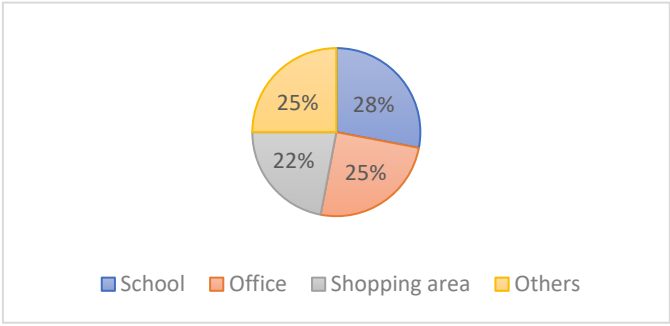


Diagram 4.13. Trip destination
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

The distribution of trip destinations indicates that school and office are the main destinations of daily trips, which 52% of respondents do. On the other hand, 22% of trip destination is a shopping area, and the rest 25% is others, which includes hospitals, house of worship, and sports arena.

- Time of trip

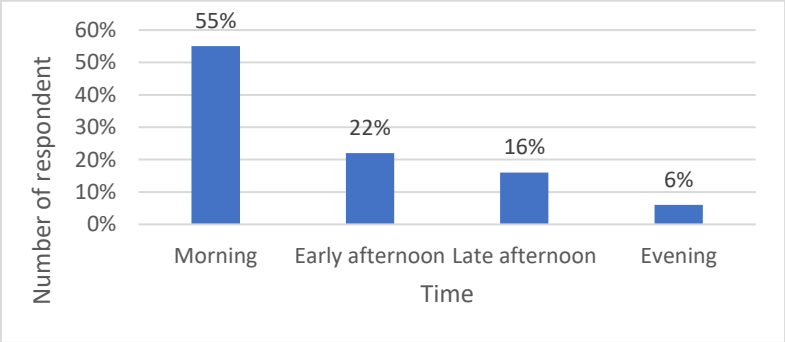


Diagram 4.14. Time of trip
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Based on Figure 4.14, dominant trips happen in the morning. Furthermore, 38% of trip is in the afternoon, and the rest 6% is in the evening. Most of the trips are in the rush hour between 06:00-09:00, which are trips from home to school and office. Furthermore, the next busy trips are between 11:00-14:00 for shopping and lunchtime. Besides that, most schools end their teaching activities also between 11:00-14:00, and office hour ends in the late afternoon between 16:00-19:00.[9]

- Choice of transport

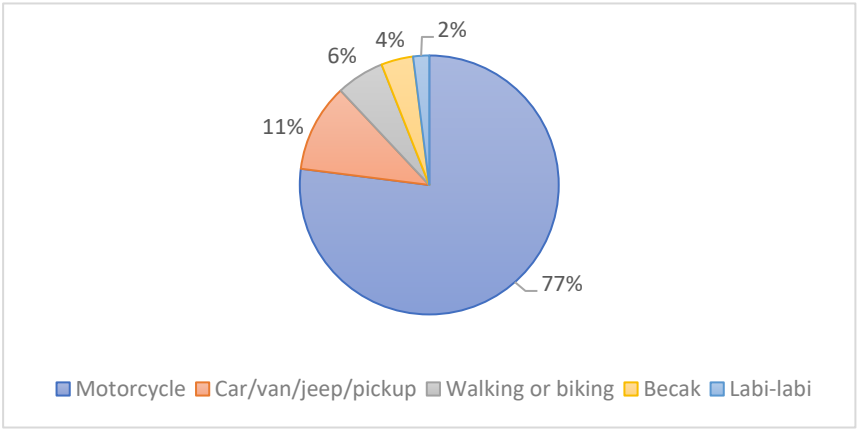


Diagram 4.15. Choice of transport
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

The motorcycle is the most favorable, of which 77% of the daily trip use this mode. Some reasons behind this are because (1) motorcycle is cheaper in its operational price compared with the cost of public transport like labi-labi or pedicab, (2) it is agile, compact, and can penetrate traffic jams, (3) people can go whenever they need to (time flexibility).

[9] Banda Aceh Bus Rapid Transit Network Development, April 2017. Published by Cities Development Initiative for Asia (CDIA) in cooperation with government of Banda Aceh municipality

- Choice of alternative transport

The respondents in the interview were asked about alternative transport they choose if they cannot drive their motor-vehicle. In diagram 4.16, it is seen that 21% choose to go by public transport, i.e., bus or labi-labi. Furthermore, 35% of respondents will join another driver, 33% will go by pedicab, 6% take other modes of transport, and the rest 4% of respondents decided not to go.

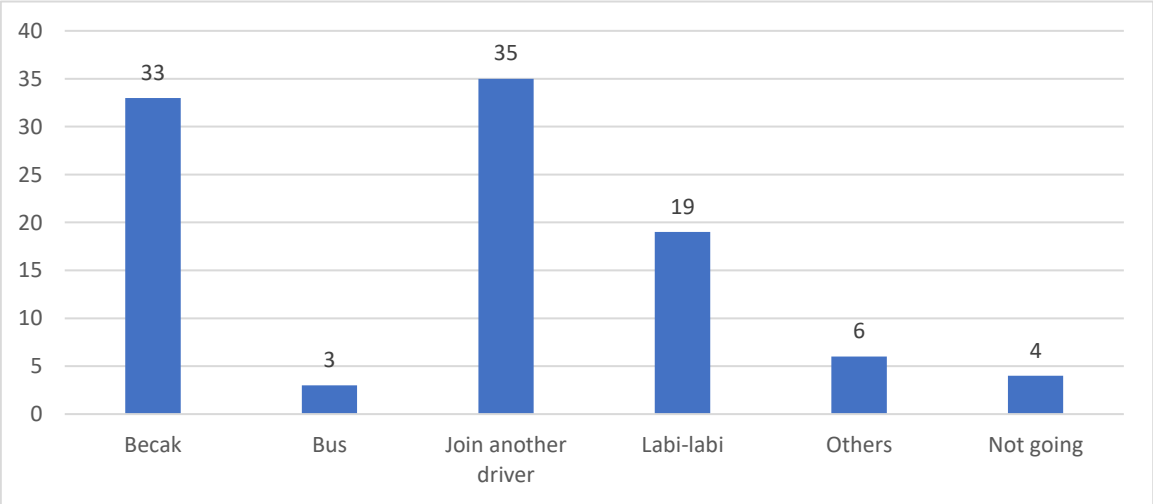


Diagram 4.16. Choice of alternative transport
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Household's trip characteristics compared with modes of transport

- Number of household member

	Percentage							
Number of household member	Pedicab	Bus	School bus	Walking	Labi-labi	Others	Car	Motorcycle
1	6%	0%	0%	6%	5%	10%	2%	5%
2	17%	0%	33%	19%	23%	30%	9%	16%
3	22%	20%	0%	24%	27%	20%	22%	29%
4 or more	55%	80%	67%	51%	45%	40%	67%	50%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 4.2. Number of household member
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Table 4.2 shows households with four or more members dominate all transport modes. It could be meant the family's behavior, which often commutes together with its family members.

- Household income

	Percentage							
Income	Pedicab	Bus	School bus	Walking	Labi-labi	Others	Car	Motorcycle
<IDR2M	51%	40%	33%	48%	59%	50%	2%	28%
IDR2M-4M	34%	20%	33%	38%	23%	20%	23%	42%
IDR4M-6M	12%	20%	33%	6%	14%	30%	35%	22%
IDR6M-10M	3%	20%	0%	7%	5%	0%	24%	7%
IDR10M-15M	0%	0%	0%	1%	0%	0%	14%	1%
IDR15M-20M	0%	0%	0%	0%	0%	0%	1%	0%
>IDR20M	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 4.3. Household income
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Table 4.3 shows the linkage between household income and choice of transport. It is seen that households have incomes less than IDR2,000,000 choose to commute by pedicab, bus, school bus, labi-labi, others, and walking. As the increase of the income, the usage of public transport decreases, and the ownership of personal vehicle increase.

- Vehicle ownership

Table 4.4 explains the comparison of vehicle ownership with the usage of transport modes. Although a household owns a vehicle, it seems other family members is still using public transport to move to the city. Household with one car is the dominant group using public transport such as bus, school bus, and labi-labi. On the other hand, the household's own motorcycle is the group who are mostly going on foot or by pedicab.

	Percentage							
Vehicle	Pedicab	Bus	School bus	Walking	Labi-labi	Others	Car	Motorcycle
No vehicle	2%	0%	0%	4%	1%	0%	0%	0%
1 motorcycle	36%	6%	0%	30%	2%	2%	14%	32%
2 motorcycles	12%	6%	33%	26%	1%	1%	15%	35%
>2 motorcycles	4%	6%	0%	10%	0%	0%	6%	11%
1 car	5%	76%	67%	1%	87%	89%	48%	0%
>1 car	0%	6%	%	0%	9%	6%	4%	0%
Bicycle	9%	0%	0%	21%	1%	1%	11%	20%
Others	33%	0%	100%	9%	0%	1%	1%	3%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Tabel 4.4. Vehicle ownership
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

- Age

	Percentage							
Age (years)	Pedicab	Bus	School bus	Walking	Labi-labi	Others	Car	Motorcycle
<17	6%	0%	38%	20%	16%	14%	2%	10%
18-24	7%	0%	31%	11%	15%	14%	3%	19%
25-54	71%	80%	25%	57%	61%	61%	80%	65%
55-64	12%	0%	0%	8%	5%	11%	12%	5%
65+	4%	20%	6%	5%	2%	0%	2%	1%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Tabel 4.5. Choice of commuting based on age
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Although it cannot be significantly specified about their choice, people in the age range between 25-54 are the group who most commute, as seen in table 4.5. Additionally, people under 25, who could be mostly students and pupils, often make their trip by school bus. Also, the Senior age group mostly goes by bus to commute in the city.

- Sex

It can see from table 4.6 that males and females have the same proportion of using pedicabs, school buses, and motorcycles. Surprisingly, only males choose bus for transport, while the group who like to walk and travel with labi-labi is 70% dominated by females. In contrast, more than 75% of males drive cars compared to females, which is less than 25%.

	Percentage							
sex	Pedicab	Bus	School bus	Walking	Labi-labi	Others	Car	Motorcycle
Male	42%	100%	50%	29%	21%	61%	76%	57%
Female	58%	0%	50%	71%	79%	39%	24%	43%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Tabel 4.6. Choice of transport based on sex
Data source: Banda Aceh Bus Rapid Transit Network Improvement, released in 2017

Public Transport in Banda Aceh

Bus Trans Koetaradja

The born of Trans Koetaradja or Trans-K is expected as a short- and medium-term solution of city transportation in Banda Aceh. The previous mode of public transportation is considered bad because it cannot fulfill the standard quality people need. Moreover, the increase of wealthy people led to the tendency to own or use a personal vehicle to commute. Furthermore, along with the increasing use of private vehicles, there was a significant decrease in the number of Labi-labi passengers.

The bus started to operate in May 2016 by serving corridor 1, connecting the Baiturrahman Great Mosque area with Darussalam area, where the public university is located. It is managed by the Banda Aceh city Transportation Agency (Dishub) by separating the function of regulator and operator. Dishub acts as a regulator while the service is provided by private companies acting as operators. The operator, which was chosen through an open tender process, provides service as the minimum standard service defined by Dishub.

Until now, Trans Koetaradja serves as "BRT-Lite" equipped with some bus stops and designed to drive without a particular bus lane. Therefore, passengers cannot expect to travel faster than by driving a personal vehicle because the bus is possibly trapped in the congestion in rush hour. It also means that the bus has a problem being on schedule to arrive at each stop.

Interestingly, the public's response to the bus is quite good, which is seen from the growth of the number of the passenger as well as from the load factor. Dishub (2019)[10] reports on its website that in 2017, more than a million-passenger commuted with Trans K, which was serving three corridors. In 2018, 2 more routes were added, and the number of passengers significantly increased up to 4 million.

Trans-K does not only function as daily city transportation but also as a supporter of national and international events conducted in Banda Aceh and surrounding areas. It drives passengers from certain points of departure to where the events take place. It is helpful for event participants as well as visitors. In the first quarter of 2019, the number of passengers reaches 1,3 million.

Labi-labi

Wiranto (2015)[11] explains that Labi-labi is a modified single-cabin pickup truck used as public transport. It started operating at the beginning of the 1980s with a small car equipped with a 550cc machine and could accommodate 11 passengers. A few years later, the trend changed, and Labi-labi began using Daihatsu Hijet-55, which can accommodate up to 14 passengers. After a decade, it upgraded to Hijet-1000 with a 1000cc machine and can serve 16 passengers.

Before Tsunami, the time of operation of this public transport was from 06:30 to 22:00. After the disaster, the operation time changed; from 06:30 to 18:00. Nevertheless, some units started to operate in the early morning from 04:00 to transport commodities from areas around the city to some markets in Banda Aceh.

Since its existence, Labi-labi has played an important role as the main public transport in Banda Aceh, where the dominant users were students. In 2000, 1.000 units were registered and served 17 routes; however, in 2016, the number of units operating decreased to 352 and served ten routes. Pre-feasibility study in 2014 conducted by CDIA (Cities Development Initiatives for Asia) shows only 80 units operated because the load factor during peak hours is only 50%.

The drop in the number is because of the decrease in public interest due to uncertainty in the service schedule, including the long waiting time for departure in the Keudah terminal. Besides that, a driver of labi-labi said that one of the reasons behind the low public interest using his transportation service is because of the existence of the bus Trans K that offers free transportation in the city, which has some stopes in the area of Baiturrahman Grand Mosque. For that reason, most labi-labi drivers choose to depart the journey from the area of the Grand Mosque instead of Terminal Keudah to compete with the Trans K in serving passengers. It is predicted that Labi-labi will disappear by itself over the time.

[10] https://dishub.acehprov.go.id/aceh-transit/empat-juta-lebih-pengguna-bus-transkoetaradja/

[11] https://www.liputan6.com/citizen6/read/2292696/labi-labi-transportasi-unik-yang-hanya-ada-di-aceh

Becak Motor (Bentor)

Becak motor is a kind of transportation that use a motorcycle and passenger seat on the left side. The passenger seat is like a small wagon with an openable roof. Some bentor drivers usually drive around slowly to get passengers, but most of them stop on the street sides and wait for passengers coming to approach. Before departure, prospective passengers must negotiate the travel price with the driver. The driver will deliver the passenger to his destination once the price-dealing is gotten.

Muzakir (2016) explained in Merdeka News[12] that the service condition of the bentor is far from expected. Based on his research, the number of units is not comparable to the number of passengers. Other weaknesses are the maintenance of the bentor bad, which makes it unattractive, there is no tariff uniformity, and it does not have a certain base/station, which then creates competition between drivers in catching passengers.

Recently, the existence of bentor in Banda Aceh has decreased due to the decreasing number of its passenger. People can use Trans Koetaradja for free or order an online taxi (2- or 4-wheels vehicle) by application on their mobile phone. A driver of becak motor told Anteroaceh[13] news in September 2019 that the maximum money he can earn in a day is half of what he earned earn some years ago. Besides that, he must pay some money to the owner of becak motor every day. This situation leads some drivers to leave bentor and find other jobs.

Online Transportation Service (2- and 4-wheels vehicles)

A current trend of transportation in Indonesia, especially in Banda Aceh, is online-transportation services. People can use this service by installing the application on their mobile phones and enjoy the service offered by online-transportation providers. The users only need to input their origin and destination, and then the application will calculate the cost of the trip as the chosen vehicle type (motorcycle or car). Afterward, the application will automatically contact the nearest driver from the location of origin.

Besides that, the online transportation providers also offer some other services. Two popular services are food delivery and product delivery service. Users can order any kinds of food in the city in the application, from street food to franchise food in big restaurants. In the case of sending homemade food products, documents, and packages in the city, the easiest and quickest way is also using this service that will cost the customer based on the distance between origin and destination.

The first online transportation service in Banda Aceh in early 2017 is HOJAK, which offers three types of transportation services: ho-becak, ho-bike, and ho-car. It is a local company that starts its business with 30 motorbikes, ten cars, and five becak. This provider's favorite transportation is ho-bike because a trip using a motorbike is the fastest way through the city traffic, and it is also very cheap (Rp5.000/2 km)[14].

In mid of 2017, a national-level online-transportation company started its business in Banda Aceh. GOJEK started to operate with more than 500 drivers and offered more services in its apps, such as go-box (moving house), go-tix (cinema ticket purchase), go-med (medicine shopping), go-pay (bill payment), go-massage, go-clean (house cleaning), go-auto (vehicle on-site repairment), and go-glam (beauty service). With those services, GOJEK embraces other local companies as partners, like restaurants, pharmacies, massage services, cleaning services, workshops, beauty salons, etc.

[12] https://www.merdeka.com/peristiwa/becak-di-banda-aceh-pakai-argo-per-kilometer-ini-tarifnya.html

[13] https://anteroaceh.com/news/nestapa-tukang-becak-di-aceh-dari-penghasilan-rp-35-ribu-hingga-tidur-dibecak-ketika-malam/index.html

[14] Price in 2017. Source: http://www.travelenses.com/2017/08/hojak-in-indonesia-banda-aceh-city.html

Pedestrian

Methodology

The writer chooses to use three ways to know the pedestrian condition in the city center area. They are by learning spatial planning documents, observing, and through structured questionnaires spread out on the street. One hundred forty questionnaires were spread out in May 2017 and in May 2019 in the area of Baiturrahman Grand Mosque, and the targets were pedestrians. The time of the structured interview is from 09:00 to 16:00. Lastly, it is an evaluation using chosen variables from chapter 2.

With these different aspects, it is expected to get comprehensive information, from the plan of government, from the perspective of the writer, and from the side of the users.

Pedestrian System Development in the City Center

Refers to the "Rencana Tata Ruang Wilayah[15] (RTRW) Kota Banda Aceh 2009-2029", the strategy for pedestrian system development is by placing it as the extension of public transportation mode. Its development will not change the layout and the spatial use arrangement that has been determined. The expansion plan of pedestrian lanes appoints that the lane's minimum width is 1,2 meters for the area of the city center and the sub-city center.

The plan for the lane expansion in the city center is divided into four segments. The first segment is Tentara Pelajar street, between the Keudah city bus terminal and Diponegoro street. The other three segments are on Diponegoro street; segment 2 is between the intersection of Pasar Aceh and Cut Meutia street, segment 3 is between Cut Mutia Street and the "A" intersection of the Pante Pirak bridge, and segment 4 is between the "A" intersection and Simpang 5 (5-way intersection).

Based on figure 4.2, the pedestrian-lane development aims to develop the 4-segments as the pedestrian center which is located in the middle of the commercial area, in the heart of the old-city center, where the Keudah city bus terminal, as labi-labi terminal, is situated.

Visually, the corridor of segment 1 is not attractive enough, not only from the product traded but also the visual look of the buildings. On the side of the street, there are 2- and 3-story buildings selling furniture, and on the other side is the Keudah terminal and office. The façade of the buildings is not harmonious with a paint color that is already dull.

In segment 2, a mall and shops sell textile, clothes, accessories, restaurants, and cafés. Of those four segments, segment 2 has the highest traffic intensity, and congestion mostly happens in the late afternoon, especially on weekends. It is a one-way street with the bad condition of pedestrian lanes. Some parts are damaged, broken off, or blocked by the trader's merchandise. Although many people have seen this segment, none of them are walking due to the situation mentioned above. The visitors come with a car or motorcycles parked their vehicles at the side of the street.

Segment 3 has different characters compared to other segments. It is a one-way street with a 4-lane motorway. This segment is important because it is the location of (1) the entrance to the basement parking of the Grand Mosque, (2) the main stop of the bus Trans K, and (3) the entrance to the Chik Pante Kulu street, which is shopping area (likely unofficial pedestrian zone) filled with street vendors.

[15] City's Spatial Planning of Banda Aceh 2009-2029

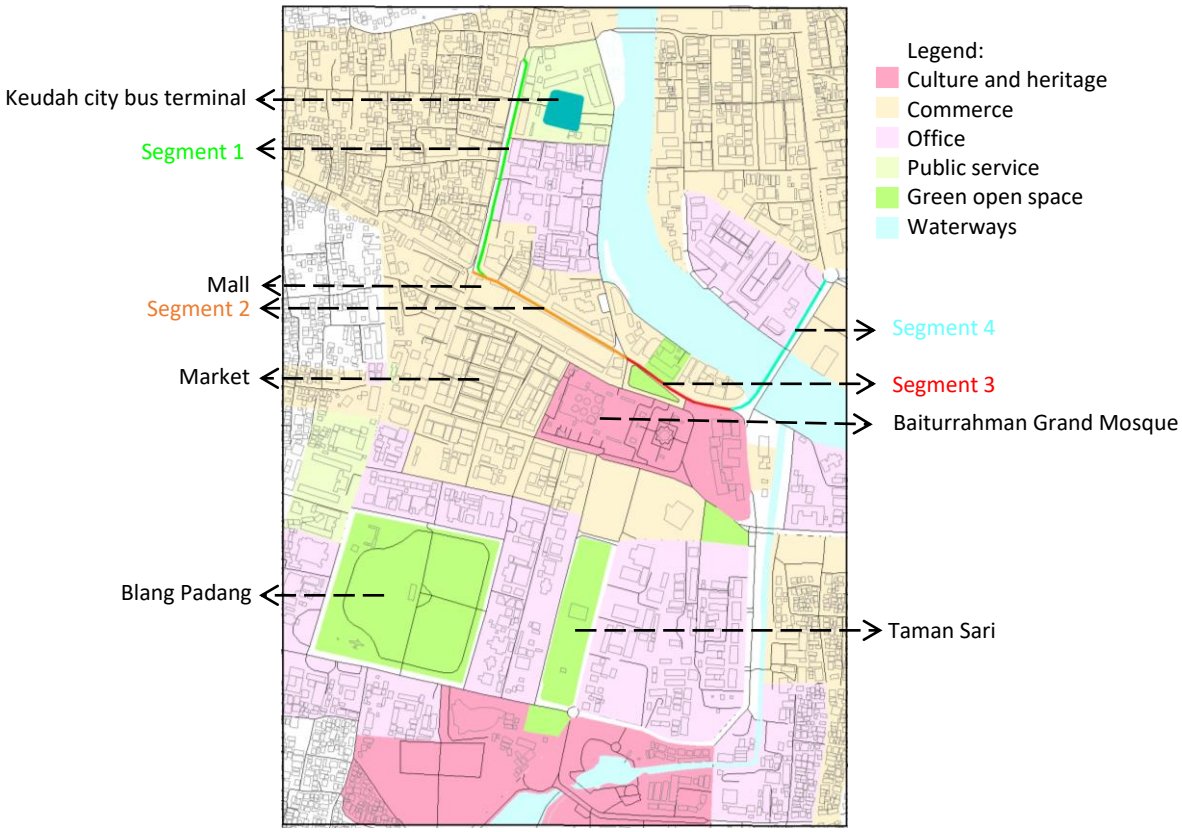


Figure 4.2. Location of 4 segments of pedestrian development
Data source: City's Spatial Plan of Banda Aceh 2009-2029

Unfortunately, the pedestrian lane in segment 3 is not accessible due to the goods from the shops and street vendors. Besides that, people who want to go to the Grand Mosque or want to reach the bus stop from the other side of the street have trouble because there is no crossing lane on this segment.

Segment 4 is a 2-way road that consists of 3-lanes each. It has the best pedestrian lane condition compared to the other three segments. However, still, nobody is seen walking on this segment, although it is an important connection linking the "A" intersection and Simpang 5 (5-way-intersection). Using Lynch's (1960) element, Simpang 5 is a node of the area; It is a strategic spot surrounded by restaurants and other commercial functions as well as junctions connecting main city roads. Every Sunday morning, the city has a car-free day, and Simpang 5 is part of the area where motor vehicles are prohibited from entering.

Questionnaire 2017

There are 4 main things earned from the questionnaire.

1. For the choice of transport in visiting Baiturrahman Grand Mosque area, almost half of the respondents answer that they come using a motorcycle. 19% of respondents come to the area by car and 14% by public transport. Interestingly, there is 14% of respondents arrive by other kinds of transport, and only 7% come by foot to the area.

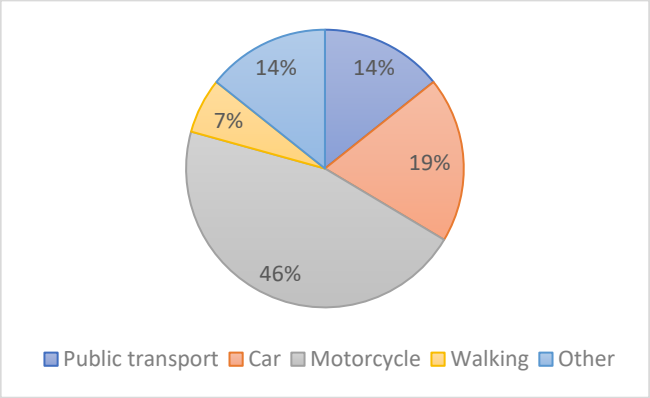


Diagram 4.17. People's choice of transport in visiting Baiturrahman Grand Mosque area
Data source: Questionnaire May 2017

2. To move within the area of the Grand Mosque, 39% of respondents use motorcycles, and 34% use other kinds of transportation to move within the area. Comparing diagram 4.17 to 4.18, it is possible that few people who come by driving a car and riding a motorcycle change their transport mode to either walk or using other transport to move around.

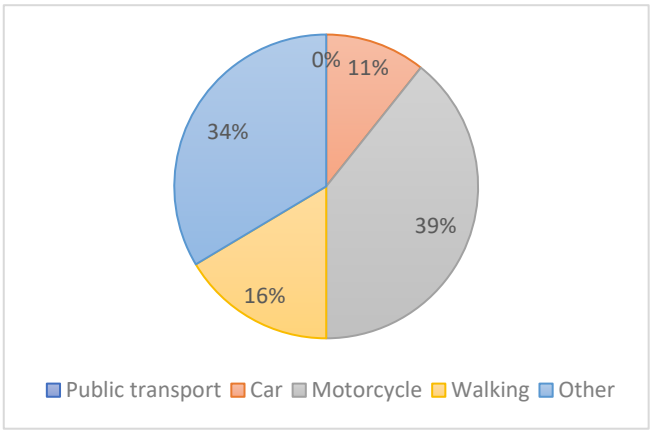


Diagram 4.18. People's choice of transport to move within Baiturrahman Grand Mosque area
Data source: Questionnaire May 2017

3. When the respondents were asked about their reason for not walking, up to 41% of respondents complained about accessibility related to distance. They said that they do not intend to walk because the distance between places they want to visit in the area is too far for them. On the other hand, 23% of respondents say that they are lazy and exhausted from walking, while 23% complain about the weather that is too hot to walk in the sunshine. There are 8% of respondents criticized pollution, and only 5% protested the condition of the pedestrian lane.

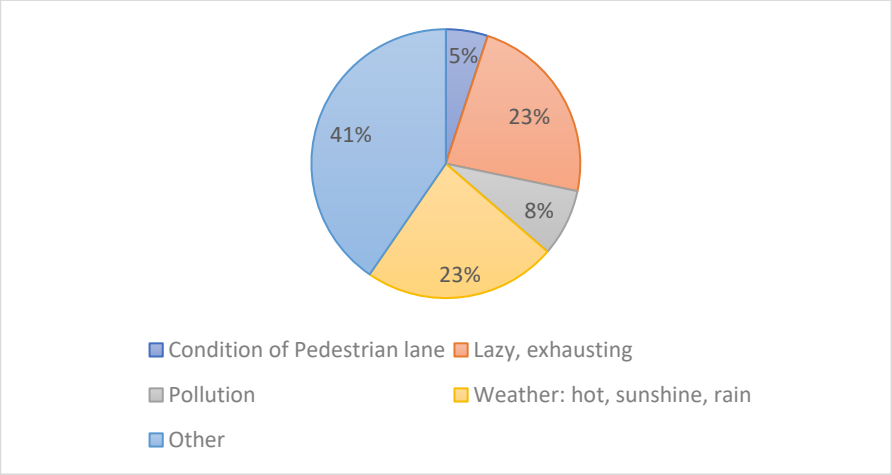


Diagram 4.19. People's reason for not to walk
Data source: Questionnaire May 2017

4. All respondents are asked whether they will walk if a good pedestrian lane in the area is available. 71 % of respondents confirmed that they would walk within the area, and 23% of respondents will consider walking, while 6% really do not want to walk.

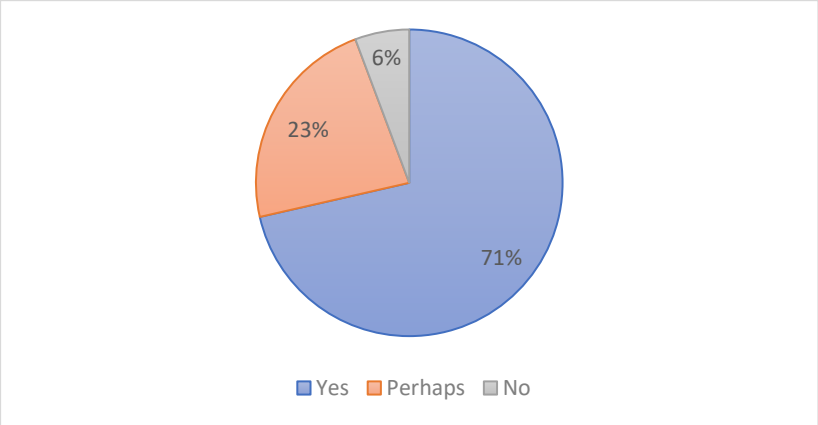


Diagram 4.20. People's will to walk if the pedestrian lane is good
Data source: Questionnaire May 2017

Questionnaire 2019

In May 2019, 140 structured questionnaires were spread in the area of Baiturrahman Grand Mosque in Banda Aceh. Learning from Questionnaire 2017, the writer added questions about the visited place, time and frequency of visit, and vehicle ownership, to get a more comprehensive understanding of trends from the respondents. The sample of questionnaires are in appendix chapter 4.

- Most visited places (first destination)

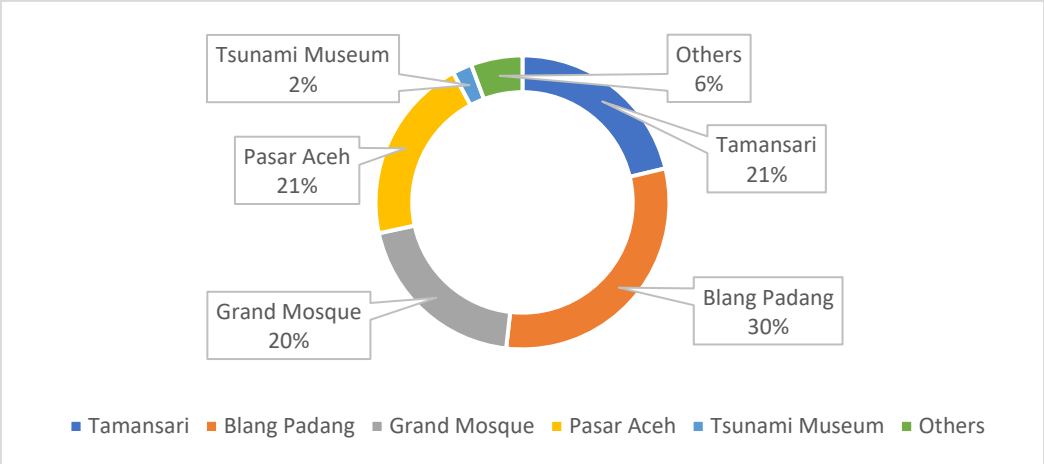


Diagram 4.21. Most visited places (first destination)
Data source: Questionnaire May 2019

There are five main answers given by respondents when they were asked about their destination in the city center. The answers are Blang Padang, Tamansari, Pasar Aceh, Baiturrahman grand mosque, Tsunami museum. The most visited place in the old city center is Blang Padang, where 30% of respondents make it their main destination. Blang Padang is an 8-hectare green field which is located between Iskandar Muda Street, Syekh Muda Wali street, and Prof Abdul Majid Ibrahim street. People visit this field to do sports like jogging, basketball, soccer, and badminton playing and enjoy the food sold by small stands on the northern side of the Blang Padang field. Besides that, it has also become a tourist destination because there are historical monuments spread out on the field; the airplane monument of RI-001, which was the pioneer of the current government's flight (Garuda Indonesia), and the monument of "Thanks to the World" as a thankful monument to all countries which supported Aceh after Tsunami 2004. Additionally, there are 80 inscriptions in different languages which represent the donor country along the jogging track.

Meanwhile, around 20% of respondents chose Tamansari, a city park located 200 meters south of Baiturrahman grand mosque. The east part of the Tamansari is directly opposite the Banda Aceh Mayor's office. This park is equipped with a playground for children, two buildings that are accessible to anyone, and free Wi-Fi. It makes Tamansari become an alternative tourism place for families in Banda Aceh.

The remaining respondents have the same percentage choose Pasar Aceh and the grand mosque. Pasar Aceh, which has been there since the existence of Banda Aceh city in the 1200s, sells daily needs, from raw food to fashion and accessories. Located in the west of Baiturrahman grand mosque, people know Pasar Aceh not only the market itself but also the surrounding shops known as Pasar Aceh. In 2013, a new building was opened, which consists of 106 kiosks. In addition, The Baiturrahman grand mosque is an important place for Muslims in Aceh. It is a historical building and a center of worship, cultural, and social activities. Found in 1612, the grand mosque is a witness to the change of Banda Aceh city from time to time. It became a fortress against Dutch soldiers before they burned it out in 1873. A year later, the Dutch government rebuilt the mosque as an apology to the Acehnese. It was well decorated, of which the wall and pillars, marble floors, and stairs are from china, the cast-iron windows are from Belgium, and the masonry was brought from Netherland. It makes the mosque become one of the most beautiful in Indonesia. Today, Muslim visit Baiturrahman five times a day for worshiping and special Islamic events.

It is only 2% of respondents chose the Tsunami museum, and 6% visited other places. Tsunami Museum was built as a reminder of the 2004 Indian Ocean earthquake and Tsunami disaster. The construction was finished and opened to the public in 2011. Besides its beautiful architecture that adapts Aceh's cultural principle, it also functions as an educational center and an emergency shelter for Tsunami.

- Most visited places (second destination)

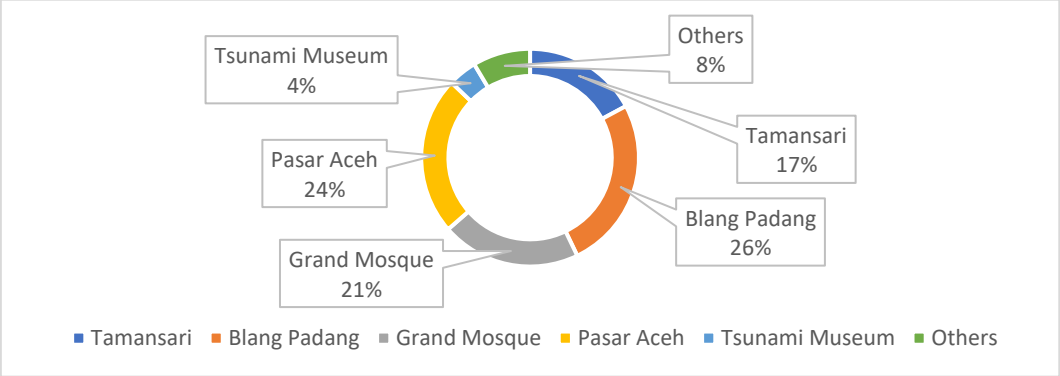


Diagram 4.22. Most visited places (second destination)
Data source: Questionnaire May 2019

Furthermore, the respondents were asked about their second destination in the city center. 26% choose Blang Padang, 24% choose Pasar Aceh for shopping, and 21% choose the grand mosque to worship. Additionally, there are 17% go to Tamansari. There are only 4% choose Tsunami museum while 8% choose other places.

- Frequency of visit

For the frequency of visits, most of the respondents report that they come 2-4 times to the old city center. 22% of respondents visit the old city center every day and 31% once a week. Meanwhile, 3% answer that they rarely visit it.

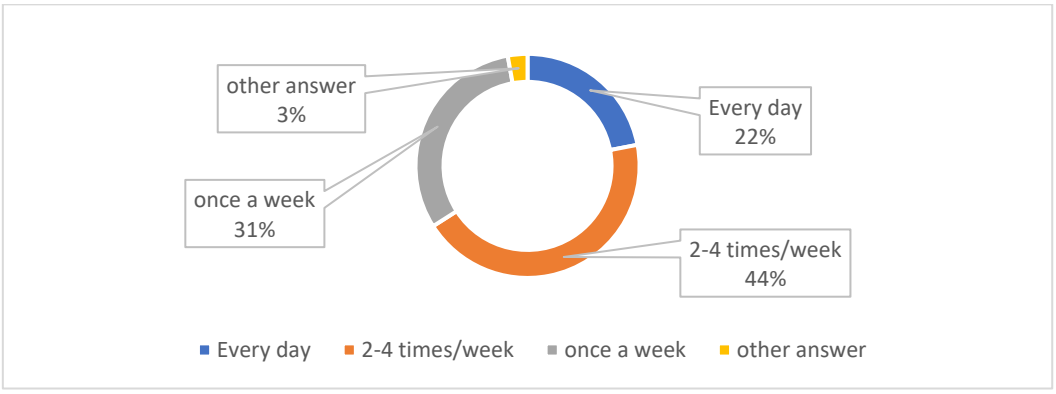


Diagram 4.23. Frequency of visit the old city center
Data source: Questionnaire May 2019

- Time of visit

The time to visit the area is equally balanced during the day. 28% of respondents came before 10 o'clock, and the same percentage of 25% of respondents each came between 13:00-16:00 and between 16:00-19:00. The remaining 21% visit the old city center in the range time of 10:00-13:00. Furthermore, no respondents came to the area after 19:00.

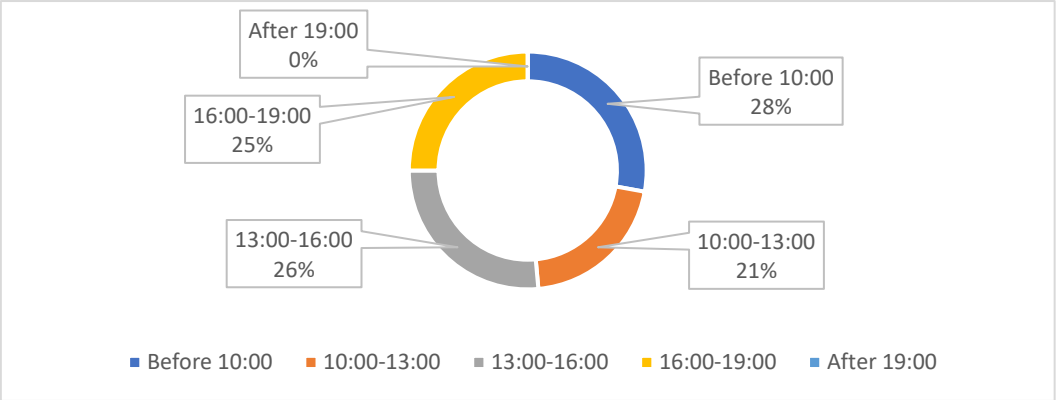


Diagram 4.24. Time of visit
Data source: Questionnaire May 2019

- Choice of transport to reach destination

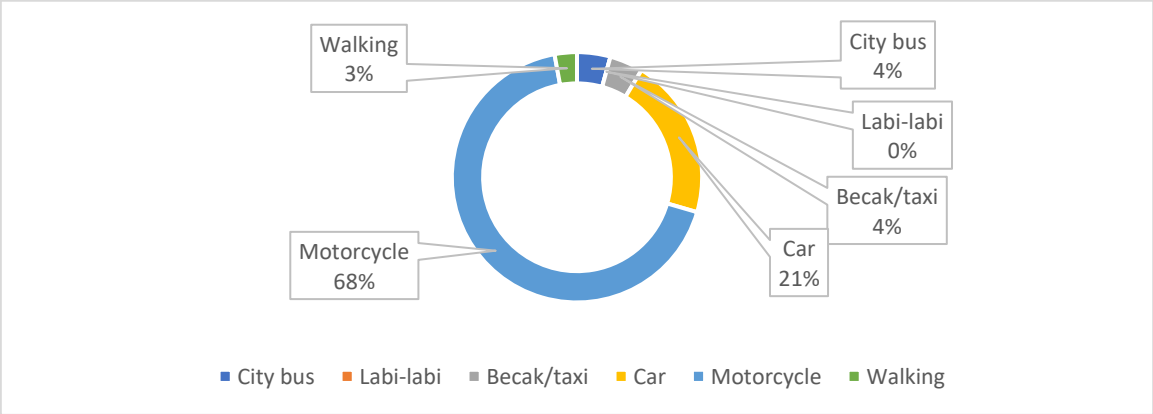


Diagram 4.25. Choice of transport to reach destination
Data source: Questionnaire May 2019

More than two-thirds of respondents go riding a motorcycle. While 21% were driving a car, the rest were 4% going by bus, 4% by Becak or Taxi, and 3% respondents walking.

- Choice of transport within the city center

After reaching their first destination, half of the respondents continue to move with motorcycles within the area. If it is compared to the previous diagram, it means that around 13% of 68% of respondents with motorcycle change their way of transport after arriving at the main destination. It also happened with respondents who came with a car, where 10% of 21% changed the way they move.

The significant progress can be seen in the number of walkers. Within the city center, 33% of respondents chose walking to commute from the main destination to the next destination in the area. On the other hand, it is only 1% using becak or taxi, while 2% give other answers that was not listed in the questioner's option.

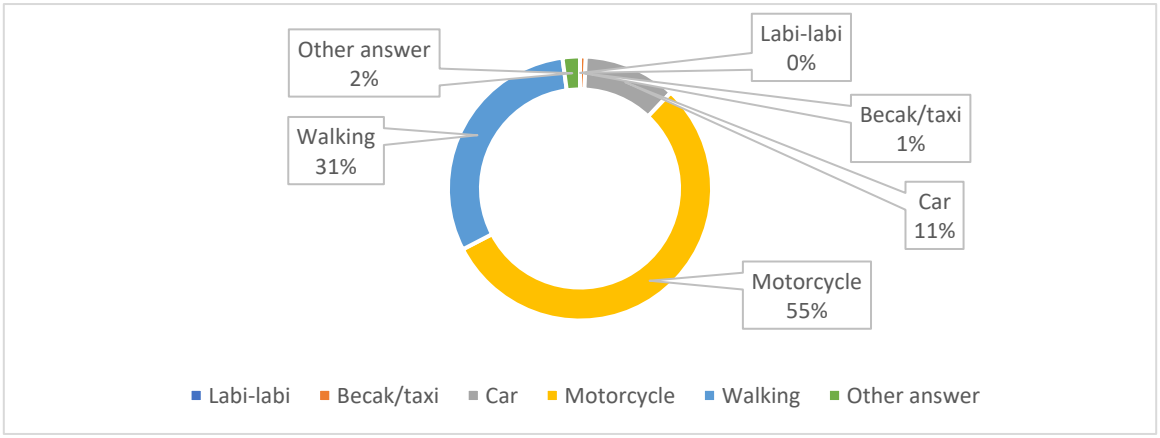


Diagram 4.26. Choice of transport within the city center
Data source: Questionnaire May 2019

- Reason to walk

To all respondents who answer walking as their choice of transport, to reach the main destination, and to move within the area, they answer their reason for walking. 75% of respondents said because their destination is nearby and it is easier to walk rather than continue with vehicles. In contrast, 13% of respondents report that they found it hard to find parking spaces. It is only 4% of respondents chose to walk because they do not have to spend money for parking or fuel, while 8% gave other answers that were not in the questionnaire's option.

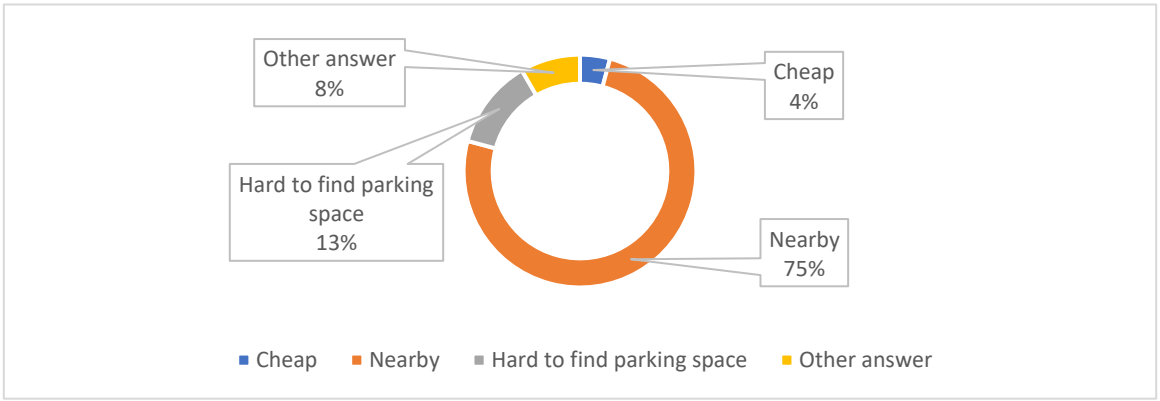


Diagram 4.27. Reason to walk
Data source: Questionnaire May 2019

- Reason not to walk

In contrast, the respondents who did not choose to walk at all were also asked the reason why they did not want to walk. Almost three fourth answer because they are lazy, or walking can make the exhaust. Meanwhile, 9% of respondents said it is too hot to walk, and they will find it difficult to commute if it suddenly rains. The remaining 3% of respondents do not like the pollution, and 8% of respondents said other answers that are not in the questionnaire's option.

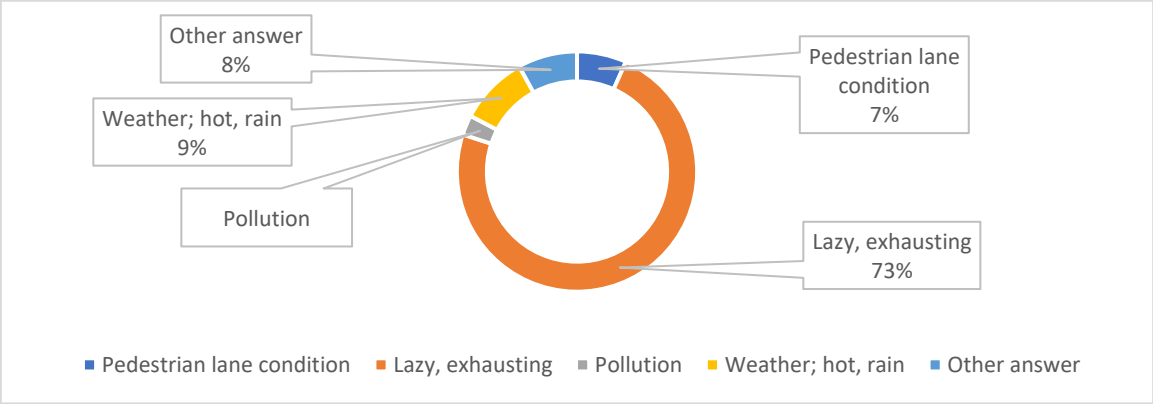


Diagram 4.28. Reason not to walk
Data source: Questionnaire May 2019

- Desire to walk in a better pedestrian lane

The next question during the interview was if the respondents intended to walk in a good pedestrian environment. The result shows that one-third of them positively would like to walk, and 28% answered no. 42% of respondents answer possibly yes and will consider that.

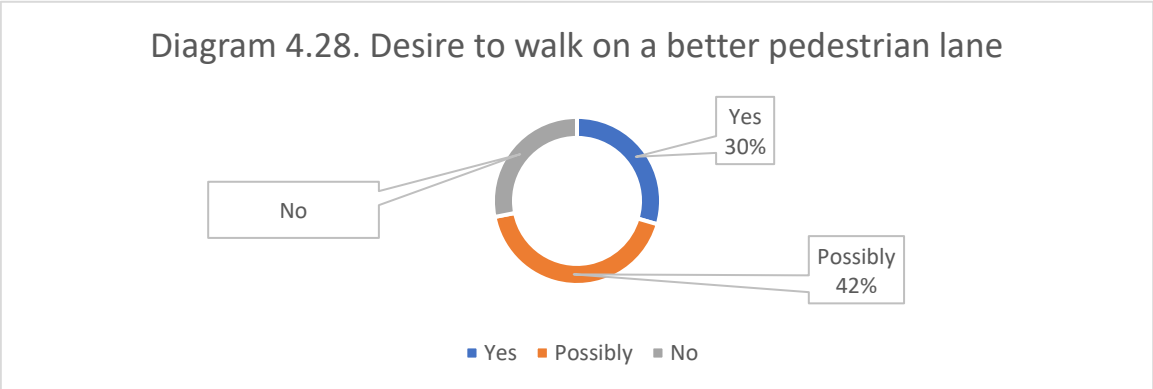


Diagram 4.29. Desire to walk on a better pedestrian lane
Data source: Questionnaire May 2019

- Vehicle ownership

At the end of the interview, the interviewer asked about the respondent's ownership of a personal vehicle. 31% of respondents confessed that they have both car and motorcycle at home. Meanwhile, 58% of them have only a motorcycle, and 10% do not own a motor vehicle. It is only 1% of the respondent that has only a car without a motor vehicle.

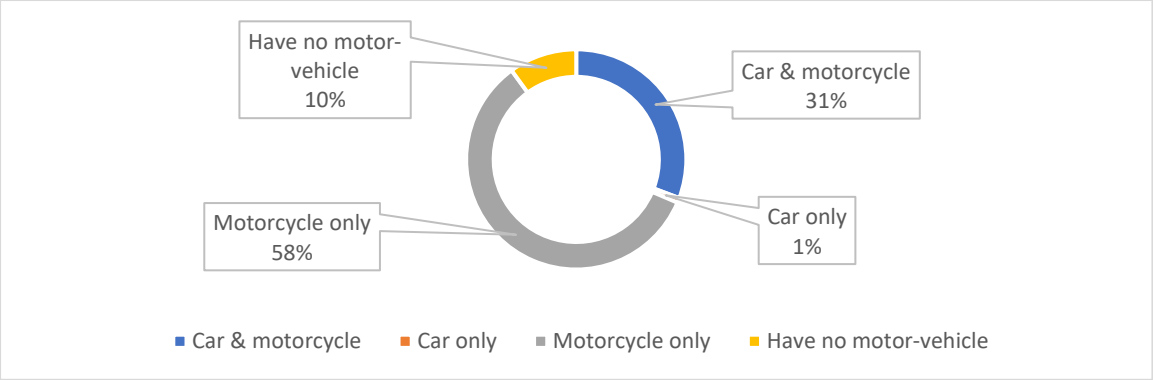


Diagram 4.30. Motor-vehicle ownership
Data source: Questionnaire May 2019

- Motorcycle ownership

The respondents who have motorcycles informed about the number of units they own. Surprisingly, 70% of respondents own more than one motorcycle, and 30% own only 1-unit motorcycle in their household.

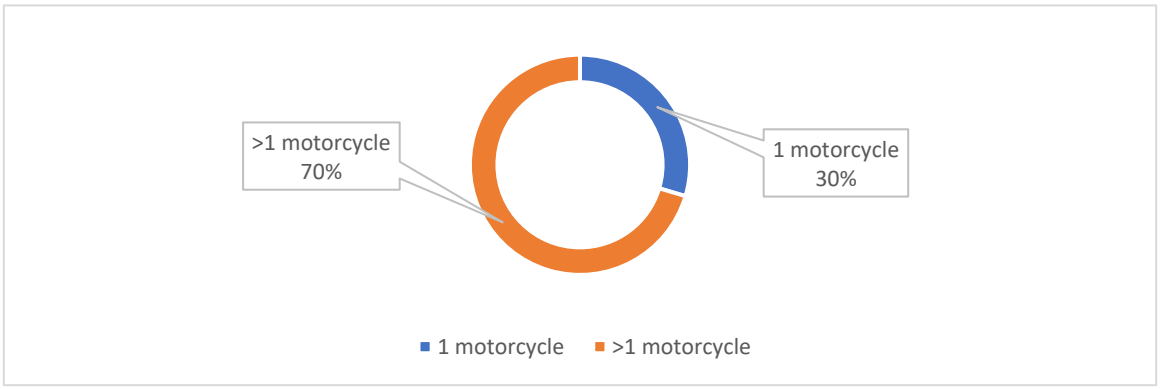


Diagram 4.31. Motorcycle ownership
Data source: Questionnaire May 2019

Variables Evaluation

1. Availability of walking paths

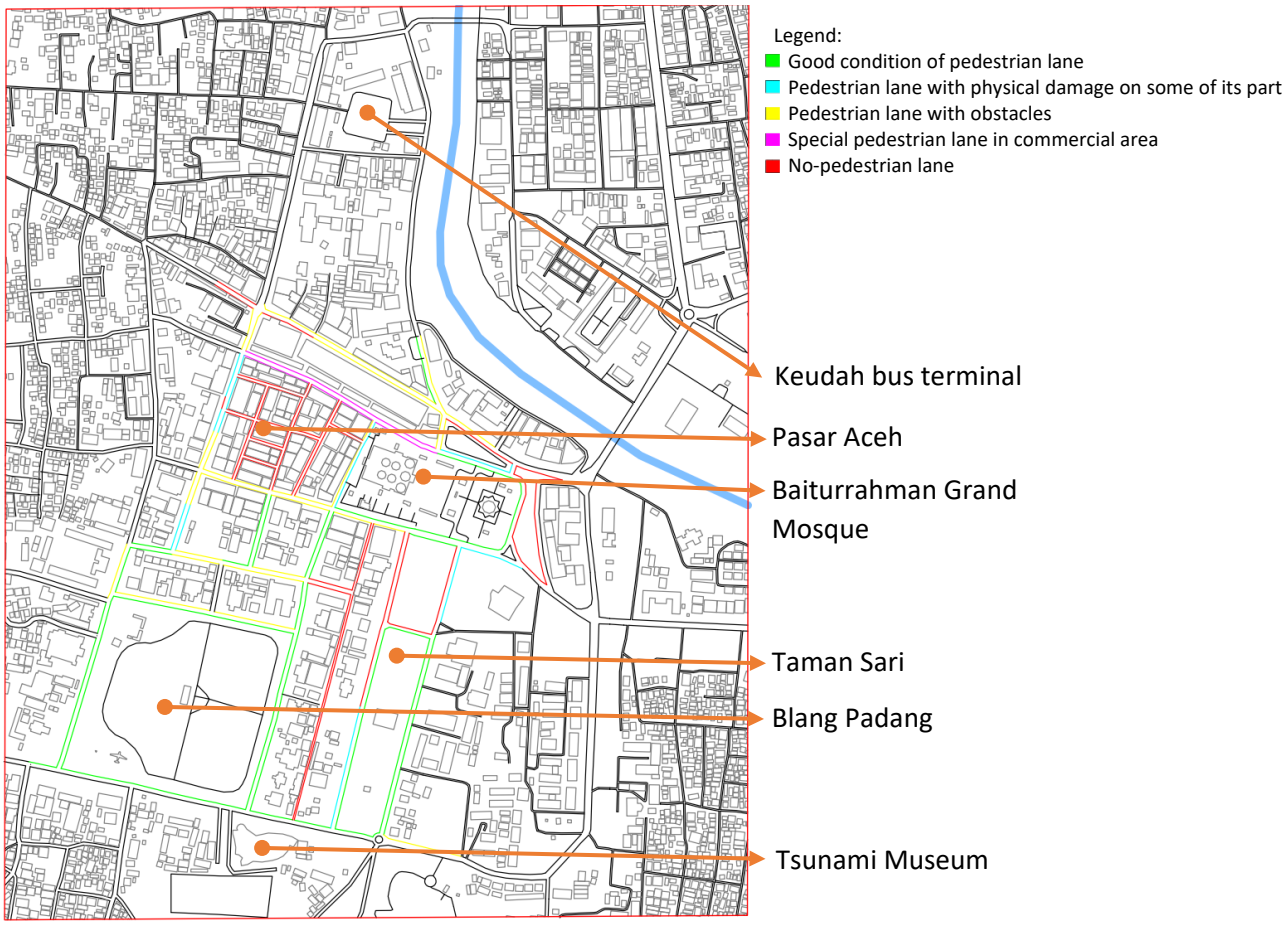


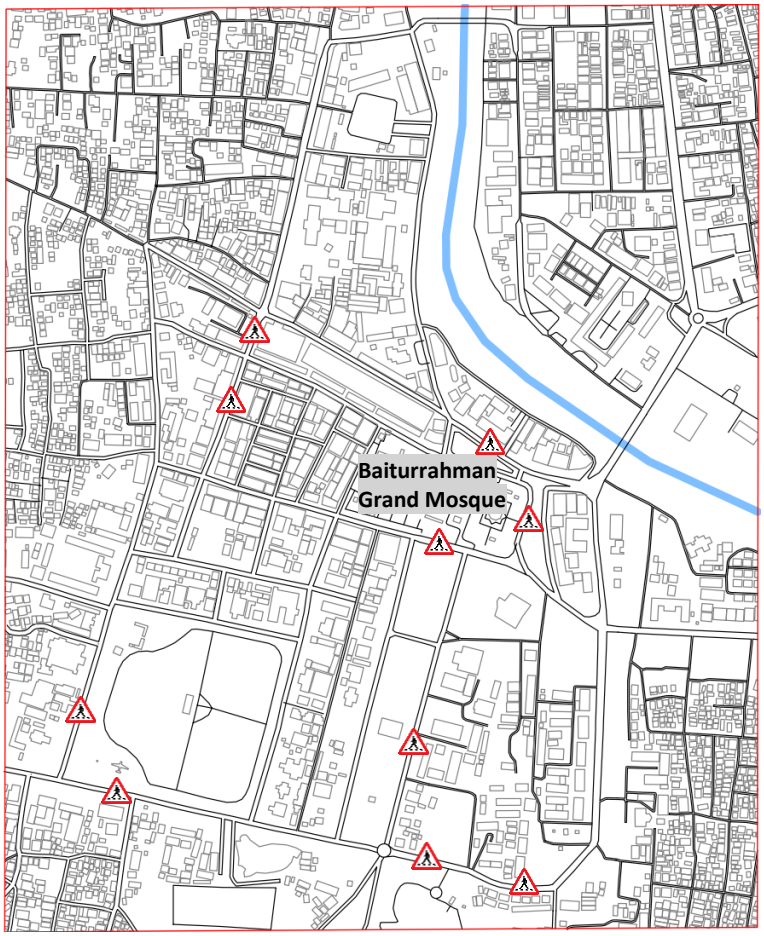
Figure 4.3. Quality of pedestrian-lane in Baiturrahman Grand Mosque area
Data source: Observation October 2019

Figure 4.3 shows that the pedestrian lane around Baiturrahman Grand Mosque, Blang Padang, and Taman Sari is in good condition (Appendix 1-3). However, from its functionality, this pedestrian line is less used because most people reach these places by car and motorcycle. Meanwhile, the pedestrian lane around Pasar Aceh is filled with obstacles; they are the product of the traders and the carelessly parked motorcycles. For circulation inside the market, Pedestrians and vehicles share the same path.

Furthermore, the street between Blang Padang and Taman Sari has no special line for pedestrians. Even though this street is a direct connector, which connects Grand Mosque and Tsunami Museum, this street has low intensity of traffic and is potential as a good pedestrian path.

2. Availability of Crossing

Figure 4.4 shows the location of the zebra cross. Based on observation, only a few people use zebra crosses to cross the streets due to safety reasons. The walker should be extra careful when they cross the streets because there is no pedestrian light that can stop the driving vehicles. Besides that, the knowledge or awareness of the drivers is low to stop before the zebra cross when people cross the street using it.



Even though there are some point of zebra cross located in the area, most drivers and riders do not obey it, that make walker must extra beware when crossing the street.

Figure 4.4. Location of zebra cross
Data source: Observation October 2019

3. Walking Path Modal Conflict

There are two main conflicts experienced by Pedestrians in walking in this area. Firstly, the obstacles along the pedestrian line as shown in appendix 5. They are (1) physical damage to the line, (2) commercial activities, such as the product of the traders and tables and desks belonging to street cafés, (3) motorcycles that park carelessly, and (5) flower board for special events. The general situation in this area is likely that the building owner thinks that area in front of their property, including the pedestrian lane, is their territory, making them do whatever they like.

Secondly, as mentioned above, conflict with vehicles happens in crossing the street. People find it difficult to cross the street on the zebra cross. Because of this situation, many people carefully cross the street wherever they like and not on zebra crosses.

4. Motorist behavior

- The number of traffic violations

Traffic violation in Banda Aceh, which occur when drivers violate laws regulating vehicle operation on streets, tends to decrease in the last decade. Most violations ignore the traffic lights and drive above the allowed maximum speed. Since 2005, the number of traffic violations in Banda Aceh has tended

to decrease from year to year. In 2013, the number increased by 200% compared to the previous year and then slightly went up from 2014 to 2017. Additionally, a lot of teenagers without driving licenses also drive motorcycles and cars in the city.

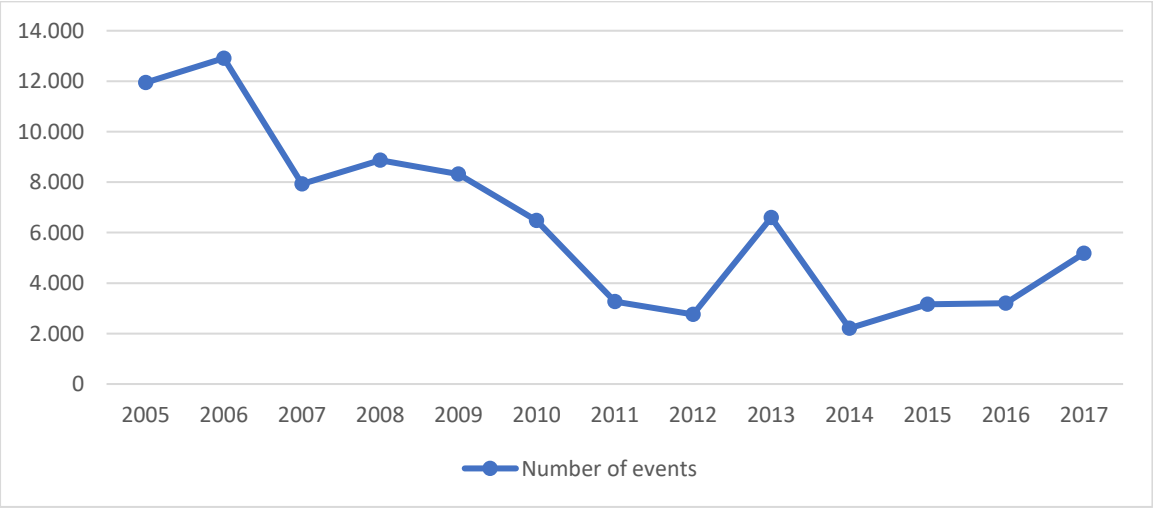


Diagram 4.32. The number of traffic violation
Data source: Questionnaire May 2019

- The number of accidents.

From 2005 to 2015, the number of accidents remains stable. However, the number of injuries slightly rose from 2008 to 2010 and significantly increased from 2010 to 2010. After 2012, it decreased step by step until 2015. The same trend also happened to the number of fatalities on the street.

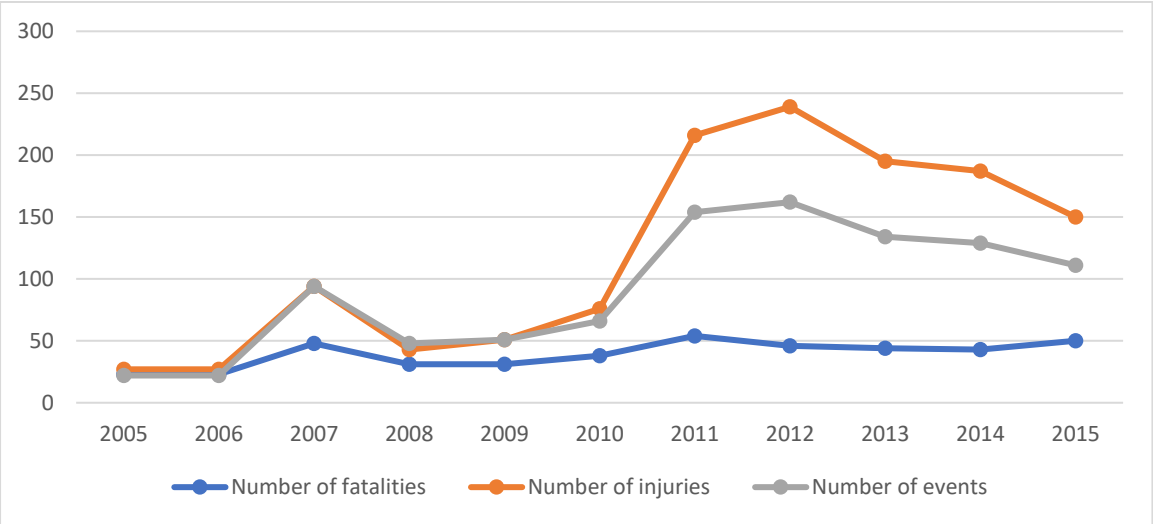


Diagram 4.33. The number of accidents
Data source: Questionnaire May 2019

5. Maintenance and cleanliness

The cleanliness of the city is under responsibility of Dinas Lingkungan Hidup Kebersihan dan Keindahan Kota[16] Banda Aceh (DLHK3). They run the cleanliness by applying the retribution system, where people should pay a monthly fee to get the service. Waste transportation is carried out every night, and the customers are asked to put their packed trash in front of their property (mostly on pedestrian laine) between 19:00 and 07:00. The customers must provide their own bin and clean their environment independently. Meanwhile, DLHK3 provides some bins in public spaces such as bus stops and city parks (Blang Padang and Taman Sari).

6. Amenities

Some of the DLHK3's work targets in performing its job are maintaining green open space and public street lighting, beautifying the city through city parks, green lane parks, street furniture, building façade, and managing banner and billboard layout setting. The public street lighting is good because streetlights are spread evenly throughout the area (Appendix 4).

A public toilet is available in Blang Padang and Taman Sari. Unfortunately, there is no signboard that informs the visitor where the toilets are located. There is neither signboard that leads visitors to specific places, although this area has some interesting tourism objects. There are no benches along the pedestrian lane as well as in Blang Padang and Taman Sari; people usually bring their own mat and stretch it on the grass for sitting.

7. Disability

Aini et al. l (2019)[17] report that the pedestrian lane in Taman Sari is not stable, strong, and weatherproof, which potentially harms the users in specific weather conditions. It does not fulfill technical guidelines, where the mound should be less than 1,25 cm, and the safety edge should be 10 cm high and 15 cm wide. On the other hand, the pedestrian lane in Blang Padang does not fulfill the standards of stopping point and lighting, as well as the mound and the safety edge. In addition, from the measure of comfort access, the dimension and color of the pedestrian lane are okay; however, form and texture are not good.

There is no special texture that leads blind walking on the lane, nor a ramp available along the lane that makes it inaccessible for disability. As reported by Mutia and Rinaldi (2017)[18], their interview with blinds revealed that there is no special line or road signs that can lead Pedestrian to the bus stop. There are obstacles such as trees and power poles to reach the bus stop through the street side or pedestrian lane. At the bus stop, there is a ramp, which, unfortunately, is too steep for a wheelchair to access and has a slippery surface. There is neither space available for a wheelchair to wait in the bus stop.

[16] City Environmental and Cleanliness Agency

[17] https://iopscience.iop.org/article/10.1088/1757-899X/506/1/012018

[18] http://www.jim.unsyiah.ac.id/kenegaraan/article/view/5911/2568

Guidelines of Pedestrian Development

The official document, which becomes the guidelines for planning, provision, and utilization of facilities and means of the pedestrian network in the urban area, is composed and published by the Ministry of Public Works. The guideline is the appendix of Minister of Public Works' regulation number 03/PRT/M/2014. It is intended as a reference for regency/city governments, as well as related parties in the management of spatial planning, especially in the planning, supply, and utilization of pedestrian network infrastructure and facilities in the Spatial Plan (RTRW) and specifically in the Detailed Spatial Plan (RDTR) and can be used in composing Building and Environmental Plan (RTBL). In addition, it aims to realize pedestrian networks in urban areas that are safe, comfortable, and humane so that they are able to encourage people to prefer walking and using public transportation, which support the creation of safe, comfortable, productive, and sustainable spaces.

As shown in figure 37, the role of the guidelines is as a complement spatial plan guideline, which functions (1) as a technical reference for the planning of infrastructure and pedestrian network facilities in the preparation of plans for the supply and utilization of pedestrian network infrastructure and facilities in the city's spatial plan, regency's RDTR, and spatial plan for strategic area of districts/cities; (2) as a technical reference for the provision of pedestrian network infrastructure and facilities, as basic considerations in the preparation of the RTBL and Detailed Engineering Design (DED); and (3) as reference for the use of pedestrian network infrastructure and facilities.

Users of these guidelines are all stakeholders in the planning, provisioning, and utilization of pedestrian network infrastructure and facilities in urban areas, especially regency/city governments and the community in the preparation of city spatial plans, as well as detailed plans for regency/city spatial plans.

Provisions on Infrastructure Planning and Means of Local Networks

Provision based on street function and land use

Standards for space scale for pedestrian-lane can be developed and utilized according to the typology of pedestrian sections by considering local habits and types of activities. Standards for pedestrian services consist of:

- Standard A

  Pedestrians can walk freely, including being able to determine the direction of walking freely, with a relatively fast speed, without causing interference between pedestrians. Pedestrian track area ≥12 m^2 per person with pedestrian flow <16 people per minute per meter.

- Standard B

  Pedestrians can still walk comfortably and quickly without disturbing other pedestrians, but the presence of other pedestrians has begun to affect the flow of pedestrians. Pedestrian track area ≥3,6 m^2 per person with pedestrian flow >16-23 people per minute per meter.

- Standard C

  Pedestrians can move with the current flowing normally even though in the opposite direction there will be small intersections and relatively slow due to limited space between pedestrians. The area of pedestrian track ≥2.2–3.5 m^2/person with pedestrian flow >23-33 people per minute per meter.

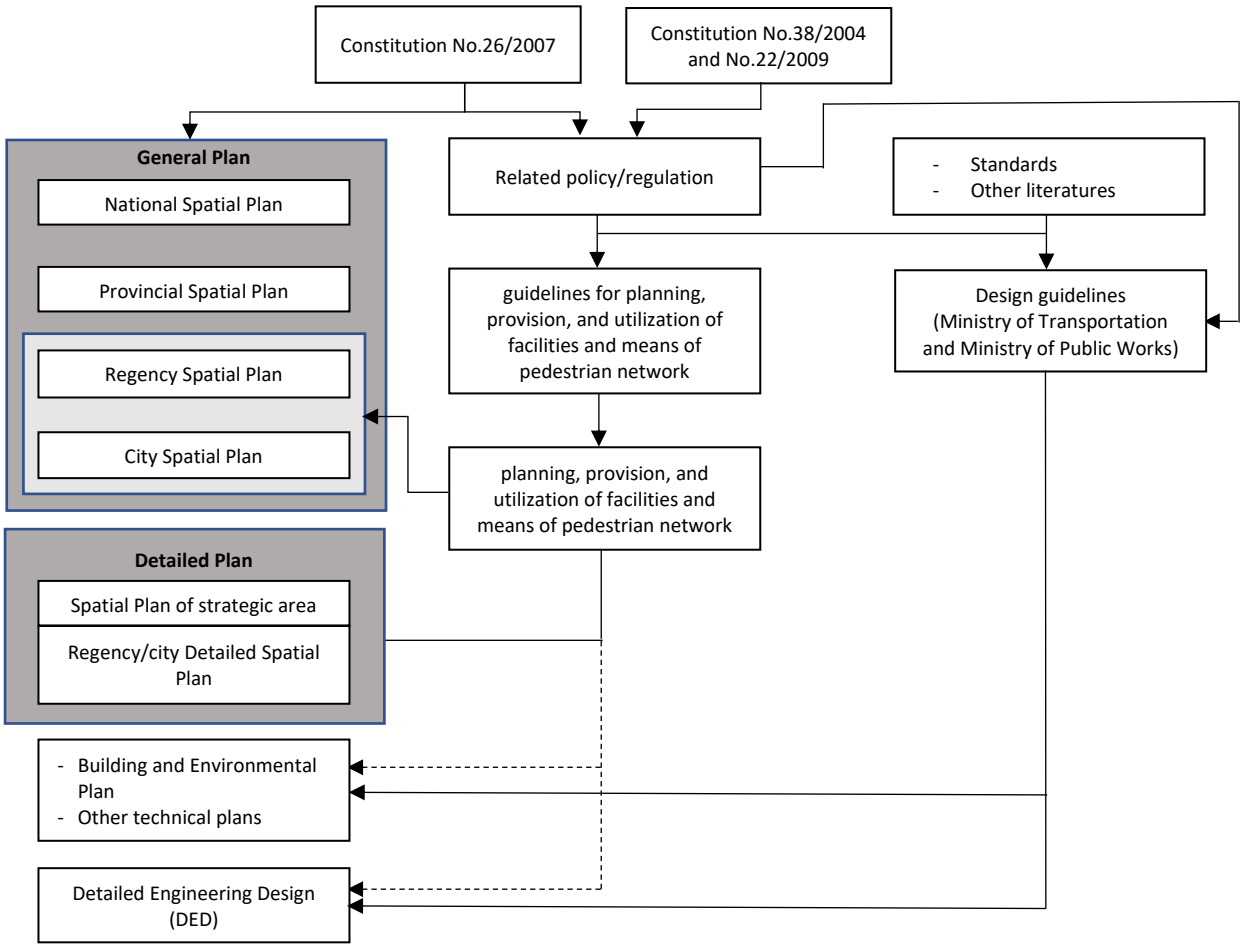


Diagram 4.34. Position of Guidelines for Planning, Provision, and Utilization of Pedestrian Network Infrastructure and Facilities in Urban Areas
Source: Minister of Public Works regulations No.3/2014

- Standard D

Pedestrians can walk with normal flow but must change positions frequently and change speeds because opposing pedestrian flow has potential to cause conflict. This standard still produces a comfortable threshold flow for pedestrians but potentially make intersections and interactions between pedestrians. The area of pedestrian paths ≥1.2–2.1 m^2/person with pedestrian flow >33-49 people per minute per meter.

- Standard E

Pedestrians can walk at the same speed, but the movement will be relatively slow and irregular when many pedestrians turn around or stop. The E standard starts to be uncomfortable to pass but is still the lower threshold of pedestrian space planning capacity. The area of pedestrian-lane ≥0,5–1.3 m^2/person with pedestrian flow >49-75 people per minute per meter.

- Standard F

Pedestrians are walking at very slow and limited current speeds due to frequent conflicts with uni-directional or opposite pedestrians. Standard F is not comfortable and is not in accordance with

the capacity of pedestrian space. The area of pedestrian paths is <0.5 m^2/person with various pedestrian flows.

Criteria for ideal pedestrian network

1) avoid the possibility of physical contact with other pedestrians and with motorized vehicles,
2) avoid traps such as holes that can cause danger,
3) have a direct path with the shortest travel distance,
4) continuously and without obstacles,
5) has supporting facilities, including benches and lighting,
6) protect pedestrians from heat, rain, wind, and air and sound pollution,
7) minimize the opportunity for people to commit a crime, and
8) accessible for all users, including pedestrians with various physical limitations, including using universal planning and design.

Pedestrian path space with special needs

1) the pedestrian path has a minimum width of 1.5 meters and a minimum area of 2.25 m2,
2) street's alignment and slope are easily recognized by pedestrians through the usage of special materials,
3) avoid various hazards that have the potential to threaten safety, such as bars and holes,
4) the level of the sidewalk must make it easy to cross the road,
5) equipped with a guideline and guide device to show various changes in the texture of the sidewalk,
6) non-slippery road surface; and
7) pedestrian paths with slope provisions are as follows:
    - The slope rate does not exceed 8% (1:12).
    - A gentle slope must have at least one handgrip (recommended for both sides). At the end of the ramps, at least the length of the handgrip has an excess of about 0.3 meters.
    - The handrails must be made with a height of 0.8 meters measured from ground level, and the length must exceed the last step.
    - All handrails are not required to have a smooth surface.
    - The sloping area must have sufficient lighting.

Minimum Distance of Pedestrian Path to Buildings

In general, the pedestrian path in front of the building consists of the front part of the building, the pedestrian lane, and the street furniture space (figure 38). Pedestrian networks have different heights between motorized vehicles or road furniture. The maximum height difference between the pedestrian lane and the motorized vehicle lane is 0.2 meters, while the height difference with the green lane is 0.15 meters.

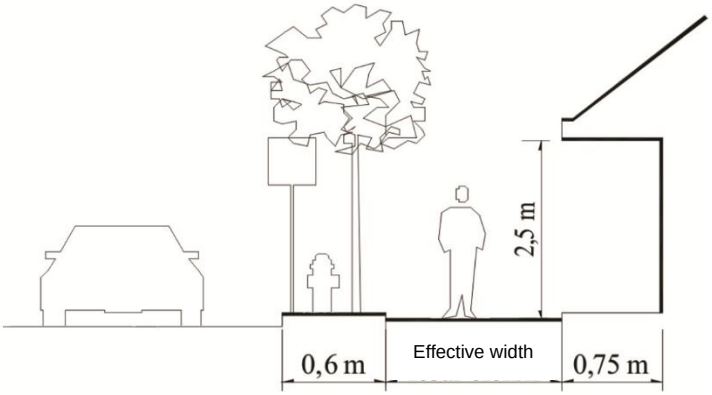


Figure 4.5. Space division in front of building
Source: Minister of Public Works regulations No.3/2014

- The front part of the building

a. The front part of the building is the space between the walls of the building and the pedestrian lane. Since pedestrians usually do not feel comfortable when walking directly adjacent to the building wall or fence, the minimum distance is at least 0.75 meters from the distance of the side of the building or depending on the use of this area. The front lane can be increased to provide opportunities for additional space for opening doors or coffee shops on the side of the road, as well as other activities.
b. People with a limited sense of sight and who often walk in a certain area can use the sound from adjacent buildings as orientation, or blind using sticks can walk between 0.3 meters to 1.2 meters from the building.
c. The front part must be free from obstructions or various protruding objects. The path to the front of the building must also be detected by the blind using a long stick.

- The pedestrian-lane

a. Pedestrian lanes are spaces used for walking or wheelchair and are designed based on the needs of people to move safely, easily, comfortably, and without obstacles.
b. The pedestrian lane is a space from a roadside corridor specifically used for pedestrian areas. This section must be freed from all obstacles, various protruding objects, and vertical barriers at least 2.5 meters from the surface of the pedestrian path, which is dangerous for pedestrians and for those who have a limited sense of sight.
c. The width depends on the intensity of its use for calculating its effective width. These pedestrian pathways are at least 1,8 to 3,0 meters wide or more to meet the desired level of service in areas of high pedestrian intensity. The minimum width for shopping and trading areas is 2 meters. This condition is made to provide opportunities for pedestrians who walk side by side or for pedestrians who walk in opposite directions to each other.
d. The lane used for pedestrians on local roads and collector roads is 1.2 meters, while arterial roads are 1.8 meters. Additional space is needed for stops and bus stops with an area of 1.5 meters X 2.4 meters.
e. The pedestrian lane must not be less than 1.2 meters, which is the minimum width needed to accommodate people carrying a dog and Pedestrians with walking aids.

f. Pedestrian-lane differs in height from motorized vehicles. The maximum height difference between the pedestrian lane and the motorized vehicle lane is 20 centimeters.

- The street furniture space

a. The space for street furniture can function as a space that restricts the traffic lane of the vehicle to the pedestrian area.
b. This street furniture space functions as a place for various elements of street furniture (water hydrants, kiosks, public telephone boxes, park benches, markers, etc.).
c. The minimum width of this road furniture path is at least 0.6 meters.
d. If the street furniture space is used as a green line that functions as a buffer planted with trees and ornamental plants, the minimum width is 1.50 meters. It is called the green line because the dominance of landscape elements are plants that are generally green.
e. The street furniture space has a height difference from a pedestrian path. The maximum height difference with the pedestrian lane is 15 centimeters.

Conclusion

Referring to the above discussion, there are two factors that determined no-pedestrian phenomenon in Baiturrahman Grand Mosque. Firstly, the ownership of motor vehicles, especially motorcycles. As the survey by TNP2K in 2012 (page 7), around 75% of low-class citizens own motorcycles to reduce their expenditure on commuting. Besides that, the report of "Banda Aceh Bus Rapid Transit Network Improvement" (BABRTNI) in 2017 shows that up to 59% of households own a motorcycle (page 9), and 77% of the household choose to transport by motorcycle (page 11). The result of the structured questionnaire in 2019 confirms it by showing that 89% of respondents own motorcycles. Furthermore, the flexibility of parking on almost all street-side in the area makes it easy for drivers to stop wherever they want.

Secondly, it is related to the behavior and habit of the people that are also connected to their welfare. BABRTNI in 2017 described that the household with the lowest income has the highest percentage of walking compared to other groups of household income (page 12). Meanwhile, respondents of the questionnaire show the reason why they do not want to walk in the city center. The questionnaire 2017 reports the cause, where 41% because of distance, 23% lazy and exhausting, and 23% because of weather. In the questionnaire 2019 result, 73% of respondents are lazy and exhausting, and 9% complain about the weather.

Therefore, the hypothesis in chapter one is proven. With the high of motor vehicle ownership and the amenities of buying it, people prefer and enjoy driving rather than using public transport and walking because it is also supported by the ease of parking. Additionally, the hot temperature, as well as less shadow along the pedestrian lane, make people lazy to walk. On one side, the purchase of vehicles indeed benefits the local government because they earn tax revenue from the sale; however, the government has a big task to answer the future impact in developing the city.

Traffic jams and pollution are a snowball that can hit through the time. It can harm the people as well as the environment, especially with the carbon emission. The traffic jam and the emission in the city center, as the center of commercial activity, potentially grow high without limitation of the vehicle access and the absence of a pedestrian-friendly environment. With the current situation, maintenance of the pedestrian lane will be less cared for because nobody uses it. The existence of the pedestrian lane will only be kept in order to fulfill the technical requirement of the street construction.

Chapter 5
Comparison of pedestrian situation in Kaiserslautern and Banda Aceh

In this chapter, the discussion is about comparing the pedestrian situation in Kaiserslautern and Banda Aceh. The comparison aims to reveal the similarities, differences, and patterns across the two cities. In order to catch them, the author chooses four main variables that have been described in the previous chapters. They are spatial situation, mobility, pedestrian condition, and policy.

Spatial Situation

Population

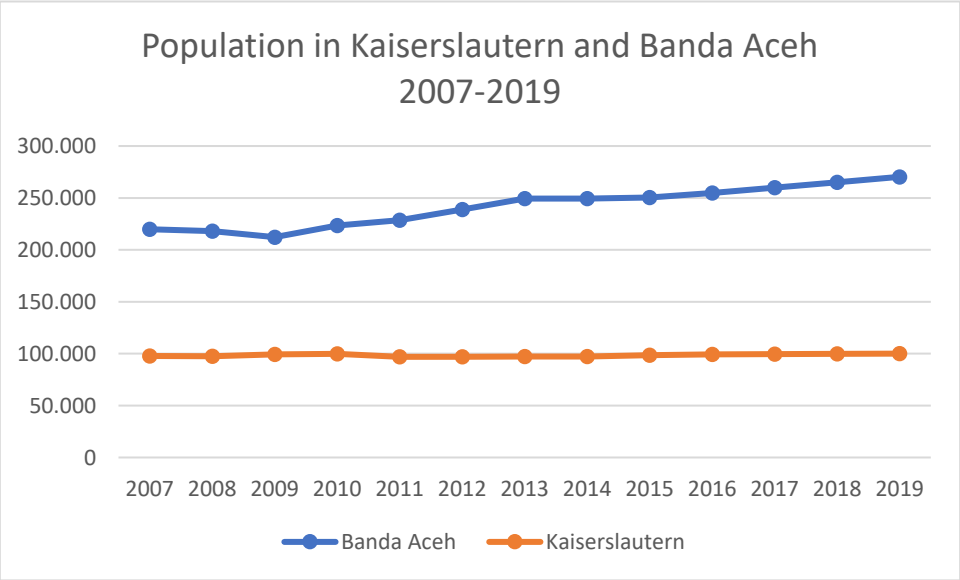


Diagram 5.1. Population in Kaiserslautern and Banda Aceh 2007-2019

Source: Annual Report of Banda Aceh in Figures from 2008, -, 2020
https://infothek.statistik.rlp.de/MeineHeimat/tscontent.aspx?id=103&l=3&g=07312&tp=1027&ts=tsPop01

Since 2009, the population in Banda Aceh has been being increased with an annual average growth of 2,29%. This year, the reconstruction and rehabilitation of the Tsunami officially ended. It is reported that the number of birthrate and immigration were high due to the better situation after the end of the armed conflict in 2005. The Year 2009 to 2003 is the period where the population significantly increased with an average growth of 4,11%. Afterward, the annual average growth from 2013 to 2019 is 1,36%.

On the other hand, the population growth in Kaiserslautern is low, with an annual growth of 0,21%. The decrease in population happened in 2008 when the city lost 0,34% and in 2011 as many as 2,83%. From 2011 to 2019, the population growth shows a positive trend with annual growth of 0,39%.

Urban structure and land use

The urban structure of Banda Aceh and Kaiserslautern is pretty different. Banda Aceh consists of districts that connected each other with the concept of a radial-concentric structure system. In this

system, the city is divided into nine sub-districts with a mix-development model of multi-center and linear growth. This development system has two city centers: the old city center and the new city center—the old city center functions as the center of worship, shopping area, tourism, and recreation. Instead, the new city center is located in the south of the city, which was developed after the Tsunami. The new city center is constructed based on Banda Aceh city's spatial planning that functions as an office, trades, and public facilities. Meanwhile, a linear growth model is implemented where the buildings are constructed along the city structure paths. As the districts intersected and connected, the residential area occupied nearly 60% of the city's land use. The settlement area occupies the east and west side of the city; meanwhile, the trade and public service areas are in the middle of the city, which runs from north to south.

In contrast to Banda Aceh, Kaiserslautern is divided into urban areas and nine other sub-districts separated in a cluster model separated by forests. Residential areas dominate the land allocation in the nine sub-districts. Only a small proportion of these Sub-districts have a center with small shops and local public facilities. Meanwhile, Kaiserslautern city center is in the inner city. The development of the Kaiserslautern city center is defined according to the Kaiserslautern active city center program, which aims to regenerate urban areas in Germany. The Kaiserslautern city center serves as a shopping area and a mixed and residential area.

Mobility

Commuting characteristic

Based on "Banda Aceh Bus Rapid Transit Network Improvement," released in 2017, people in Banda Aceh tend to use motorized transportation, which reaches 88% of the choice of transport. Motorcycle riding is the most favorable and reaches 77% of daily trips, and 11% is the car. The reason behind this trend is shown in the result of questionnaire 2019, in which 73% of respondents said that they use motorized transportation because they are lazy and exhausting. Besides that, Serambi News reported that the sale of motorcycles in Banda Aceh in January 2020 increased 12% compared to January 2019[1]. It indicates that the economic income of the community is relatively high due to the increased funding for the village's development program, which stimulates a lot of economic activities, said Saumi Elfiza from the Aceh Financial Management Agency. For the destination of traveling, averagely 52% trip is travel to office and school and 22% trip is for shopping.

On the other hand, the trend is quite different in Kaiserslautern, where non-motorized transportation reaches 40,4%, of which 32,9% is on foot, and 7,5% is the bicycle. The so-called "the environmental network," a combination of on foot + bicycle + public transport, covers 52,2% of the routes. According to the writer's experience, the good infrastructure is the main reason the environmental network has successfully become a trend. Pedestrian and bicycle lanes are provided and can reach all parts of the city. Meanwhile, public transportation serves with an on-time schedule, and it offers interesting package prices for the passenger to travel, not only inside the city but also to places surrounding. In the city, an average of 37% of trip destination is for job and education (work, kindergarten-take&drop, school), and 29% is for shopping. Additionally, the traffic is distinguished into four based on the origin and destination, which does not happen in Banda Aceh.

[1] https://aceh.tribunnews.com/2020/02/03/penjualan-sepmor-di-aceh-tinggi

City's public transportation

	Banda Aceh	Kaiserslautern
Start of service	Labi-labi: 1980s City bus (TransK): 2016	1935
Transit point	One transit point: Old city center.	Two transit points: city center and main station.
Number of routes	Labi-labi: 10 routes (2020). The TransK: 5 routes (2020).	14 routes.
Excellence	Labi-labi tariff: 0,2€/trip TransK tariff: free	It offers one-trip, daily, weekly, monthly, and yearly ticket.
Transport-integration	Each public transport has individual management	It is integrated with the regional transportation system.
Time of Service	06:30-18:30	05:15-00:00 (working days) 24 hours (weekend)
Pattern	It connects important public facilities	It serves residential area with reasonable bus stop distance.

Table 5.1. The comparison of public transport between Banda Aceh and Kaiserslautern

Public transportation in Banda Aceh started serving passengers in 1980, which is called Labi-labi. Its development reached its peak in 2000 and served 17 routes. In 2016, the city government started to operate the city bus "Trans Koetaradja," which in 2020 serves five routes where the area of Baiturrahman Grand Mosque is the center as well as the main transit point. From the first day of the operation until 2020, passengers can use the bus for free because the government subsidizes the operational cost of the city bus. Since the existence of TransK, the trend of using Labi-labi slowly but surely decreased, and in 2020, Labi-labi serves only five routes. People who are still using public transport prefer TransK because it is more comfortable than Labi-labi and is free of charge. Unfortunately, its time of service is still limited from 06:30 to 18:30, which makes people who use transportation in the early morning, mostly traders, still use Labi-labi, which operates from 04:00 to 20:00.

In Kaiserslautern, public transportation started in 1935. Nowadays, Kaiserslautern's city bus has two transit points: the city center and the main station. The city bus serves 14 routes that connect settlement areas with public facilities every day. Besides its comfort and on-time schedule, the city bus also interestingly offers not only one-trip tickets but also daily, weekly, monthly, and yearly-trip tickets. In addition, it is easy to manage the trip because the city bus ticket system is integrated with the regional transportation system—the city bus drive from 05:15 to midnight on weekdays and 24 hours at the weekend. Many people in Kaiserslautern like to drive the city bus because there are many bus stops in the settlement area, and they are easy to reach.

Parking

Kaiserslautern provides large parking space in the city center. There are five parking lot and nine parking buildings. In some parts, drivers can also park their vehicle on the street side. All parking system requires an hourly parking tariff.

Meanwhile, in the old city center of Banda Aceh, there is a parking building in the basement of the grand mosque. However, it seems not too popular, and people like to park on the street sides better than to park in the parking building. The parking on the street side is a 45-degree system, and there is an operator that helps drivers park their vehicles and collect parking fees. Unlike Kaiserslautern's tariff system, the drivers in Banda Aceh must only pay a one-parking tariff when they leave the parking area, no matter how long they park their vehicle.

Pedestrian lane condition

Pedestrian zone

The city center of Kaiserslautern has a pedestrian zone that has been being developed since 1970. Pedestrian zone accommodates the individual and unusual shops that sell all the nationwide chains, from fashion to gastronomy. In summer, there are street cafés, while in winter, the beautiful Christmas market promises a thoroughly enjoyable shopping experience with every-new aspect. Furthermore, the zone connects to the mall called "K in Lautern," which is home to 100 shops.

The pedestrian lane in the city center is well organized and equipped with good street furniture. The lane condition is good, and the width is in accordance with its location. It is also barrierless, safe, and well-integrated with other transportation modes such as bus stops and parking places.

In contrast, Banda Aceh's old city center has no special zone for pedestrians. There is a street behind the grand mosque that is intended for pedestrian-only; however, the fact that it is also accessed by motorcycle and pedicab. On that street, there are individual shops as well as street vendors that sell most things related to fashion. Also, this street is a favorite place for visitors to park their motorcycles.

Furthermore, pedestrian lane condition in the old city center area has uniform width and is broken and blocked in some parts. In some parts, it is also more than 30 cm in height and is constructed with different materials.

Pedestrian amenity

The government of Kaiserslautern city gives amenities for pedestrians. Pedestrian lane in Kaiserslautern has good street furniture, such as lighting, benches, and signages, and is disability friendly. The cleanliness is also well maintained with daily trash collection.

The pedestrian lane is equipped with a traffic light for the zebra cross, which is mainly located at the intersection. This idea is good because it creates a harmonious flow between pedestrians and motor vehicles. Additionally, the drivers respect pedestrians, who are crossing the street, and wait patiently until all pedestrians finish crossing the streets.

The government of Banda Aceh put a lot of lighting points throughout the old city center. There is also a public toilet in a location; however, no signage that informs about it. Besides that, there are no benches along the pedestrian lane, and some lanes are not accessible for disabilities. Nevertheless, maintaining cleanliness is good enough because there is daily trash collection in the area.

For crossing the street, a zebra cross is located at some necessary points. Unfortunately, they are not equipped with a traffic light that makes pedestrians should be extra careful to cross the street. Also,

motor-vehicle drivers in Banda Aceh have less respect for pedestrians; they prefer to hit the horn to stop pedestrians and let them pass or to warn pedestrians to cross faster.

Policy

In order to develop a mobility system as well as to respond to the climate protection activities, Kaiserslautern created a concept for mobility under the name *Mobilitäsplan Klima+ 2030*. It is developed based on a local transportation plan, which measures the connection reliability and development of the local transportation network and various investment measures. The mobility plan has two main objectives; (a) to show what potential exist in the transport sector to reduce greenhouse emission by 2030, which is parallel to the master plan of *100% Klimaschutz* under the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, and (b) to present the objectives for the area of mobility and to determine measures and priorities for implementation by 2030. The plan provides information about existing traffic and public transportation standard.

In contrast, Banda Aceh does not have a special plan for mobility; nevertheless, some can be found in the city's spatial plan. Part of the city's mobility in the plan is developed based on national guidelines from the Ministry of Public Works that also work as a reference for regency/city governments and related parties in spatial planning management. The national guidelines provide information about comprehensive technical standards for pedestrian network development. Unfortunately, no information about pedestrian development in the city's spatial plan refers to the national guidelines.

Chapter 6

Summary of findings and recommendation

Introduction

This dissertation aims to investigate determinant factors that lead to no-pedestrian phenomenon in the old city center of Banda Aceh. In the previous chapters, the discussion shows the root of the problems are from the three aspects: people as the pedestrian or users of the space, the physical environment as the place to walk, and the policy that develops the environment.

The analysis in chapter 4 indicates that those three aspects are a triangle that influences each other, which is the background of researching them. Nevertheless, the physical environment challenges in the city center have become the first thing seen in the eye and the main root of the problem. It is proven that space and climate matter are the explanation that makes people unwilling to walk, although it is a trade and service zone. Meanwhile, it seems that post-conflict trauma does not influence people to go walking in the city.

As the closing chapter, chapter six discusses the summary of finding and the possible recommendation to answer this research problem. Findings found through the research become considerations in recommending the practice, policy, and future research.

Findings

Banda Aceh has a good prospect in the tourism sector, especially cultural tourism objects in the city, which is located in the surroundings of Baiturrahman grand mosque. It is a potential contribution to developing a pedestrian system in the area. At the same time, it is also a commercial area, in which there is a shopping center, hotel, historical buildings, and green open space. A good pedestrian system does not connect each tourist spot in the area. The absence of information boards, signages, and information center makes visitors confuse. Maintenance of the signages is bad. (Tsunami mitigation direction)

The trend of commuting with public transport Trans-K brings a new era to the life of city people. The bus connects city centers with other important spots in the city, including the public university, seaport, and airport. The government subsidies the operation of the city bus so that people can use it for free. The data shows that the number of passengers has increased. Unfortunately, the city bus service does not reach the settlement area; it only goes through the main roads in the city. On one side, it is good, it can encourage people to walk, but on the other side, people will be encouraged to use it if it also has stops in the settlement area.

Furthermore, the city bus and Labi-labi are not well integrated. The government does not have integrated planning, and based on BRTNI 2017, it seems that government wants to let the Labi-labi gradually disappear. In fact, Labi-labi is the potential to be kept as the collector transport that serves passengers from the deepest settlement area.

Banda Aceh does not have comprehensive long-term planning for pedestrian system development. There are no planning tools and scenarios that encourage people to walk. The sidewalk is made only to fulfill the standard of project implementation, and its construction's quality control is low. The ministry of transportation and ministry of public work release standard for road and sidewalk, but it

is not adopted well at the regency level. In the cities, there is different kind of streets; national, provincial, and city street. Those streets are under the maintenance of each level of government.

Moreover, personal vehicles are most favorite transport in reaching the city center. The high use of personal vehicles, especially motorbikes, and the convenience of owning them should become a basic consideration in determining parking space and tariffs. Most riders, who visit the city center, park their motorcycle as they please; on the street side, in the pedestrian lane, and in front of shops, which hinder the accessibility of pedestrian and vehicle traffic. It happened because there is no clear zone where parking is allowed and not allowed in the area.

Although the government provides a park house, which is located in the basement of the grand mosque, only worshipers visiting the grand mosque park their vehicles there. The visitors coming for the shopping park their vehicles on the street side; it consumes street space and often creates a traffic jam in certain hours that produce air pollution. The motorcycle is a favorite vehicle because it is relatively affordable for people, and its operational cost is economical.

Additionally, since the online transportation service started in 2017, it has become a new trend and influenced people's lifestyles in the movement of people and goods. The service should be positioned as a complementary facility for city transport, which has the potential to make it an off-hours service.

The planning of 4 segments of the pedestrian system lacks accommodative because the route does not connect with other most visited places, such as Blang Padang, Taman Sari, and Tsunami Museum. It is not mentioned in the RTRW (City Spatial Plan) the reason for this plan, but it seems that the government wants to bridge the Labi-labi terminal to the commercial area, grand mosque, and the Simpang 5 (5-way-intersection). In contrast, this idea is the opposite of the notion of the government killing Labi-labi mentioned in the BRT report Banda Aceh. Therefore, there are four weaknesses in the planning of the four segments:

- The choice of segments is not relevant regarding to most visited spots.
- Low maintenance makes the pedestrian lane condition bad.
- There is no street furniture to encourage people to walk.
- Up to observation in September 2019, there were still no people walking in this segment.

Based on the questionnaire result, Blang Padang is the most favorite place visited by the people in the city center, followed by Taman Sari, the Grand mosque, and Pasar Aceh. They are the important nodes of the area. The connection between them is highly important, so these places should be linked by a comfortable and attractive pedestrian system and be equipped with adequate parking spaces. However, the directional board is absent, and the condition of the pedestrian lane is bad.

Moreover, there are two types of visitors who walk within the center. Firstly, people are willing to walk because the second destination they want to reach is nearby. These walker-type visitors usually are people who come to worship in the grand mosque and shop in commercial areas around the grand mosque. On the other hand, other people refuse to walk because they are lazy and exhausted. The non-walker type visitors are those who come to a place other than the grand mosque and then visit another place. The most striking thing from the result is that 31% of respondents walk within the city center because of the distance (Questionnaire 2019), and 66% use the private vehicle because of laziness and exhaustion (Questionnaire 2019). It means distance is the key point that encourages people to walk. Accordingly, it is necessary to set the pedestrian lanes attractive, beautiful, and comfortable to encourage people to walk between places in the city center.

Most zebra crosses in Baiturrahman grand mosque area are not equipped with a traffic light and are not located at the crossroads. It makes it difficult for walkers to cross the street because the driver's awareness to prioritize walkers crossing the street is low. Also, there is a zebra cross in some traffic lights; however, it is not accessible for disabled people because of the different heights of ground level between the zebra cross and the pedestrian lane. It is necessary to re-arrange the location of the zebra cross and campaign with signage to build awareness of drivers to respect pedestrian that is crossing the street.

In addition, the supporting facilities for pedestrians are inadequate. It is necessary to provide banks, decorative plants, shade plants, and public toilets, especially public information boards, to optimize the function of the facilities and places.

SWOT of Banda Aceh Mobility

The SWOT analysis is made by considering the "10 Principles for Sustainable Urban Transport" published by GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit). Below are the principles and the SWOT analysis discussion.

- ***10 Principles for Sustainable Urban Transport***

The first principle is the planning of dense and human-scale cities. This principle aims to give more space to people instead of the vehicles by (1) designing city spaces with mix-use facilities such as schools, shops, settlement areas with plazas, and traffic calming infrastructure, and human-scale transport modes, (2) integrating urban and transport development, and (3) support projects to create affordable housing in city centers. Then the next principle is the development of transit-oriented cities. The TOD (Transit Oriented Development) is a way to boost connectivity, decrease detours, and ensure land value capture around transit. The characteristic of TOD is an integration of function in sub-centers, where major transit stations are surrounded by shopping facilities, office spaces, and high-density apartments. The quality transit station can be enhanced by providing bike parking spaces and upgrading vital intersections for pedestrians, cyclists, and public transport.

The third principle is the optimization of the road network and use, which has become an important point in sustainable urban transport. The optimization is making sure that (1) the traffic rules are followed and enforced, such as limiting speed in residential areas, and (2) providing traffic information i.e., on-time performance, congestion, and parking, so that the citizens can benefit from the rad network and use it in a sustainable way.

Encouraging walking and cycling is the fourth principle that has become the key to sustainable urban transport. The basic is developing comprehensive cycling and walking concept with high-quality street design standards for sidewalks, cycle paths, and a complete street network. Furthermore, providing pedestrian zones with zero barriers for pedestrians, implementing the green waves for bicycles, and appointing cycling and pedestrian advisors in transport administration will encourage more walking and cycling in the city. Furthermore, in many countries, people walk because they must, not only because they want to or they enjoy it, so it is critical to ensure the equity of all users, including women, children, older people, and disabled people.

The fifth principle is the must-have system in urban transportation development called transit improvements. The improvements make sure high service quality in public transport is based on performance indicators and build public transport associations to integrate timetables, fares, and tickets. Moreover, it involves ease of access and intermodal integration for all existing city transportation such as rail, bus, taxi, car sharing, etc.

The hardest challenge in managing city transportation is controlling vehicle use. As the sixth principle, controlling the vehicle use can involve travel restrictions implemented in many cities in the world and involve private sectors participation in sustainable transport. The implementation could be a set of parking policies and incentives to commute by bike or public transport. The key is the provision of a high-performance public transport network with comfortable interchange facilities and distance-based pricing.

The next principle is managing to park. Ideally, the ideal parking management has parking regulations, requirements of maximum parking, and other methods such as limiting the parking duration and applying parking fees and clear marking on-street parking. After that, it is good to keep citizens well informed about parking information and a balanced parking supply.

Furthermore, the eighth principle is promoting clean vehicles. It could be a campaign such as giving rewards for efficient vehicles, such as feebates and green procurement for vehicles on the one hand. On the other hand, vehicle scrapping or retrofit schemes for old vehicles can help to promote clean vehicles and low emission zones. Besides that, it can also focus on a clean fuel policy to promote cleaner vehicles, including electric ones. Further approaches are incentives for clean taxi fuels and the provision of stations for alternative fuel vehicles as well as improved inspection and maintenance.

The number nine of the principles is communicating the solution. Since sustainable urban transport is a transportation development that focuses on citizens rather than on cars, it is crucial to keep the citizens and stakeholders well informed and communicate all solutions comprehensively. The campaigns to show that public transport is nice, convenient, and offers a lot of benefits are necessary. The campaigns can also promote regional products, local leisure activities, or ride-sharing programs. This information can be set up through user-friendly public transport websites and open data for smartphone developers.

The last principle in sustainable urban transport is approaching the challenges comprehensively. In fact, introducing a sustainable urban transport system in the city will need a lot of stakeholders, support, time, and budget. It starts with the stakeholder's process to assess and discuss measures, execute and communicate a comprehensive sustainable urban mobility plan, and integrate transport into the climate change action plans. Besides that, creating public institutions is necessary, which is responsible for sustainable urban transport, such as an integrated city and transport planning authority or a public transport alliance. Also, measuring emissions as well as monitoring the performance of the measurement is always a good step to prove the benefits of a more sustainable urban transport.

- ***Strength, Weakness, Opportunity, and Threat of Banda Aceh Mobility***

Strengths: two city centers, transit improvement, clean vehicle promotion, vehicle use control, parking management, and law enforcement.

Since the rehabilitation and reconstruction after the Tsunami of 2004, Banda Aceh has had two city centers; the old city center in the area of Baiturrahman grand mosque and the new city center located in the southern part of the city, and some sub-centers spread put in the city (see ch.4). The area of the old city center functions as the center of worship and events, commercial area, green open space, offices and schools, and heritage site; meanwhile, the new city center functions as an office and commercial area.

Since 2016, the city has had a city bus as public transportation with a certain schedule and routing system. It connects the old city center to some important points such as the public university, airport, seaport, and a tourist place, making the grand mosque area a hub where all city bus routes end there. From the beginning of operation until now (2021), the city bus has been free of charge, and it is a reason for significant growth in the number of passengers every year. The government policy in operating the city bus in Banda Aceh is to reduce congestion (Muhajir and Nasir, 2017), and to encourage people to commute by bus instead of personal vehicles. The bus is well maintained and comfortable[1], equipped with an air conditioner and CCTV for passenger safety, and the government will add electrical bus units in 2021[2].

In the area of the grand mosque, it is easy to park personal vehicles. The drivers who visit the area can park their vehicles in a parking place located in the basement of the Grand Mosque or on the street side. Parking officers manage the parking on the street side; to him, drivers pay the parking fee.

Moreover, police officers maintain order in the traffic by conducting periodic raids on some roads. It is a way to make sure that all drivers and riders obey the traffic law. All drivers who violate will be penalized in the form of a fine. Through this regular law enforcement, it is hoped that the number of traffic violations and accidents can decrease every year.

Weaknesses: low transit hub quality, low driver awareness, low pedestrian and cycling lane quality, problems in parking management, communication

Furthermore, It seems the mixed-use building system is also not so popular. The buildings in commercial areas usually function as a trading place and product storage. The inhabitant living in the buildings is generally shop owners and their family or staff of the shops. Most people live in the settlement areas around the old city center because vertical housing is still not common. Besides that, although the grand mosque area has become the hub of the city bus, there is no integration between different modes of transport. The passengers who want to transit and change from a mode of transport to other modes feel difficult because there is no information available, whereas city buses, labi-labi, rickshaws, and taxis, are available in the area. Besides the information, there is neither integrated time schedule between the transport mode.

In traffic, the drivers usually drive at proper speed when the traffic is heavy and when there are periodic police raids. On the contrary, some drivers drive faster because there is no traffic calming in the area. From this traffic, many people complain because some drivers use racing vehicle exhausts that produce air and sound pollution. Besides that, the driver's awareness to respect for the pedestrian is low, so pedestrians should be careful even when crossing the street on the zebra-cross.

There is a pedestrian lane on the street side, but the condition is inadequate. Some barriers disturb pedestrian accessibility, such as broken pedestrian lane material, trading products, street cafés, and

[1] https://www.bandaacehtourism.com/id/a/bus-trans-kutaraja/cara-naik-trans-kutaraja

[2] https://aceh.tribunnews.com/2020/12/15/2021-aceh-miliki-bus-trans-k-listrik

trees. There is also no plaza or open space where a pedestrian can stand to enjoy the surrounding, except for the two green open spaces, in Blang Padang and Taman Sari.

In 2020, the city government will start to build bicycle lanes on arterial roads[3]. However, there is no clear urban cycling network, and the construction of bicycle lanes on some of these roads is not functioning properly. Apart from the unavailability of bicycle parking space, the bicycle lane is used as a vehicle parking area and trading area. For example, a city street section, in addition to being a place for selling, this road section has also turned into a parking lot for motorcyclists, cars, and even rickshaws. Not only that, but naughty motorcyclists also use this road section for shortcuts. Also, one of the worrying things about cycling activities is the relatively weak guarantee of safety. Because if there is an accident with a motorized vehicle, bicycle users are more likely to become the main victim. These problems result in disruption of comfort and safety for bicycle lane users.

Meanwhile, the parking fee in the city center is relatively cheap, and there is no limitation on parking duration. In 2019, the parking fee for the car was Rp3000 (±€0.30) and Rp1000 (±€0.10) for motorcycles with unlimited time. Likewise, drivers can park their vehicles on most parts of the street side in the commercial area. It is indeed an amenity for drivers and discourages them from changing to public transport.

The last weakness is communication, in which the government cannot provide or share information with people. There is no integrated information system for traffic as well as transportation. New information is usually provided on the official website of the city transportation service, but still, not so many people access it. The government usually campaign for a new trend using banner such as encouraging people to use city bus and "bike to work" instead of going by personal vehicle, but it is unfortunately only for a short period of time.

Opportunities: walking environment development, Car Free Day (CFD)

People in Banda Aceh are welcome to pedestrian development in the city. The result of the structured questionnaire (in ch.4 p.24) shows that more than 70% of respondents are willing to walk in a better walkable environment. It is indeed an opportunity to set up a more pedestrian-friendly environment, especially in the area of the Grand Mosque, that can contribute to strengthening the site as a hub of transit. Besides that, with the existence of several cycling communities in the city[4], the habit of cycling is naturally campaigned among citizens to make them start considering cycling as a mode of daily transport.

In addition, in 2018[5], the city government started a Car Free Day (CFD) program conducted on a street section in the old city center area. The program starts from 06:30 to 10:00 every Sunday morning, and hundreds of citizens attend the program. It offers many activities such as exercise with music, jogging, bazaar, talk show, and live performance. The CFD is a good sample of activity to reduce pollution in the city. Although it is only 3.5 hours, it becomes a temporary "zero emission zone."

Threats: population growth, infrastructure requirement

[3] https://dishub.acehprov.go.id/aceh-transit/berbagi-fasilitas-sesama-pengguna-jalan/

[4] https://dishub.acehprov.go.id/aceh-transit/berbagi-fasilitas-sesama-pengguna-jalan/

[5] https://infopublik.id/kategori/nusantara/298410/car-free-day-mulai-jadi-tren-warga-kota-banda-aceh

There are three main threats related to mobility Development in Banda Aceh that can possibly cause a domino effect. (1) with the growing population and the absence of a vertical settlement strategy, Banda Aceh is the potential to rapidly grow into a megapolitan, which needs more infrastructure development. It requires more transport service, or, with the current trend, (2) the number of personal vehicles will probably explode in a decade that synergically requires more space for road development. As a result, not only road but also space for parking. (3) Parking on the street side triggers congestion in rush hours. Those things threaten the continuity of citizens and environmental life.

Recommendation

- ***Recommendation for practice***

1. Creating a pedestrian zone is a way to train people to walk.

In Indonesian cities, shopping malls are places for leisure and recreation. Its size is big and spacious and mostly located in a strategic place in the city. People spend a lot of time walking, looking around, shopping, and dine-in in the mall. The malls provide air conditioners and are comfortable walking in them. Adapting this idea and also learning from what happened in Kaiserslautern, pedestrian zone development in the commercial area is an ideal field to train people to walk outdoor.

In building this pedestrian zone, some aspect is needed, such as natural and artificial shade to decrease the temperature and appropriate street furniture is must-have equipment, for example banks, trash cans, lights, fountains, drinking tap water, etc. in addition, It should be Integrated and accessible with public transport, parking space, and pedestrian lane.

Learning from Kaiserslautern case, asking for feedback from the visitors is an effective way to improve the quality. The pedestrian as the user of the place should give their opinion periodically to get the problem that will quickly be answered. Besides that, the government should be ready with the change of the economy in the pedestrian zone. The making of pedestrian zone should be done step by step instead of making a massive change. This methods can decrease a bad impact of the development.

2. Creating space for regular events is to generate attractiveness of the place.

From the pedestrian zone development in Kaiserslautern, events were regularly made in the pedestrian zone to invite people and liven up the zone. In Banda Aceh's old-city center, Blang Padang is regularly used as a place for exhibitions, open-air concerts, and national ceremonies. The place for events should not tie only to Blang Padang but also to other parts of the planned pedestrian zone, which are adjusted to the type, scale, and time of events. Program synchronization is needed between related parties, such as tourism services, religious affairs, social communities, etc.

Promotion and campaigning the pedestrian zone through events should also be done with social media. In many cases, some events in Banda Aceh were not published well so only a few people come to visit. Besides that, the government or committee for the pedestrian zone should have an annual events plan, which is announced in at least the local medias.

3. Focus on pedestrian lane connection between the most visited places in the area.

A pedestrian lane system should connect the most visited places found in the questionnaire; be built with necessary material, wide enough for 2-ways walking, and equipped with necessary street furniture, including signboard. A good pedestrian connection will encourage people to walk more than a move by vehicle. Also, decoration plants and natural and artificial shade are needed to create a good view and comfort for a walker. The pedestrian will feel more sense of recreation when the zone provides the visual of colorful flowers, greenery plants, and the aroma of nature. The shades will protect them from the heat of sunshine. Furthermore, there should be "a brake" at every certain distance, such as a fountain, sitting area, monument, small plaza, etc. The break is a way to enhance the space quality and create a strong memory of the place.

4. Provide parking space at some points with a particular parking tariff.

Parking space is critically needed for the visitors who come by personal vehicle. The current parking house is located in the basement of the Grand Mosque. The information about the parking house location should be shown at some points to direct drivers. Additional parking space could be on some parts of the roadside by considering the potential traffic jam that would be occurred. Parking space for bicycles must also be provided at some points. In addition, the parking tariff should be more than the existing tariff to implicitly encourage people to use public transport instead of ride/drive. To guarantee that all expected scenario run as planned, a "Law enforcement patrol" must regularly patrol to take action against visitors who violate parking regulations.

5. Strengthening the role of a city bus by putting a stop in strategic spots, a wider area of coverage, and longer service time.

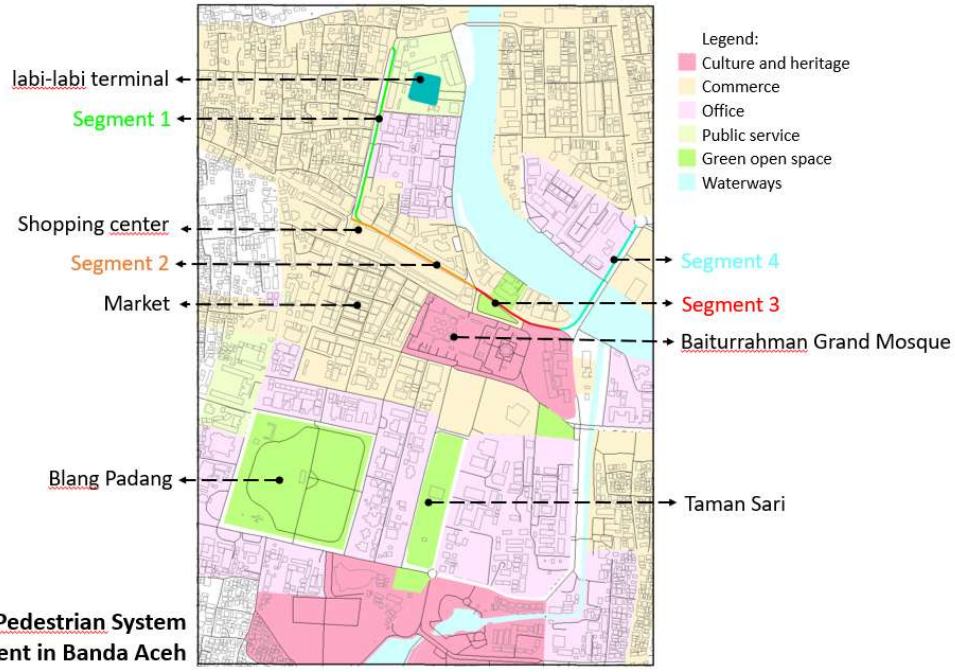
The bus stop must be accessible for walkers, have clear location information, and protect prospective passengers from rain and hot sunshine. The city center should be reachable from all parts of the city, which means the bus route at least serves along the city's main corridors. Labi-labi, pedicab, and online transportation services can function as collector transport for the secondary corridors. The service time of the city bus should consider the activity in the city center.

6. Building apps that provide information about products sold by merchants and information about tourism destinations (sightseeing) and events in the area.

The project will involve merchants, tourism services, industry, etc. All stakeholders take a role because each of them has interest on this project. The merchant and industry need to promote their products, the tourism service needs to publish tourist events, and the transport department needs to update information about bus services.

With the app, the consumer can see the products sold by merchants. They get information about the latest products, prices, and the shops that sell them. The merchants and industries can also update their new (upcoming) products. Besides that, it is easier to spread information using apps for upcoming events (for the tourism service that regularly conducts them) than banners and advertisements in newspapers. With the app, all prospective visitors and tourists can also see all information related to the pedestrian zone.

- ***Recommendation for policy***



4 Segments of Pedestrian System Development in Banda Aceh

1. The city spatial plan must be updated related to pedestrian development because based on Banda Aceh's "Bust Rapid Transit Network Improvement 2017", the government will let Labi-labi gradually disappear. It means the location of the Labi-labi terminal in segment one is no longer relevant as the origin.
2. The government should have an "action plan" for city mobility system development that integrates all transportation development plans, including pedestrian system development.
   - The action plan is useful for avoiding overlapping existing development with future development and overlapping between ministries/departments.
   - The action plan should provide guidelines and standards for certain aspects of city mobility, from vehicles (car, motorcycle, bicycle, etc.), parking space, road, standard sidewalk quality, signages, public transport, bus stop, etc., considering local conditions; climate, culture, and social activities.

- ***Recommendation for future research***

My research on the determinant factors of the no-pedestrians phenomenon in Banda Aceh, as one of the cities located in the tropics, will be helpful as a consideration in planning the pedestrian development of other tropical cities. This research on pedestrians is an essential topic to be carried out in other cities in Indonesia and south-east Asia city because all the cities generally face the same problems. The challenge is even with the same tropical location, the culture in each region is somewhat different. Armed with the case study experience in Banda Aceh and the comparative study of Kaiserslautern, the author plans to conduct two research topics for the future.

1. Measure level of walkability: effectiveness of the pedestrian system development.

Measuring walkability level is crucial before researchers and planners give their recommendations in planning challenges. Until today, researchers and planners have built their "self" parameters to measure walkability. Therefore, the measurement result is more qualitative than quantitative and also needs some time to finish. Meanwhile, the planning of an area needs formula/methods which is able to measure the level of walkability more accurately and quickly. The research will be able to contribute to evaluating the level of pedestrian-friendly (walkability) of an area. The methods/formula will help the planner, policy-maker, and researcher plan a region in an easier, quicker, and more accurate way.

2. The influence of geo-location to the standard of the pedestrian lane in the tropical cities: walker-walking space relationship in south-east Asia cities.

Some cities in a region might face the same problem in developing pedestrian systems. Interestingly, each city, even the cities in a country, does different ways to deal with the problem. This research will reveal:

- Whether any similar problem in the tropical city in south-east Asia.
- How the similarity and different ways of the decision-maker to handle the problems occurred.
- How the interaction between pedestrians in each city with their environment is.

The research aims to show how the geo-location elements affect the standard of pedestrian system development. It will also show if the location determines the level of interaction between the walker and the walking space.

Bibliography

Chapter 1

Books, Official Documents, and Journals

Bosworth, C. Edmund. 2007. *Historic Cities of the Islamic World*. Koninklijke Brill NV, Leiden, Netherland.

Buku Data Statistic Banda Aceh 2013. [The Book of Statistical Data of Banda Aceh 2013]

Creswell, John W. 2014. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications, Inc, California.

Groat, Linda and Wang, David. 2013. *Architectural Research Methods, Second Edition*. John Wiley & Sons, Inc, New Jersey.

Kwan, Mei-Po; Richardson, Douglas; Wang, Donggen; Zhou, Chenghu. 2015. *Space-Time Integration in Geography and GIScience, Research Frontiers in the US and China*. Springer Science+Business Media Dordrecht 2015.

Lynch, Kevin. 1960. *The Image of the City.* The MIT Press, Cambridge, Massachusetts, 1960.

Mesjid Bersejarah di Nanggroe Aceh Jilid I. [Historical Mosques in Aceh's Land Volume 1]. Published by Regional Office of Aceh Province's Religion Department. 2009.

Pallagst, Karina M. 2007. *Growth Management in the US*. Ashgate Publishing Limited, England.

Raap, Wilhelmina Remke. 1986. *The Great Mosque of Banda Aceh: Its History, Architecture, and its Relationship to the Development of Islam in Northern Sumatra.* UMI Dissertation Services, A Bell & Howell Company, Michigan, 1996.

Rencana Tata Bangunan dan Lingkungan Kecamatan Baiturrahman. 2013. [Layout Plan of the Building and the Environment of Baiturrahman Sub-district. 2013].

Rencana Tata Ruang Wilayah Kota Banda Aceh 2009-2029. [Spatial Planning of Banda Aceh's Region 2009-2029]

Shortell, Timothy and Brown, Evrick. 2014. *Walking in the European City, Quotidian Mobility and Urban Ethnography*. Ashgate Publishing Limited, England.

Fishbeck, Gary M. 2003. *Pedestrian Circulation* (in Time Saver Standard for Landscape Architecture, section 340). The McGraw-Hill Company, Inc.

Zhang, Lei; Nasri, Arefeh; Hong, Jin Hyung; Shen, Qing. 2012. *How Built Environment Affects Travel Behavior: A Comparative Analysis of the Connection between Land Use and Vehicle Miles Traveled in US Cities*. The Journal of Transport and Land Use vol. 5 No. 3 [2012] pp. 40-52, doi: 10.5198/jtlu.v5i3.266. http://jtlu.org.

Official Website and News

Trans Kutaraja Resmi Beroperasi. [The "Trans Kutaraja" are officially operated]**.** Government's inspectorate of Banda Aceh, article on 29 April 2016, accessed on 19 September 2016. http://inspektorat.bandaacehkota.go.id/2016/04/29/trans-kutaraja-resmi-beroperasi/

Sejarah. [History of Banda Aceh]. Banda Aceh Government official Website, accessed on 30 August 2016. http://bandaacehkota.go.id/p/sejarah.html

Data Kependudukan 2010. [Population Data 2010]. Banda Aceh's Community Development Agency, accessed on 26 September 2016. https://bpmkotabandaaceh.wordpress.com/data/penduduk/data-kependudukan-2010/

Data Geografis. [Geographical Data]. e-Performance, Assessment Application on Staffs and Task Forces' Performance] accessed on 22 September 2016. https://kinerja.bandaacehkota.go.id/anjab/profil-datageografis.html

Banda Aceh Climate. accessed on 22 September 2016. http://en.climate-data.org/location/3321/

Menyoal Transportasi Kota Banda Aceh Pasca Tsunami. [Questioning City Transportation in Banda Aceh after Tsunami], Tribun news 28 December 2015, accessed on 22 September 2016. http://aceh.tribunnews.com/2015/12/28/menyoal-transportasi-kota-banda-aceh-pascatsunami

Penumpang Mulai Kecewa dengan Bus Transkutaraja [Passangers began disappointed with the "Transkutaraja" bus service]. Haba daily news on 8 May 2016, accessed on 19 September 2016. http://habadaily.com/news/6779/penumpang-mulai-kecewa-dengan-bus-trans-kutaraja.html

Kisah Harry Burton si Wartawan Perang Meliput Konflik Aceh [The story of Harry Burton, The war correspondent in covering conflict in Aceh], the Globe Journal news, 27 October 2012, accessed on 28 September 2016. http://theglobejournal.com/Sosok/kisah-harry-burton-si-wartawan-perang-meliput-konflik-aceh/index.php

Suasana Aceh semasa conflict (in Memoriam Harry Burton). [Atmosphere in Aceh during conflict], Reader's opinion – Kompas news on 2 December 2009, accessed on 27 September 2016. http://www.kompasiana.com/winwannur/suasana-aceh-semasa-konflik-in-memoriam-harry-burton_54ff35eca33311dc4950f920

113.206 Kendaraan di Aceh Bertambah [113,206 units of vehicles augment in Aceh]. Serambi Indonesia news 19 January 2016, accessed on 29 September 2016. http://aceh.tribunnews.com/2016/01/19/113206-kendaraan-di-aceh-bertambah

10 Tahun setelah Tsunami, Banda Aceh sudah bergeliat. [10 years after the Tsunami, Banda Aceh is already alive]. Serambi Indonesia news 19 January 2016, accessed on 29 September 2016. https://www.merdeka.com/peristiwa/10-tahun-setelah-tsunami-banda-aceh-sudah-bergeliat.html

Chapter 2

Abdullah, Jamalunlaili; Mazlan, Mohd Hafiy. 2016. Characteristic of and Quality of Life in a Transit Oriented Development (TOD) of Bandar Sri Permaisuri, Kuala Lumpur. Presented in AMER International Conference on Quality of Life, Medan, Indonesia, 25-27 February 2016. Elsevier Ltd.

Agustin, Etty; Santosa, Happy Ratna; Soemardiono, Bambang. 2014. Street Corridor Arrangement to Improve the Quality of Corridor Environment. International Journal of Education and Research Vol. 2 No. 2 February 2014.

Azmi, Diyanah Imami; Karim, Hafazah Abdul; Amin, Mohd Zamreen Mohd. 2014. Comparing the Walking Behaviour between Urban and Rural Residents. Presented in ASIA Pacific International Conference on Environment-Behavior Studies, Cairo, Egypt, 31 October – 2 November 2012. Elsevier Ltd.

Iswanto, Danoe. 2006. Pengaruh Elemen-elemen Pelengkap Jalur Pedestrian terhadap Kenyamanan Pejalan Kaki. [The Influence of Complementary Elements on Pedestrian Line for Walkers]. ENCLOSURE Volume 5 No. 1. Maret 2006 - Jurnal Ilmiah Perancangan Kota dan Permukiman.

Komanoff, Charles; Roelofs, Cora; Orcutt, Jon; Ketcham, Brian. 1993. Environmetal Benefits of Bicycling and Walking in the United States. US Transportation Research Record 1405. ISBN 0309055547

Luadsakul, Chatdanai; Ratanvaraha, Vatanavongs. 2013. The Study of Walkability Index: A Case Study in Nakhon Ratchasima Province. International Journal of Emerging Technology and Advanced Engineering.

Malaitham, Sathita; Fukuda, Atsushi; Vichiensan, Varameth; Wasuntarasook, Vasinee. 2015. (Malaitham, Fukuda, Vichiensan, & Wasuntarasook, 2016). The National Academics of Science, Engineering, Medicine.

Masjutina, Svetlana. 2016. *Urban = Pedestrian?*.

https://www.linkedin.com/pulse/urban-pedestrian-svetlana-masjutina

Mercola, Joseph. 2015. New Study: Daily Walk can Add 7 Years to Your Life.

http://fitness.mercola.com/sites/fitness/archive/2015/09/11/daily-walk-benefits.aspx

Nuzir, Fritz Akhmad; Murwadi, Haris; Dewancker, Bart. 2016. Proceedings of the 11th ISAIA, 20-23 September 2016, Miyagi, Japan.

O'Hanlon, Julia; Scott, Marcia S; West, Lexi. 2016. Healthy and Complete Communities in Delware: The Walkability Assesment Tool. Institute for Public Administration, University of Daleware.

Pongprasert, Pornraht; Kubota Hisashi. 2016. Switching from motorcycle taxi to walking: A case study of transit station access in Bangkok, Thailand. International Association of Traffic and Safety Sciences.

Rahman, Norhafizah Abdul; Shamsuddin, Shuhana; Ghani, Izham. 2015. *What Makes People Use the Street?: Towards a liveable urban environment in Kuala Lumpur city center*. Presented in Asian Conference on Environment-Behavior Studies, Seoul, South Korea, 25-27 August 2014. Elsevier Ltd.

Ryan, Bill. 2003. Economic Benefits of Walkable Community. Let's Talk Business, Issue 83. Center For Community Economic Development, University of Winconsin-Extension. http://fyi.uwex.edu/downtowneconomics/files/2012/07/economic-benefits-of-a-walkable-community.pdf

Shamsuddin, Shuhana; Hasan, Nur Rasyiqah Abu; Bilyamin, Siti Fatimah Ilani. 2012. Walkable Environment in Increasing the Liveability of a City. Presented in ASEAN Conference on Environment-Behavior Studies, Bangkok, Thailand, 16-18 July 2012. Elsevier Ltd.

Sutikno, Fauzul Rizal; Surjono; Kurniawan, Eddi Basuki. 2013. Walkability and pedestrian perceptions in Malang City emerging business corridor. Elsevier B. V.

Tanaboriboon, Yardphol; Guyano, Jocelyn A. 1991. *Analysis of Pedestrian Movements in Bangkok*. Transportation Research Boards 1294.

Tipakornkiat, Chalat; Limanond, Thirayoot; Kim, Hyunmyung. 2012. Determining an influencing area affecting walking speed on footpath: A case study of a footpath in CBD Bangkok, Thailand. Elsevier Ltd.

Townsend, Craig; Zacharias, John. 2009. *Built environment and pedestrian behavior at rail rapid transit stations in Bangkok.* Springer.

Wibowo, Sony S.; Tanan, Natalia; Tinumbia, Nuryani. 2015. *Walkability Measures for City Area in Indonesia (Case Study of Bandung)*. Journal of the Eastern Asia Society for Transportation Studies, Vol. 11, 2015.

Winayanti, Lana; Tsaputra, Antony; Mandiartha, Putu; Setiawan, Bakti & Zuraida Lukluk. 2015. Walkability and Pedestrian Facilities in Three Indonesian Cities: Padang, Yogyakarta, and Mataram. Presented in 15th Indonesian Scholars International Convention, London, 3-4 October 2015.

Zakaria, Juriah; Ujang, Norsidah. 2014. Comfort of Walking in the City Center of Kuala Lumpur. Presented in Asian Conference on Environment-Behavior Studies, Seoul, South Korea, 25-27 August 2014. Elsevier Ltd.

Chapter 3

Official documents

Mobilitätsplan Klima+ 2030 Kaiserslauternstadt.
https://www.kaiserslautern.de/sozial_leben_wohnen/verkehr_parken/plan_mobilitaet/index.html.de.

Nahverkehrsplan Stadt Kaiserslautern ab 2009.

internet

Kaiserslautern city official website

https://www.kaiserslautern.de/arbeit_bildung_wissenschaft/standort/statistik/bevoelkerung/index.html.de

Die Rheinpfalz Newspaper

Date	News
11.08.1934	Die Stadt verfithönert fith
25.08.1935	Wenn es Nacht wird in Kaiserslautern
23.11.1935	Die Zeit veränderte das Gesicht der Städte
26.10.1973	Verlosung in der Fußgängerzone
16.09.1974	,,Zu wenig Bedürfnisanstalten”
25.07.1974	Die weiteren Arbeiten zum Ausbau der Fußgängerzone in der Innenstadt machen gute Forschritte
20.07.1957	Auflockerung der Innenstadt schreitet voran
28.01.1960	Sanierung der Innenstadt bleibt nach wie vor die gestellte Aufgabe
07.03.1963	Wucherndes Wachstum oder ausgereifte Entfaltung der Barbarossastadt?
13.11.1963	Licht lockt Leute
02.01.1968	Verkehrsgutachten der Professoren Hollatz und Schaechterle
08.10.1968	Ester Schritt für freie Innenstadt
22.11.1968	Verkehrsfreie City – der Fußgänger ist König
23.11.1968	,,Ausgerechnet Jetzt” – Taxifahrervund verkehrsfreie City
24.11.1968	Die Innenstadt gehört den Fußgängern
03.12.1968	Verkehrsfreie City pro und contra
10.12.1968	Für und Wider zur verkehrsfreien Innenstadt
14.01.1969	Diskussion um gesperrte Innenstadt steht bevor
18.01.1969	Nur noch am Samstagen ,,fahrzeugfreie Innenstadt”
29.11.1969	Ab heute Abend erstrahlt die Innenstadt im Lichterglanz
13.01.1971	Das Projekt einer verkehrsfreien Innenstadt ist mit vielen Problemen verbunden
08.06.1971	,,Kleiner Markusplatz“ als Oase der Füßgänger Fackelrondellpläne rund ums Karstadt-Kaufhaus
12.06.1971	Ein standiges Ärgernis
25.08.1972	Auch Kaiserslautern soll Fußgängerparadies werden
24.08.1972	Die Innenstadt wird jetzt endlich ,,fußgängergerecht”
01.12.1972	,,Park-and-ride” als Versuchsballon
24.02.1973	Für Fackelstrasse kein städtisches Korsett
31.03.1973	Picture: Fackelstrasse gleicht einem Schützengraben
09.04.1973	Picture: Asphaltbummel am langen Samstag
11.05.1973	Zweiter Fußgängerabschnitt anvisiert
14.07.1973	Jetzt werden Autos endgültig verbannt
03.08.1973	Picture: Die Kaiserslauterer Fußgängerzone hat in diesen Tagen des Sommerschlußverkaufes ihre große Bewährungsprobe bestanden
05.09.1973	Jetzt offiziell gesperrt

06.10.1973 Fußgängerzone liebenswerte Visitenkarte
23.05.1974 Bitte um Mitarbeit
23.05.1974 Fußgängerzone: Montag Baubeginn in der Kerststraße – Brunnen für den Schillerplatz
17.06.1974 Der Bürger und sein Fußgängerparadies ,,Amateurvorschläge“ zur Neugestaltung
17.06.1974 Aufruf zur Mitarbeit
28.06.1975 ,,Expansion” der Fußgängerzone geht weiter Schwerpunkt ist diesmal die Stiftskirche
03.11.1975 Dritter Bauabschnitt
10.11.1975 Fußgängerzone: Lektion für Knerweler un Griwwelbisser
11.10.1976 Auto-Salon: So belebt war die Fußgängerzone selten
24.12.1976 Bummel durch Pfälzer Fußgängerzonen
24.11.1976 Leistungen des Handels zahlen sich aus
30.08.1979 Irrgarten
05.11.1979 Großes Fest mit vielen Attraktionen Neue Fußgängerzone offiziell eröffnet
02.11.1979 In der neuen Fußgängerzone sind vor allem Fachgeschäfte zu Hause
07.11.1979 Autos sollen langsam fahren
23.09.1980 Kein demokratischer Stil
22.01.1981 Haufenweise Ärger
22.01.1981 Wir meinen
03.02.1983 Favorit der Steinstraäßler heißt waiterhin verkehrsberuhigte zone
29.06.1983 Strikt gegen Fußgängerzone
29.08.1986 Ruhebänke für die Fußgängerzone
28.03.1988 Gesamtkonzept nun im Bauausschuß
16.09.1988 Ein neues Stück Füßgängerzone
26.01.1989 Rogel: Störende ,,bauwerke” verbieten
17.11.1989 ,,Absatzguillotinen in Fußgängerzone“
23.03.1991 Schönere Fußgängerzone und Attraktionen auf den Plätzen
24.01.1992 In der City: Hindernislauf mit Kinderwagen
05.06.1992 ,,Auch ein kleiner Freiraum”
14.06.1993 Testlauf für die ,,Fußgängerzone“ führt ins Chaos
26.06.1993 ,,Richtiger Schritt zu einer attraktiven City”
03.07.1993 Fußgängerzone: Zweiter Versuch für Oktober geplant
13.10.1993 Plan für zweiten Testlauf steht
11.11.1993 Stadt plan vier weitere Tests für Fußgängerzone
15.10.1993 Eine City-Promenade von über zwei Kilometer Länge
18.11.1993 ,,Fußgängerzone ohne konzept“
23.11.1993 Fußgängerzone: Handel tritt auf die Bremse
05.02.1994 Weiter Radeln in der Fußgängerzone
03.02.1995 Neugestaltung der Fußgängerzone: Piontek wartet Hertie-Zukunft ab
17.03.1995 Frühlingserwachen in Lauterer Flaniermeile
05.12.1995 Konzept für Fußgängerzone vorgelegt
07.12.1995 Studie des stadtplanungsamtes stellt Bedarf fest: Fußgängerzone soll saniert werden
12.01.1996 Ausbau Fackelstraße: Start im Sommer?
20.01.1997 Grüne: Fußgängerzone mit Busspur
11.03.1997 500 000 Mark für Fußgängerzone
12.03.1997 Suche nach attraktivem Belag beginnt
12.03.1997 Aus alt wird neu – Geschäftshaus in der kerststraße
22.03.1997 Künftig Fußgängerzone in dezentem Rot und hellem Grau
16.04.1997 Raiffeisenplatz wird ohne Parkplätze ausgebaut
30.04.1997 Stadt beginnt mit dem Ausbau der Fackelstraße
15.07.1997 Geld für Fußgängerampeln bewilligt
26.08.1997 Drei Musterleuchten für die neue Fußgängerzonein
09.09.1997 KAISERSLAUTERN KOMPAKT: Leuchte ,,Typ A” für die Fackelstraße bestimmt
18.09.1997 Kommt es zur Gründung einer Interessengemeinschaft?
19.09.1997 Reges Interesse an Interessengemeinschaft
23.09.1997 Anlieger der Fußgängerzone treffen sich am Donnerstag
27.09.1997 Geschichte vom Gegensatz der Geschlechter
09.10.1997 Jetzt wird das Pflaster in der Fackelstraße verlegt

23.10.1997	Wie gefällt Ihnen das neue Pflaster?
21.10.1997	Fackelstraße vor dem Nikolaustag fertig”
11.1997	Übel aufgestoßen… Geröllwüste Fußgängerzone KL
11.11.1997	Unterführung bleibt erhalten
24.11.1997	Oberbürgermeister weiht neue Fußgängerzone ein
02.12.1997	Attraktive Fußgängerzone
15.01.1998	Viel Wirbel um neue Mülleimer für Flaniermeile
29.01.1998	Keine ,,Brummis” in der Fackelstraße?
05.03.1998	Bauarbeiten in der Fackelstraße begonnen
17.02.1998	Auflagen für Auslagen vor Geschäften
28.02.1998	Fußgängerzone: Es geht weiter
16.06.1998	Parkplatz am Casimirsaal abends offen
22.06.1998	Es mangelt an Fakten und Zahlen
23.06.1998	,,Es kann nur besser werden”
25.06.1998	Mehr Parkplätze in der City sind nötig
26.06.1998	Shopping macht keinen Spaß mehr”
27.06.1998	,,Herzschrittmacher” für die City
29.06.1998	Politur furs Image und Hilfe für den Fachhandel
30.06.1998	Einzelhandelskonzept teilt Stadt und Handel
28.08.1998	Bus- und Parkmünzen für die Innenstadt
02.09.1998	Schwacher Trost
02.09.1998	Bauarbeiten: Stadt wirbt um Verständnis
16.10.1998	SPD: Bauarbeiten sollen für Weihnachtsgeschäft ruhen
13.11.1998	Deubig: Fackelstraße bis zum 27. November fertig
27.01.1999	,,Kraftwerk der Innenstadt”
17.02.1999	Erster ,,Citypolizist” nimmt Arbeit auf
18.03.1999	Riesenstraße wird neu gemacht
08.04.1999	,,Stadt soll Radwege vernünftig ausbauen”
08.04.1999	Blechlawinen und Ampelschaltungen
22.04.1999	Umland bewerted die Lauterer Innenstadt ,,leicht positive”
28.04.1999	Das Wunder von der Fackelstraße
05..05.1999	Konzept für ein Kinderzentrum steht
14.05.1999	Sitzmöbel und Pflanzkübel
01.07.1999	Von Edelstahl über farbiges Stahlblech bis Holz
07.07.1999	Für eine attraktive City
09.07.1999	Seniorenbeirat fordert Mitspracherecht
27.07.1999	Leitungsarbeiten in der Riesenstraße
03.08.1999	Der Taubenplage den kampf angesagt
21.08.1999	Anlieger gegen Ausbaubeiträge
10.09.1999	Widersprüche der Anlieger abgelehnt
30.09.1999	Chice Edelstahl-Bänke für die Lauterer City
12.10.1999	Wasserspiele mit schwimmender Granitkugel
13.10.1999	Neues Pflaster
22.10.1999	Für Fußgängerzone Kontrollen gefordert
21.01.2000	Mieten machen Handel Leben schwer
25.03.2000	Steigende Ladenmieten in Spitzenlagen?
08.04.2000	,,Barbarossaroute” durch die Innenstadt
27.04.2000	,,Weshalb verhalten sich halter derart?”
04.05.2000	Raiffeisenplatz soll Hinterhofcharakter ablegen
09.05.2000	,,Schieben Sie! Das spart eine Menge Geld”
06.2000	Stadtstreife hat ihren Dienst aufgenomen
08.06.2000	,,Verkehrte Welt”
12.07. 2000	Ritter, Gaukler und Puppenspieler
13.07.2000	Gemeinsamer Kampf gegen Ladendiebstahl
20.07.2000	Toilettenhäuschen: Ausschreibung vor Gericht
09.10.2000	*Bronzeplakette* im Pflaster führt in die Vergangenheit
22.10.2001	Ladenmieten in City ziehen wieder an

05.02.2002 Parken ohne bürokratische Hürden
14.05.2002 ,,Mehr wäre wünschenswert”
18.05.2002 Braun unterstützt City-Streifen
22.05. 2002 Der Müll wartet nicht
23.05.2002 24-Śtunden-präsenz ,,nicht realisierbar”
07.06.2002 Spektakel für Kinder auf Straßen und Plätzen
13.06.2002 ,,Sonntags die City reinigen”
17.06.2002 ,,Schmutzig und unappetitlich”
12.07.2002 ,,Artet immer mehr aus”
29.10.2002 Sonntags und auch feiertags
16.11.2002 Ziel: Mehr Sauberkeit und Sicherheit in der Innenstadt
24.09.2002 Vier Bäume schmücken künftig die Marktstraße
03.04.2004 Bodenpreise in der Innenstadt stagnieren
27.05.2004 Um 22 Uhr ist im Freien Schluss
01.07.2004 Längere Öffnung der Freisitze gefordert
08.07.2004 Protest gegen lärmende Altstadt-Zecher
11.07.2005 Plätze und Straßen ein einziger Spielplatz
04.2006 Alte Stadtansichten: Die Fackelstraße
06.09.2006 ,,Gebührenerhöhungen eine Dreistigkeit”
15.11.2007 Einzelhandel fordert verbindliches Konzept
23.10.2008 Mit dem Ausbau steigt der Umsatz des handels
18.03.2010 Betonkübel mit Sträuchern machen die Flaniermeile grün
05.07.2010 Kommen Verbote unter die Räder?
18.08.2016 Pflaster in der Fußgängerzone wird erneuert
24.08.2016 ,,Probleme mit dem Wasserlassen”

Chapter 4

Literature source

Banda Aceh Central Statistics Agency. Banda Aceh in Figure 2008. ISBN: 979.466.477.4

Banda Aceh Central Statistics Agency. Banda Aceh in Figure 2010. ISBN: 979.466.025.

Banda Aceh Central Statistics Agency. Banda Aceh in Figure 2011. ISBN: 979.466.025.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2012. ISBN: 979.466.025.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2015. ISBN: 978.602.71268.1.7.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2017. ISSN: 2477-6696.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2018. 2019.

Banda Aceh Planning and Development Agency. *Kajian Tingkat Kenyamanan Jalur Pedestrian pada Kawasan Pusat Perhotelan Peunayong dan Sekitarnya.* 2019.

Government of Banda Aceh. *The Spatial Plan of Banda Aceh 2009-2029*. 2009.

Minister of Public Works Regulation; No.03/PRT/M/2014 about *Guidelines For Planning, Providing, And Utilization Of Feedback Network Infrastructure And Facilities In Urban Areas*. 2014

Online resource

Aceh Transportation Service. *Empat Juta Lebih Pengguna Bus Trans Koetaradja.* Accessed December 12, 2021. https://dishub.acehprov.go.id/aceh-transit/empat-juta-lebih-pengguna-bus-transkoetaradja/

Aceh Transportation Service. *Digitalisasi Pelayanan Bus Trans Koetaradja.* Accessed December 12, 2021. https://dishub.acehprov.go.id/aceh-transit/digitalisasi-pelayanan-trans-koetaradja/

Afif. *Becak di Banda Aceh pakai argo per kilometer, ini tarifnya.* Merdeka News July 22, 2016. Accessed December 12, 2021. https://www.merdeka.com/peristiwa/becak-di-banda-aceh-pakai-argo-per-kilometer-ini-tarifnya.html

Bakri. *115.777 Sepmor Baru Bertambah di Aceh.* Serambi News January 10, 2017. Accessed December 12, 2021. https://www.merdeka.com/peristiwa/becak-di-banda-aceh-pakai-argo-per-kilometer-ini-tarifnya.html

Bakri. *Penjualan Kendaraan Baru di Aceh Tetap Tinggi.* Serambi News February 13, 2021. Accessed December 12, 2021. https://www.merdeka.com/peristiwa/becak-di-banda-aceh-pakai-argo-per-kilometer-ini-tarifnya.html

BRR and Partners. *Aceh and Nias, Two Years after the Tsunami.* 2006 Progress Report. Accessed 21st December, 2021. https://reliefweb.int/sites/reliefweb.int/files/resources/8F7E4BD64414C4C449257252001DDD68-Full_Report.pdf

Cities Development Initiative for Asia (CDIA). *Banda Aceh Bus Rapid Transit Network Improvement.* Accessed 12th December, 2021. https://itdp-indonesia.org/publication/banda-aceh-bus-rapid-transit-network-improvement/

Hadi, Abdul. *Foto: Melihat Lebih Dekat Bus Listrik yang Diuji Coba Trans Koetaradja di Aceh*. Acehkini News January 17, 2021. Accessed December 12, 2021. https://kumparan.com/acehkini/foto-melihat-lebih-dekat-bus-listrik-yang-diuji-coba-trans-koetaradja-di-aceh-1uzqIjVkAzD/full

Johnson, Bridget. *World's Worst Tsunamis*. Accessed 6th December, 2019. https://www.thoughtco.com/worlds-worst-tsunamis-3555041

Junaidi, Hafid. *Walikota Sambut Baik rencana Pembangungan MRT.* Accessed December 12, 2021. https://bandaacehkota.go.id/berita/12622/wali-kota-sambut-baik-rencana-pembangunan-mrt.html

Majiah, Wahyu. *Nestapa Tukang Becak di Aceh, Dari Penghasilan Rp.35 Ribu Hingga Tidur Dibecak Ketika Malam*. Anteroaceh News September 6, 2019. Accessed December 12, 2021. https://anteroaceh.com/news/nestapa-tukang-becak-di-aceh-dari-penghasilan-rp-35-ribu-hingga-tidur-dibecak-ketika-malam/index.html

Travelenses. *[INFOGRAPHIC] Hojak in Indonesia, Banda Aceh City*. Accessed 12th December, 2021. http://www.travelenses.com/2017/08/hojak-in-indonesia-banda-aceh-city.html

World Food Programme. *The Past, Present, and Future: Aceh Tsunami Response, Recovery and Preparedness*. Accessed 26th August, 2019. https://www.wfp.org/publications/past-present-and-future-aceh-tsunami-response-recovery-and-preparedness-0

Wolfensohn Center for Development. *Post-Tsunami Aid Effectiveness in Aceh*. Working paper 6. 2008. Accessed 4th October, 2019. https://www.brookings.edu/wp-content/uploads/2016/06/11_aceh_aid_masyrafah.pdf

Wiranto, Asmar. *Labi-labi, Transportasi Unik yang Hanya Ada di Aceh*. Liputan 6 News, 13th August, 2016. Accessed 12th December, 2021. https://www.liputan6.com/citizen6/read/2292696/labi-labi-transportasi-unik-yang-hanya-ada-di-aceh

Yusriah, Izza. *Keadaan Infrastruktur Kota Banda Aceh Pasca Gempa Bumi dan Tsunami*. Accessed October 4, 2019. https://medium.com/planologi-2015/keadaan-infrastruktur-kota-banda-aceh-pasca-gempa-bumi-dan-tsunami-78776755d714

Chapter 5

Official documents

Banda Aceh Central Statistics Agency. Banda Aceh in Figure 2008. ISBN: 979.466.477.4

Banda Aceh Central Statistics Agency. Banda Aceh in Figure 2010. ISBN: 979.466.025.

Banda Aceh Central Statistics Agency. Banda Aceh in Figure 2011. ISBN: 979.466.025.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2012. ISBN: 979.466.025.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2015. ISBN: 978.602.71268.1.7.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2017. ISSN: 2477-6696.

Banda Aceh Central Statistics Agency; Banda Aceh Development and Planning Agency. Banda Aceh in Figure 2018. 2019.

Online resource

https://infothek.statistik.rlp.de/MeineHeimat/tscontent.aspx?id=103&l=3&g=07312&tp=1027&ts=tsPop01 Accessed September 3, 2021

List of interview partners

Indonesia

Henny Marlina, ST, MT. *The head of Architecture Department, Universitas Muhammadiyah Aceh, Indonesia*. 20.09.2016. Telephonic.

Muhammad Zubir, S.SiT, M.Si. *The head of traffic and transport, Department of Transportation, Communication and Information of Banda Aceh city, Indonesia*. 08.05.2017. Banda Aceh, Indonesia.

Dedi Fahrian, ST, MT. *The staff of Tourism Department of Aceh Province, Indonesia*. 08.05.2017. Banda Aceh, Indonesia.

Maysarah Bakri, ST, M.Arch. *The lecturer at the Architecture Department, Universitas Islam Negeri Ar-Raniry, Indonesia.* 16.07.2019. Banda Aceh.

Germany

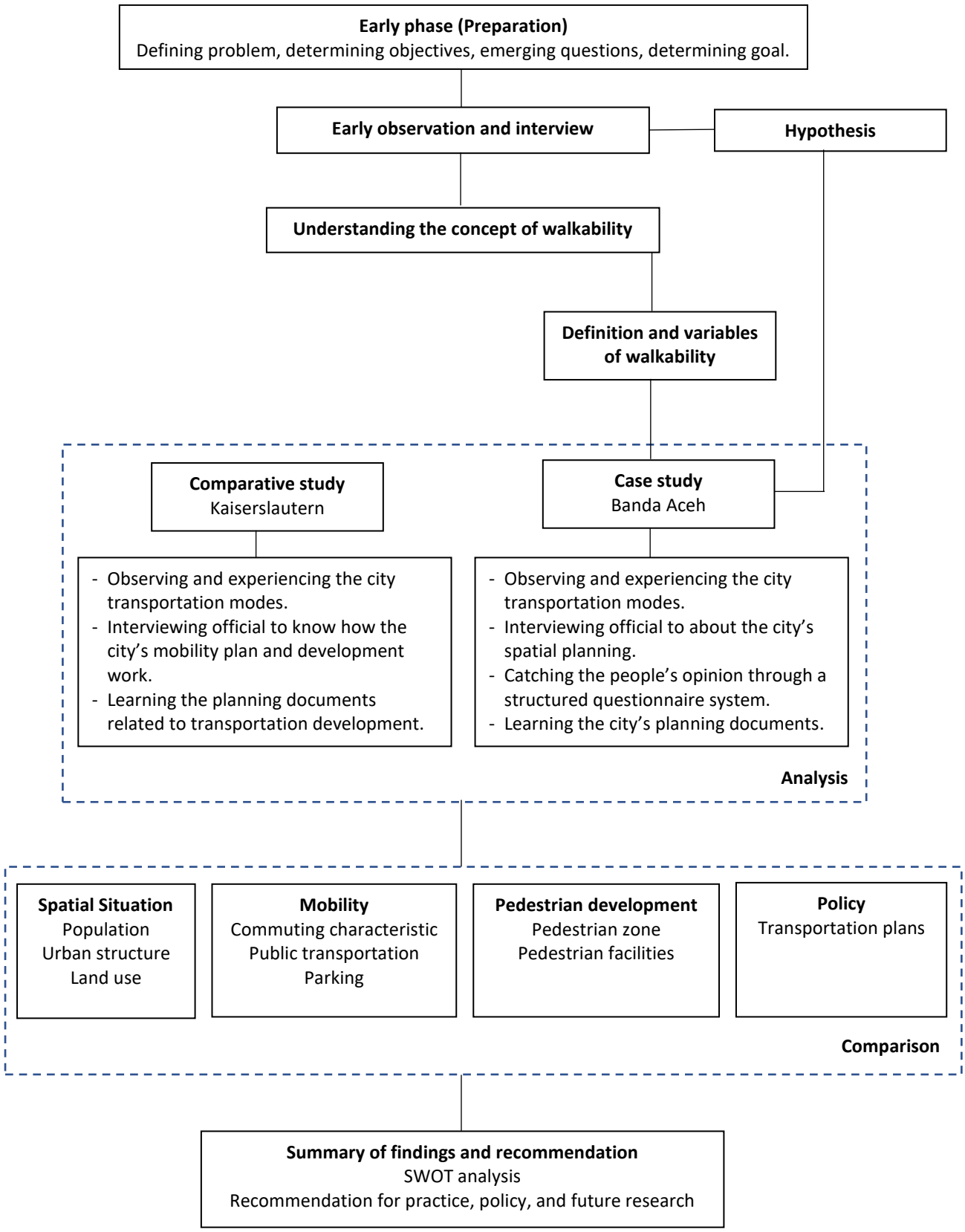
Christian Ruhland, *The Department of city planning Kaiserslautern, Germany*. 25.05.2018. Kaiserslautern, Germany.

DIAGRAMS

FIGURES

TABLES

Appendix chapter 1: Framework



Appendix chapter 2: Planning system comparison in Three Countries

(Source: Ryser and Franchini, 2015)

Variable	Indonesia	Malaysia	Thailand
Total Area	1.89 million km^2	330,290 km^2	513,120 km^2
Population	256 million	28.3 million	67 million
Percentage of people living in Urban Areas	53,7%	71% lives	40%
Administrative division	30 provinces 348 regencies 92 municipalities 4,994 districts 70,921 sub-districts	13 states government 3 federal territories	76 Provinces 1200 Municipalities (tesaban) - 32 municipalities with 50,000 population or more - 100 municipalities in second class (Town Municipality) - The rest are in the third class (Sub-district Municipality)
Government system	- National level - Provincial level - Regency level	- The federal - The state - The local government	- National level - Provincial level - Local level
Current National Development Plan	President Jokowi's Mid-term development plan that was introduced in 2014 focuses on three dimensions of development: - Importance of human development; - Prioritized field of food, energy/electricity, marine industry, tourism and manufacture; - Social and regional equality.	Vision 2020 was introduced in 1991 covers a 30- year periods and focus for the national development effort.	11th National Plan (2012-2016) aims to reconcile urban development with climate change preparedness and other environmental goals.
National planning composer	The department in charge of managing national development planning is the National Development Planning Board (BAPPENAS), which functions related to organizational structure, the process of national development planning	The ministry of Housing and Local Government (MHLG) is answerable to the Parliament regarding services and strategies of town planning.	The actual plan-making is in the hands of the provinces and local authorities who are supported by planning consultants.

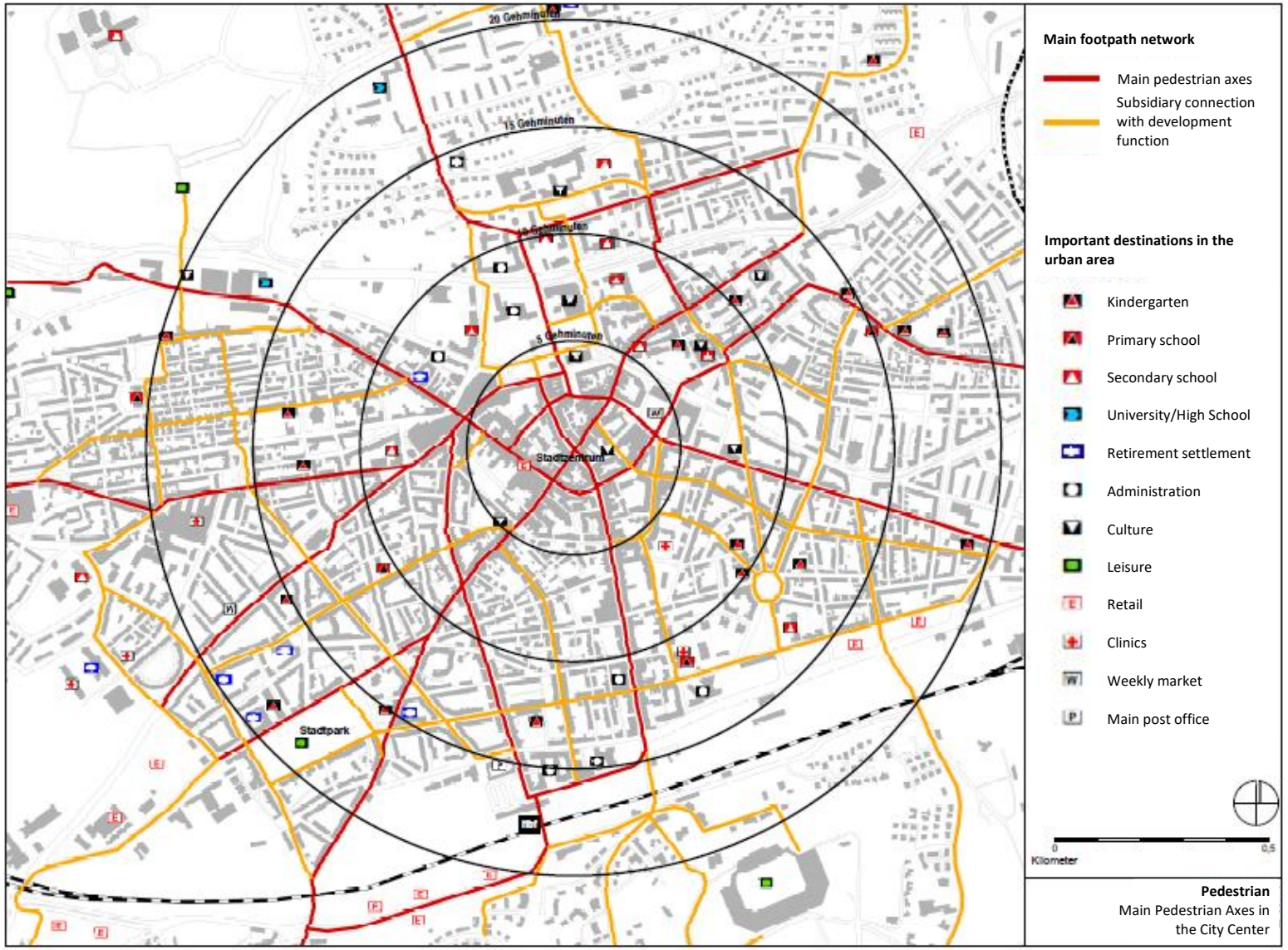
Variable	Indonesia	Malaysia	Thailand
	implementation, as well as human and financial report.		
Plot of planning policy	Development planning (Development Planning Deliberation - DPD) is performed from sub-district level to national level (bottom up). At the sub-district level, the Organization of the Sub-district Participatory Community (OSPC), along with the head of the Sub-district Commission coordinate the compilation of resources, problems, and development requirements into a sub-district program which includes a self-supporting fund. Agreed by district, then the head of the regency town, the plan is submitted to the Heads of the local and the Provincial Planning Boards which organized the examination in public of the proposed development plan (DPD) and stakeholders (public, private, and government).	Matters regarding town and country planning falls under the concurrent list where both Parliament and State Legislatures share the powers to make law. The state authorities are responsible for organizing the local government and municipal services and assume the position of "central government" to the local authority. The local authority is the principal government agency which exercises control at the local level.	Department of Public Works and Town & Country Planning under The Ministry of Interior were the most important one for urban and regional planning. Nowadays, it has largely shifted to Provinces and Municipalities. For regional planning purposes, it is usually the province that is charged with planning tasks above the local level although various attempts have been made to create planning regions consisting of three or more provinces, especially in those areas where the provinces are small.
Planning legislation	Planning legislation - Law No. 22/1999, transferring part of central government competences to both provincial and district/city government. - Law No. 17/2003, state finance strengthened local government budget system. - Law No. 25/2004, National Development Planning (NDP) is a development planning procedure aimed at producing long-range development plans, as well as middle term, and annual plans executed by local and central government. - Law No. 26/2007, the goals of NDP. - Amended Spatial Planning Act (Presidential decree No. 54/2008), establish metropolitan	Various development plans (the national physical plan) has been formulated under part III of the Town and Country Planning Act (TPCA, 1976) in order to guide the decision makers when processing planning permissions.	Legislation for urban planning: - Urban Planning Law 1975 defines 2 statutory plans 1) the general plan, 2) the specific plan for selected areas. - The building control act (1979) - Ministerial Regulation on land use planning and building control - Municipal bylaws

Variable	Indonesia	Malaysia	Thailand
	plans to cover the whole metropolitan area with 5 yearly revisions. - Law No. 23/1997 and No. 31/2009, regulate environmental management.		
National Plan	At the national level, the inputs for the deliberation of the development plan (DPD) are compiled by the minister. There the objectives of the Central Government Work Plan are examined, together with the proposed programs for local and provincial governments. The final agreed Central Government Work Plan becomes the guidance for the central government budget, which is being ratified by local and the Indonesian Legislative Assembly.	The National Physical Plan (NPP) is produced every five years by responding to Malaysia Plan, the country's five years Development Plan as well as other national policies such as the Industrial Master Plan, Vision 2020, and Agriculture Plan. The NPP is prepared by the Director of Town and Country Planning and approved by the National Physical Planning Council (NPPC).	The National Economic and Social Development Board (NESDB) under the Prime Minister's office is the "think tank" of the national government. Responsible for the national five-year plans and general policy formulation.
Public participation	Public participation in planning was guaranteed by law 32/1999. The municipal planning boards (BAPPEDA) can specify participation procedures. Formal procedures for consultation processes are also laid down by decrees for plan making.	Report of survey and draft structure plan is to be publicized. The affected public has the right to inspect the documents and make objection. Content of draft local plan should be made public. Any objection by the public will be considered by an inquiry or hearing committee of three persons appointed by State Planning Committee.	Public participation in the review and refinement of general plan through the public hearings is not particularly effective, especially not in smaller municipalities. However, there are so many traditional linkages between government and business representatives that their participation in any type of plan making and planning review can be taken for granted but that would take place through the informal channels of personal connections.
Sustainability	Environmental Impact Analysis (AMDAL) are imposed on certain large-scale undertakings, and the Ministry of Environment advocates environmental management and monitoring efforts (UKL-UPL).	The MHLG, through the Federal Department of Town and Country Planning (FDTPC) has, since the mid 1990's supported green urbanism through its policies and guidelines.	3 R's Program (reduce, re-use, recycle).
Implementation of Sustainability	The notion of sustainable development was introduced in Indonesia in Law No. 4/1982 on Principles on Environmental Management which	Currently in 2012, in conjunction with the World Town Planning Day celebration in November, the MHLG shall be acknowledging the best performing local authorities	Public environmental consciousness has grown beyond expectation; for example, in combining environmental measures such as garbage collection, with economic

Variable	Indonesia	Malaysia	Thailand
	dealt, inter alia, with conservation areas. In 2010 the government adopted a national action plan to reduce greenhouse gases – RAN-GRK, but implementation remains challenging.	in the implementation of the five green neighborhood initiatives, namely: - The provision of pedestrian walkways, - The provision of bicycle lanes, - The implementation of the rain water harvesting system, - The practice of waste composting, - The development of neighborhood garden. These categories are the five actions to be prioritized according to the Green Neighborhood Development Action Plan.	motives – enabling the poor communities to make a profit from local schemes of garbage collection, recycling, and manufacture of goods from waste materials.
Summary	The engagement of communities and private sector in the regional development process has inevitably changed the role of the government from doer of the development to regulator and facilitator, while the communities and private sector become doers and implementers. This development process has created a group of civil societies and concern stakeholders which actively involved in development planning and implementation.	Although the planning machinery and process seem to suggest rigidity in the system, in reality the actual process is more flexible and pragmatic. This is due to the fact that planning is done at all planning horizons and level and they present opportunities of revisions and incorporation of new strategies as well as to respond to new problems and opportunities as the arise. Malaysia's development effort is premised on a pro-business growth strategy, meaning that private sector is the country engine of growth, while the public sector plays the facilitating role.	The present stage of spatial planning in Thailand really is a conglomerate of partial achievements in several directions, and of slow progress in other respect. On the other hand, the legal framework offers possibilities or even requirements that are not met by practical application (the absence of specific plans according to the law). Investors do design and implement detailed plans for industrial estate or shopping centers, without using the tool of specific plans offered by the law.

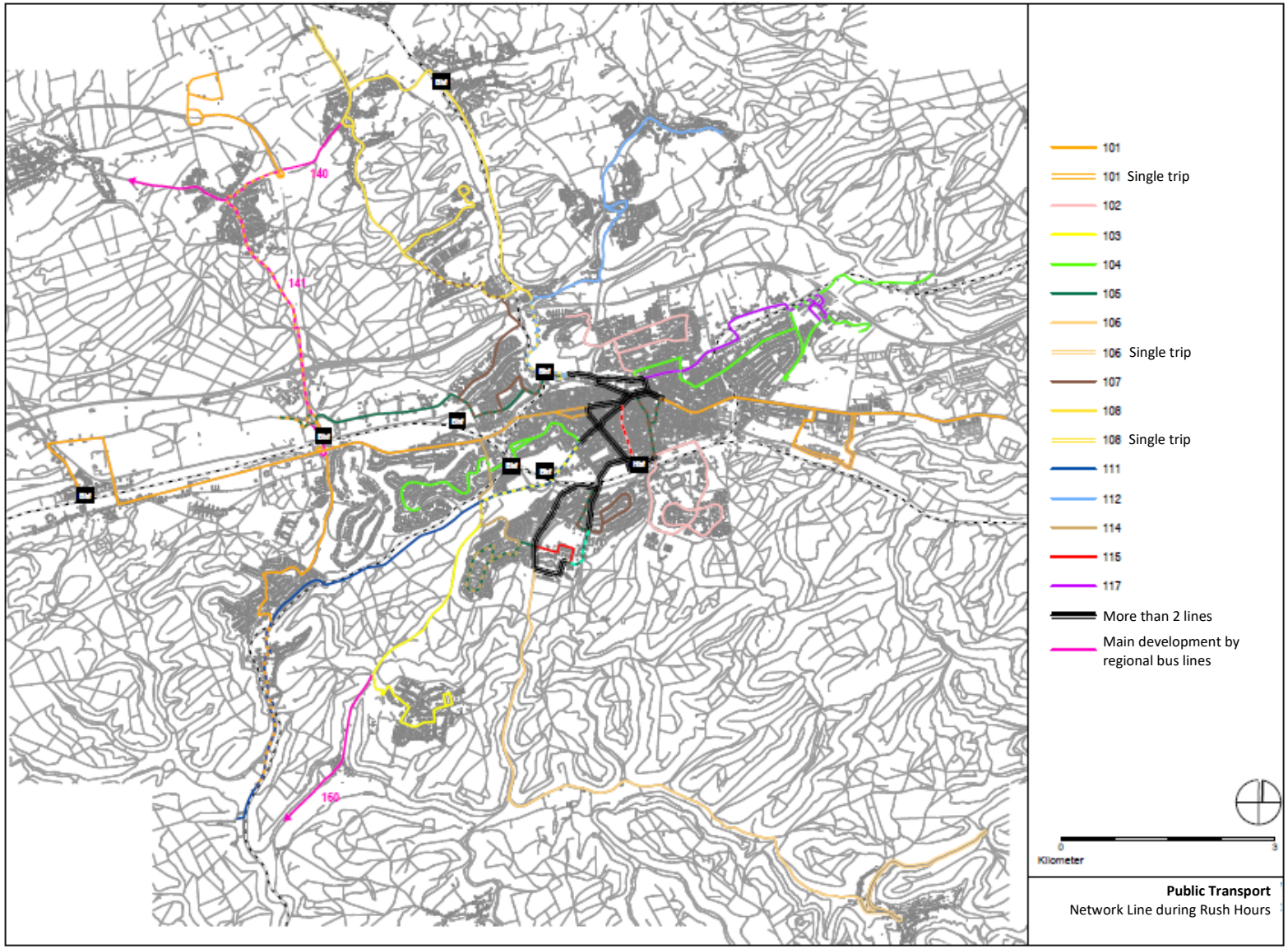
Appendix chapter 3

Map 1. Pedestrian – Main Pedestrian Axes



Source: Kaiserslautern Mobilitätsplan Klima+ 2030

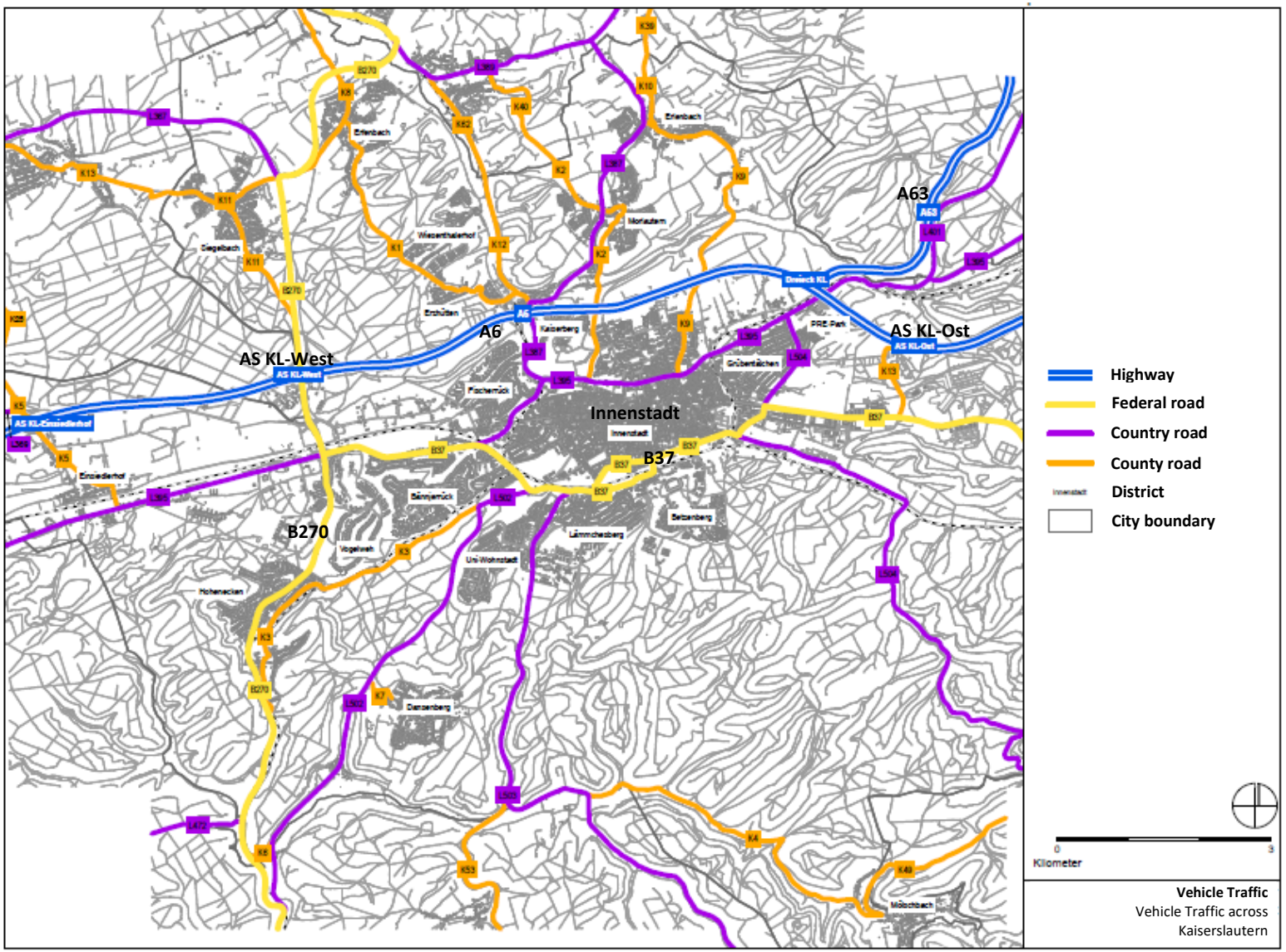
Map 2. Network line during rush hour



Source: Kaiserslautern Mobilitätsplan Klima+ 2030

Appendix chapter 3

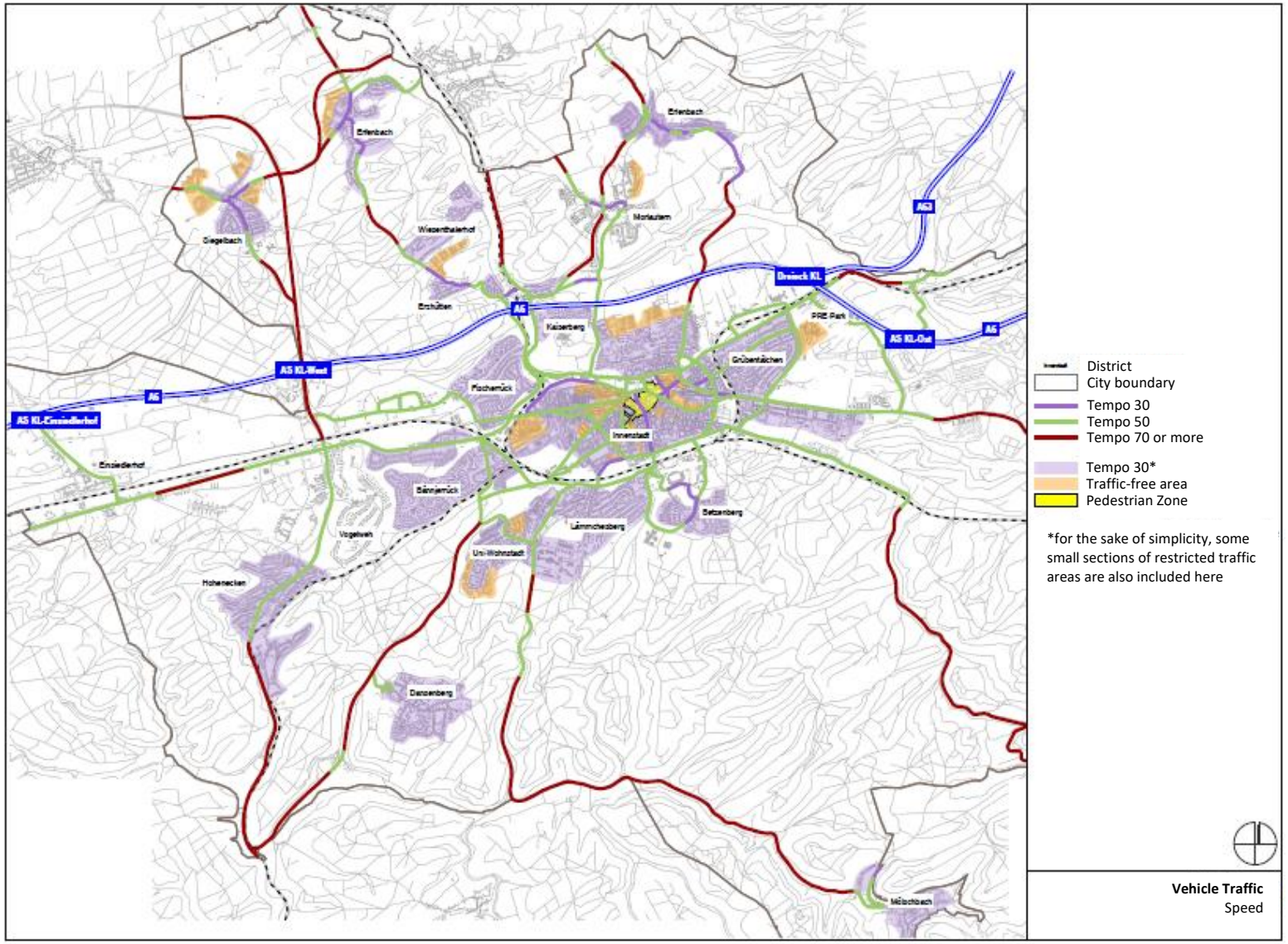
Map 3. Vehicle Traffic Across Kaiserslautern



Source: Kaiserslautern Mobilitätsplan Klima+ 2030

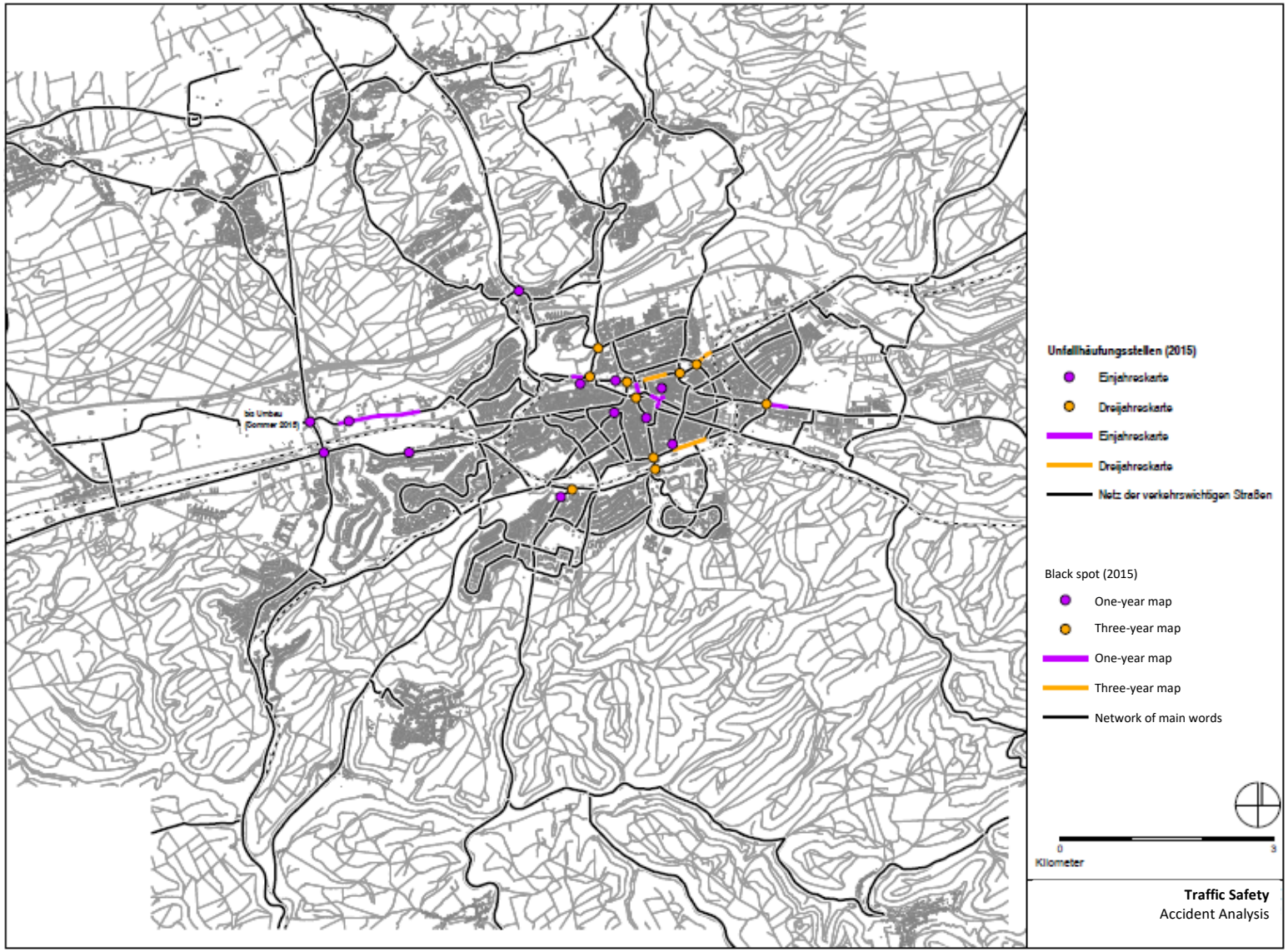
Appendix chapter 3

Map 4. Vehicle Traffic Speed



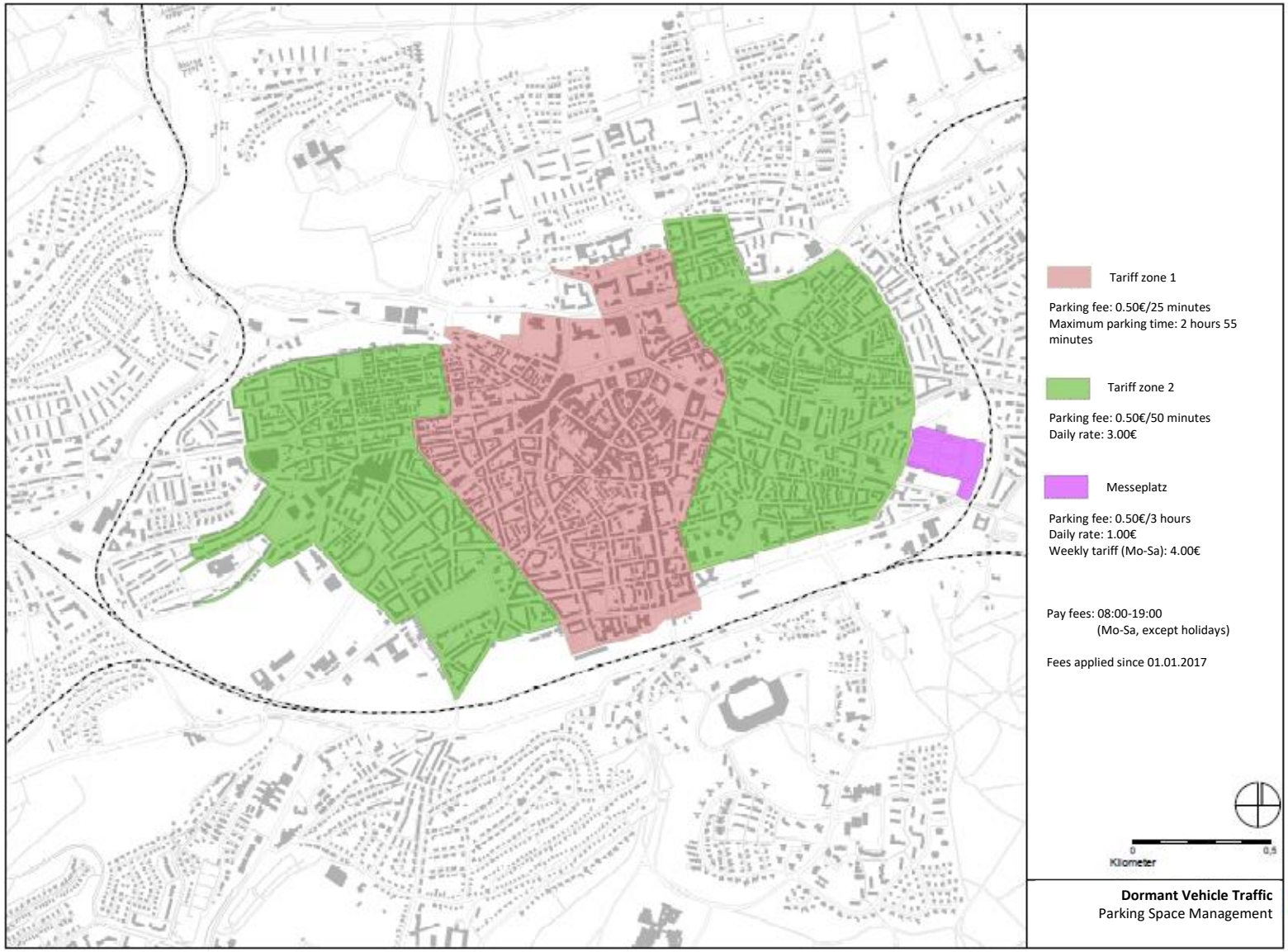
Source: Kaiserslautern Mobilitätsplan Klima+ 2030

Map 5. Traffic Safety - Accident Analysis



Source: Kaiserslautern Mobilitätsplan Klima+ 2030

Map 6. Parking Management - Tariff

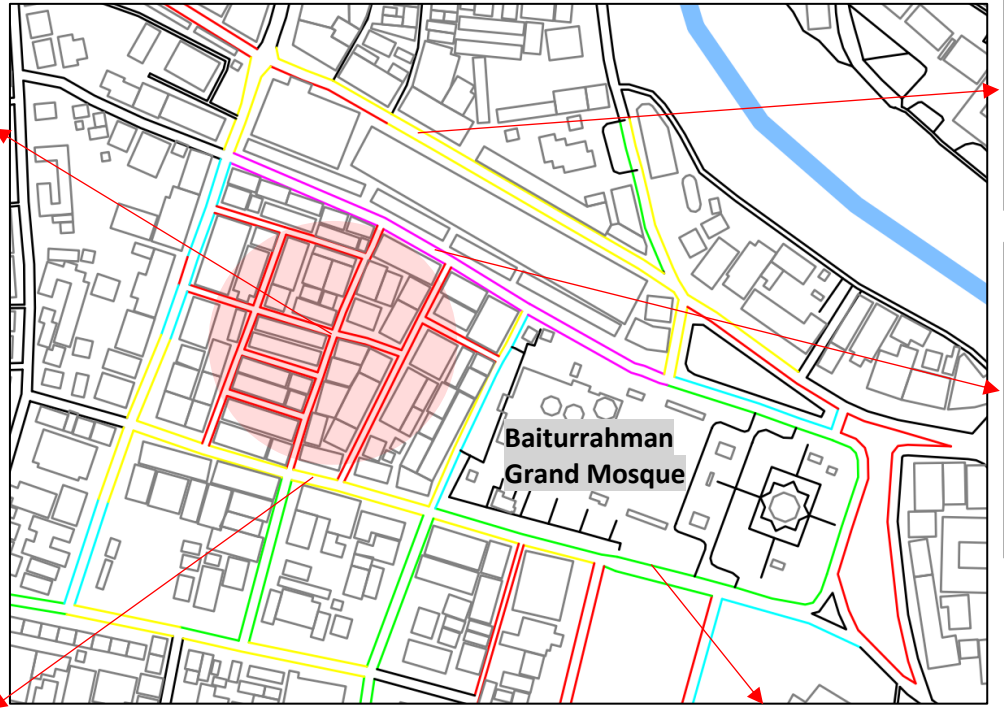


Source: Kaiserslautern Mobilitätsplan Klima+ 2030

In the area of Baiturrahman Grand Mosque, there is pedestrian line at the sides of the street, however not all parts are accessible. In the commercial area, especially in Pasar Aceh, the pedestrian line is blocked by the products from the traders. Meanwhile, in the other parts it is blocked by trees and other obstacles.

Pasar Aceh
There is no pedestrian lane inside Pasar Aceh. The street inside is a shared space type.

Diponegoro Street
The products of the shops "consume" space that disturbs pedestrian' access on the lane.



Tgk Chik Pante Kulu Street
This street is forbidden for cars to access. It is only for walker and motorcycle. During the day, the street is function as parking place.

Mohammad Jam Street
The access on pedestrian lane in both side of the street is blocked by the products of traders and motorcycle.

Side of the Grand Mosque
The Baiturrahman Grand Mosque is surrounded by good pedestrian lane condition.

The Area of Grand Mosque and Pasar Aceh

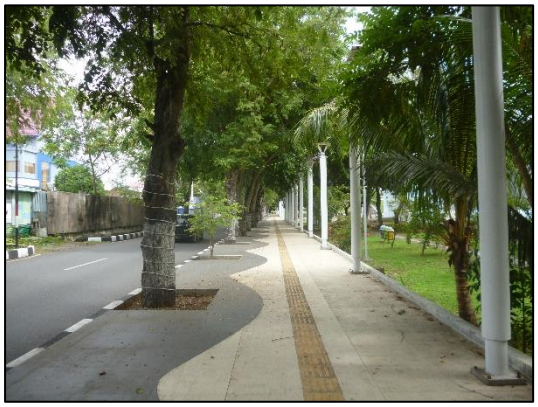
Imam Bonjol Street (west)
The pedestrian lane on the side of Blang Padang is wide and shaded due to the trees. The lane on the other side is also good and neat.

South side of Blang Padang
The pedestrian lane is surrounded by greenery.

Cemara Street
There is no formal pedestrian lane on this street. The street is quite desolate and function as "back-side area" of the buildings on the neighborhood.

Imam Bonjol Street (north)
The pedestrian lane is broken on some parts. Besides that, the accessibility is also disturbed by trees planted on the lane and coffee shop's activity.

The Area of Blang Padang

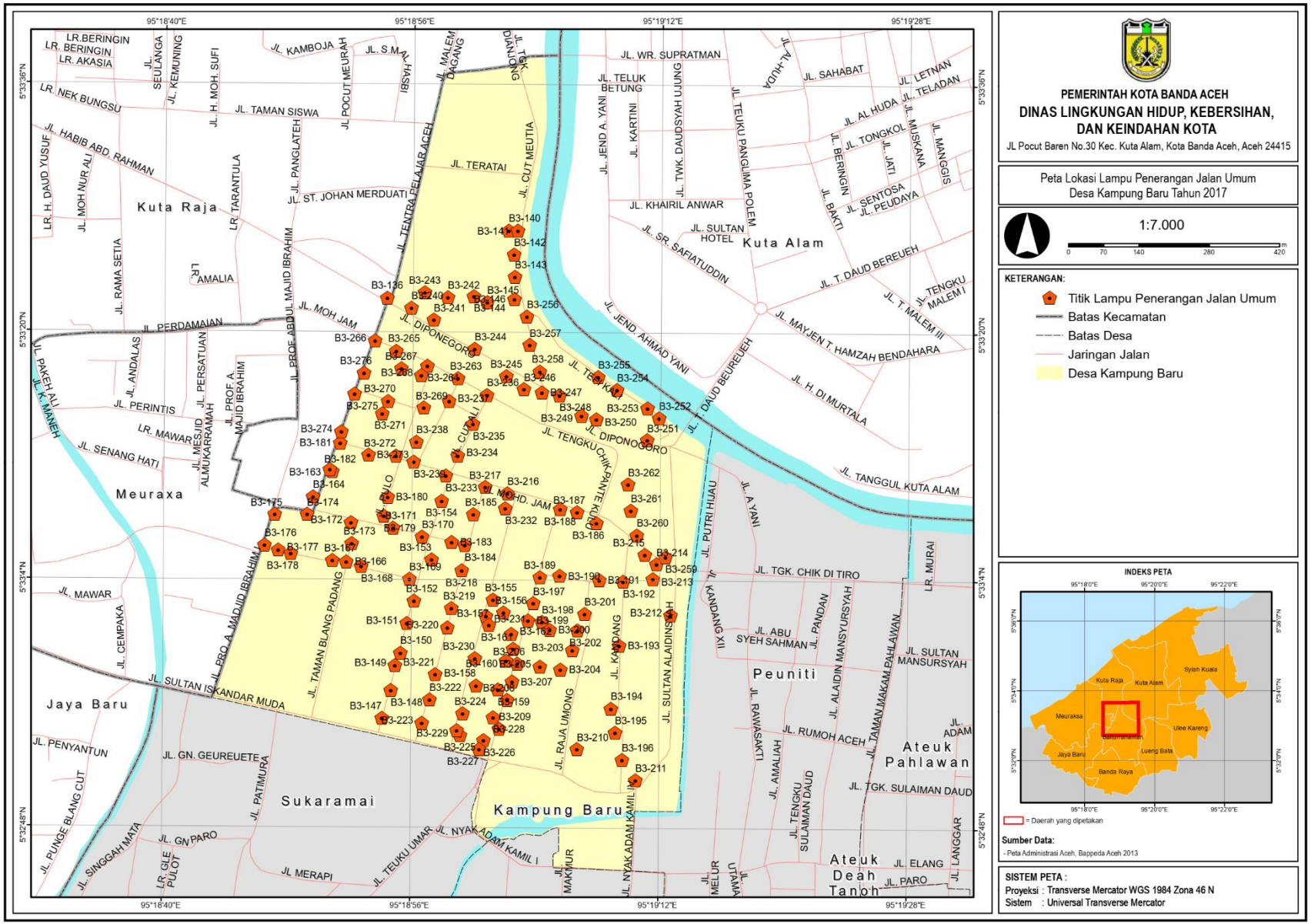


Tengku Abdullah Street
The pedestrian lane that surrounds Taman Sari is wide and shaded due to the trees. Its pavement is also decorated with different colors. In contrast, the pavement of the lane on the other side is broken and looks not maintained well.

Tengku Abu Lam U Street
The pedestrian on this side is good enough and accessible.

The Area of Taman Sari

Appendix chapter 4

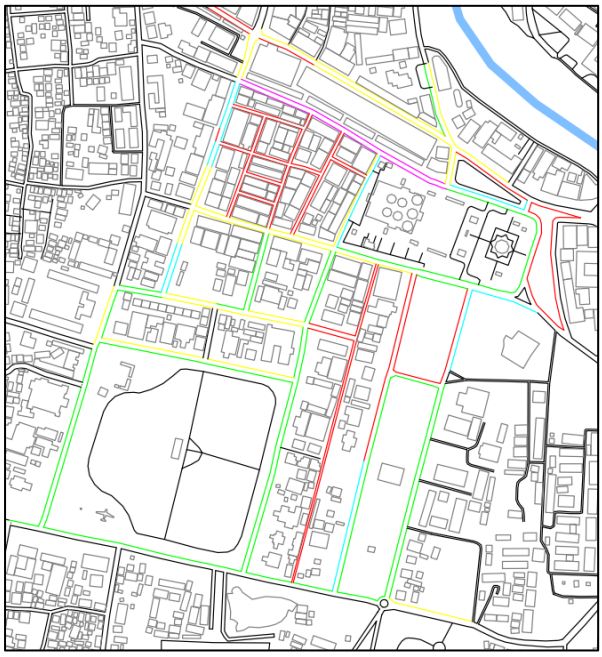


xxx

Appendix chapter 4

Walking path modal conflict

- Obstruction along the pedestrian lane.



c. Trees

d. Careless parking

a. Physical damage

b. Commercial activity

e. Flower board for special events

Sample of questionnaire

Questioner ini ditujukan bagi pejalan kaki (orang yang berdiri/melalui trotoar) secara random.
This questioner is randomly addressed to pedestrian (person who is standing/walking) in pedestrian line.

1.	Tempat apa yang paling sering anda kunjungi di kawasan ini? (tujuan utama) *Which destination do you visit mostly in this area? (main destination)*	Taman Sari
2.	Seberapa sering? *How often?*	☐ Setiap hari | *Every day* ☐ 2-4 kali seminggu | *2-4 times per week* ☐ Sekali seminggu | *Every week* ☐ Jawaban lain | *Others* Tidak sering (not often)
3.	Jam berapa? (gunakan format 24 jam) *What time? (please use 24 h format)*	04:00 wib
4.	Naik apa anda ke sana? (Boleh lebih dari 1 jawaban) *How do you go there? (Multiple answers are possible)* Keterangan tambahan (kalau ada): *Additional information (if possible)* _____	☑ Bus Transkotaradja & labi-labi | *Public transportation* ☐ Mobil | *Car* ☐ Sepeda motor | *Motorcycle* ☐ Berjalan kaki | *Walking* ☐ Bus/labi-labi dan berjalan kaki | *Public transportation and/then walking*
5.	Selain tempat tersebut, kemana lagi anda pergi di kawasan ini? (boleh lebih dari 1 jawaban) *What is your second destination? (multiple answers are possible)*	–
6.	Naik apa anda bergerak di sekitar sini? *How do you move from one to other places in the city center?*	☐ Mobil | *Car* ☐ Sepeda motor | *Motorcycle* ☑ Berjalan kaki | *Walking*
7.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> adalah **bagian** dari jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **part** of the answer for question number 6.* Kenapa anda berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you choose to walk? (multiple answers are possible)*	☐ Murah | *Cheap* ☑ Dekat | *Nearby* : _____ meters ☐ Susah cari parkir | *Hard to find parking place* ☐ Mahal bayar parkir berulang kali | *Expensive to pay multiple parking fee*
8.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> **bukan** salah satu jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **not** part of the answer for question number 6.* Kenapa anda tidak mau berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you reject to walk? (multiple answers are possible)*	☐ Kondisi trotoar | *Condition of pedestrian line* : _____ ☐ Malas, capek | *Lazy, exhausting* ☐ polusi | *pollution* ☐ Cuaca: panas, hujan | *Weather: hot sunshine, rain* ☐ Lainnya | *others* _____
9.	Kalau kondisi trotoar dibuat menjadi lebih lebar dan nyaman, apakah anda mau berjalan kaki di sekitar sini? *Do you willing to walk if the pedestrian lines are wider and more comfortable?*	☑ Ya, tentu saja | *Yes, indeed* ☐ Mungkin | *Perhaps* ☐ Tidak | *No*

	Umur *Age*	13 Years
	Jenis kelamin *Sex*	☑ Laki-laki | *Male* ☐ Perempuan | *Female*
	Tempat tinggal *Place of living*	Kaju
	Pekerjaan *Occupation*	Murid SMP (student)
	Jumlah kendaraan yang dimiliki oleh keluarga anda *Number of personal vehicles*	☐ Mobil | *Car* 1 Unit/s ☐ Sepeda Motor | *Motorcycle* 1 Unit/s ☐ Sepeda | *Bicycle* 2 Unit/s ☐ Lainnya | *Others* _____ Unit/s

Day/date of interview : Wednesday / 10 mai 2017

Time of interview : 14:09 WIB

Questioner | Page 1
Aktivitas Wisata dan Komersial
Commercial and Tourist Activities

Questioner ini ditujukan bagi pengunjung Mesjid Raya Baiturrahman secara random.
This questioner is randomly addressed to the visitors of Baiturrahman Grand Mosque.

1.	Tujuan datang ke tempat ini. (Boleh lebih dari 1 jawaban) *Purpose of visiting this open space. (Multiple answers are possible)*	☐ Shalat | *Worship* ☐ Belajar | *Study and learn* ☐ Interaksi sosial, bertemu teman | *social interaction, friends meeting* ☐ Acara khusus/perayaan | special events ☑ Lainnya | *Others* Belanja (shopping)
2.	Seberapa sering? *How often?*	☐ 5 kali sehari semalam | *5 times worship-time* ☐ Sehari sekali | *Once a day* ☐ Hari jumat saja | *Only on Friday* ☑ Jawaban lain | *Others* Seminggu 1 (once a week)
3.	Jam berapa? (gunakan format 24 jam) *What time? (please use 24 h format)*	10.00
4.	Apa yang anda sukai dari tempat ini? (boleh lebih dari 1 jawaban) *What do you like of this place? (multiple answers are possible)*	☐ Arsitektur bangunannya | *Architecture style* ☐ Tempat belajar agama | *Place to learn religion* ☐ Kenyamanan interior dan fasilitasnya | *The comfort of interior and its worship's facilities* ☐ Suasananya | *The atmosphere* ☑ Lainnya | *Others* Suka belanja (she like shopping)
5.	Naik apa anda ke sini? (Boleh lebih dari 1 jawaban) *How do you come here? (Multiple answers are possible)* Keterangan tambahan (kalau ada): *Additional information (if possible)* _____	☐ Bus Transkotaraja & labi-labi | *Public transportation* ☐ Mobil | *Car* ☑ Sepeda motor | *Motorcycle* ☐ Berjalan kaki | *Walking* ☐ Bus/labi-labi dan berjalan kaki | *Public transportation and walking*
6.	Pertanyaan ini diajukan **jika** pengunjung datang dengan kendaraan pribadi. *This question is asked, **if** the visitors come by their own vehicle.* Apakah anda kesulitan menemukan tempat parkir? Do you find difficulty in finding place to park your vehicle?	☐ Ya | *Yes* ☑ Tidak | *No*
7.	Biasanya, setelah dari sini, apakah anda mengunjungi lokasi lain di sekitar sini? *After finishing activities here, do you usually visit other place nearby?*	☐ Ya, tentu saja | *Yes, indeed* Ke | *To* _____ ☐ Kadang-kadang | *Sometimes* ☑ Tidak | *No*
8.	Naik apa anda ke sana? (tempat berikutnya yang akan dikunjungi) *How do you go there? (secondary destinations)*	☐ Mobil | *Car* ☑ Sepeda motor | *Motorcycle* ☐ Berjalan kaki | *Walking*

9.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> adalah **bagian** dari jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **part** of the answer for question number 6.* Kenapa anda berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you choose to walk? (multiple answers are possible)*	☐ Murah | *Cheap* ☐ Dekat | *Nearby* : _____ meters ☐ Susah cari parkir | *Hard to find parking place* ☐ Mahal bayar parkir berulang kali | *Expensive to pay multiple parking fee*
10.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> **bukan** salah satu jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **not** part of the answer for question number 6.* Kenapa anda tidak mau berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you reject to walk? (multiple answers are possible)*	☐ Kondisi trotoar | *Condition of pedestrian line* : _____ ☐ Malas, capek | *Lazy, exhausting* ☐ polusi | *pollution* ☐ Cuaca: panas, hujan | *Weather: hot sunshine, rain* ☐ Lainnya | *others* _____

	Umur *Age*	25 Years
	Jenis kelamin *Sex*	☐ Laki-laki | *Male* ☑ Perempuan | *Female*
	Tempat tinggal *Place of living*	Ule Kareng
	Pekerjaan *Occupation*	Mahasiswa.
	Jumlah kendaraan yang dimiliki oleh keluarga anda *Number of personal vehicles*	☑ Mobil | *Car* 2 Unit/s ☑ Sepeda Motor | *Motorcycle* 4 Unit/s ☑ Sepeda | *Bicycle* 1 Unit/s ☐ Lainnya | *Others* _____ Unit/s

Day/date of interview : Kamis / 11-05-~~2016~~ 2017

Time of interview : 13.07

Lokasi : Pasar Aceh.

Putri Puspa Sari

3

Questioner | Page 1
Ruang Terbuka dan Ruang Terbuka Hijau
Open and Green Open Space

Questioner ini ditujukan bagi pengunjung Mesjid Raya Baiturrahman secara random.
This questioner is randomly addressed to the visitors of Baiturrahman Grand Mosque.

Lokasi | *Location*: ☐ Baiturrahman Grand Mosque ☑ Lainnya | *Other*: Trains station

1.	Tujuan datang ke tempat ini. (Boleh lebih dari 1 jawaban) *Purpose of visiting this open space. (Multiple answers are possible)*	☐ Shalat	*Worship* ☐ Belajar	*Study and learn* ☐ Interaksi sosial, bertemu teman	*social interaction, friends meeting* ☐ Acara khusus/perayaan	special events ☑ Lainnya	*Others* Jalan-jalan keluarga
2.	Seberapa sering? *How often?*	☐ 5 kali sehari semalam	*5 times worship-time* ☐ Sehari sekali	*Once a day* ☐ Hari jumat saja	*Only on Friday* ☑ Jawaban lain	*Others* 1 bulan 4 atau 5 kali
3.	Jam berapa? (gunakan format 24 jam) *What time? (please use 24 h format)*	11:30
4.	Apa yang anda sukai dari tempat ini? (boleh lebih dari 1 jawaban) *What do you like of this place? (multiple answers are possible)*	☐ Arsitektur bangunannya	*Architecture style* ☐ Tempat belajar agama	*Place to learn religion* ☑ Kenyamanan interior dan fasilitasnya	*The comfort of interior and its worship's facilities* ☑ Suasananya	*The atmosphere* ☑ Lainnya	*Others* Ada tempat makan bakso
5.	Naik apa anda ke sini? (Boleh lebih dari 1 jawaban) *How do you come here? (Multiple answers are possible)* Keterangan tambahan (kalau ada): *Additional information (if possible)* _____	☐ Bus Transkotaraja & labi-labi	*Public transportation* ☑ Mobil	*Car* ☐ Sepeda motor	*Motorcycle* ☐ Berjalan kaki	*Walking* ☐ Bus/labi-labi dan berjalan kaki	*Public transportation and walking*
6.	Pertanyaan ini diajukan **jika** pengunjung datang dengan kendaraan pribadi. *This question is asked, if the visitors come by their own vehicle.* Apakah anda kesulitan menemukan tempat parkir? Do you find difficulty in finding place to park your vehicle?	☐ Ya	*Yes* ☑ Tidak	*No*
7.	Biasanya, setelah dari sini, apakah anda mengunjungi lokasi lain di sekitar sini? *After finishing activities here, do you usually visit other place nearby?*	☐ Ya, tentu saja	*Yes, indeed* Ke	*To* _____ ☑ Kadang-kadang	*Sometimes* ☐ Tidak	*No*
8.	Naik apa anda ke sana? (tempat berikutnya yang akan dikunjungi)	☑ Mobil	*Car* ☐ Sepeda motor	*Motorcycle*

	How do you go there? (secondary destinations)	☐ Berjalan kaki | *Walking*
9.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> adalah **bagian** dari jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **part** of the answer for question number 6.* Kenapa anda berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you choose to walk? (multiple answers are possible)*	☐ Murah | *Cheap* ☐ Dekat | *Nearby* : _____ meters ☐ Susah cari parkir | *Hard to find parking place* ☐ Mahal bayar parkir berulang kali | *Expensive to pay multiple parking fee*
10.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> **bukan** salah satu jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **not** part of the answer for question number 6.* Kenapa anda tidak mau berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you reject to walk? (multiple answers are possible)*	☐ Kondisi trotoar | *Condition of pedestrian line* : _____ ☑ Malas, capek | *Lazy, exhausting* ☑ polusi | *pollution* ☑ Cuaca: panas, hujan | *Weather: hot sunshine, rain* ☑ Lainnya | *others* jauh

	Umur *Age*	47 Years
	Jenis kelamin *Sex*	☑ Laki-laki | *Male* ☐ Perempuan | *Female*
	Tempat tinggal *Place of living*	Kutarang
	Pekerjaan *Occupation*	PNS
	Jumlah kendaraan yang dimiliki oleh keluarga anda *Number of personal vehicles*	☑ Mobil | *Car* 1 Unit/s ☑ Sepeda Motor | *Motorcycle* 4 Unit/s ☑ Sepeda | *Bicycle* 2 Unit/s ☐ Lainnya | *Others* _____ Unit/s

Day/date of interview : Kamis / 11 Mei 2017

Time of interview : 11 : 55

TASYA HUMAIRA

25

Questioner | Page 1
Ruang Terbuka dan Ruang Terbuka Hijau
Open and Green Open Space

Questioner ini ditujukan bagi pengunjung ruang terbuka dan ruang terbuka hijau secara random.
This questioner is randomly addressed to the visitors of open- and green open space.

Lokasi | *Location*: ☑ Blang padang ☐ Taman Sari ☐ Lainnya | *Other*: _____

1.	Tujuan datang ke tempat ini. (Boleh lebih dari 1 jawaban) *Purpose of visiting this open space. (Multiple answers are possible)*	☐ Olahraga	*Sport* 80%
		☑ Bermain, bersantai, wisata kuliner	*Play, relax, culinary tour* 75%
		☐ Interaksi sosial, bertemu teman	*social interaction, friends meeting* 0%
		☐ Acara khusus/perayaan	special events 0%
		☐ Lainnya	*Others* 5%
2.	Seberapa sering? *How often?*	☐ Setiap hari	*Every day*
		☐ 2-4 kali seminggu	*2-4 times per week*
		☐ Sekali seminggu	*Every week*
		☑ Jawaban lain	*Others* 0%
3.	Jam berapa? (gunakan format 24 jam) *What time? (please use 24 h format)*		
4.	Apa yang anda sukai dari tempat ini? (boleh lebih dari 1 jawaban) *What do you like of this place? (multiple answers are possible)*	☑ Rumput dan pepohonan	*Grass and trees*
		☑ Pedagang makanan	*Food traders*
		☐ Fasilitas	*Facilities*
		☑ Acara/perayaan	*The events*
		☐ Bangunan sekitar	*Buildings enclose this open space*
		☑ Suasananya	*The atmosphere*
		☐ Lainnya	*Others*
5.	Naik apa anda ke sini? (Boleh lebih dari 1 jawaban) *How do you come here? (Multiple answers are possible)* Keterangan tambahan (kalau ada): *Additional information (if possible)* _____	☐ Bus Transkotaraja & labi-labi	*Public transportation*
		☐ Mobil	*Car*
		☑ Sepeda motor	*Motorcycle*
		☐ Berjalan kaki	*Walking*
		☐ Bus/labi-labi dan berjalan kaki	*Public transportation and walking*
6.	Pertanyaan ini diajukan **jika** pengunjung datang dengan kendaraan pribadi. *This question is asked, if the visitors come by their own vehicle.* Apakah anda kesulitan menemukan tempat parkir? Do you find difficulty in finding place to park your vehicle?	☑ Ya	*Yes*
		☐ Tidak	*No*
7.	Biasanya, setelah dari sini, apakah anda mengunjungi lokasi lain di sekitar sini? *After finishing activities here, do you usually visit other place nearby?*	☐ Ya, tentu saja	*Yes, indeed*
		☑ Kadang-kadang	*Sometimes*
		☐ Tidak	*No*

8.	Naik apa anda ke sana? (tempat berikutnya yang akan dikunjungi) *How do you go there? (secondary destinations)*	☐ Mobil | *Car* ☐ Sepeda motor | *Motorcycle* ☑ Berjalan kaki | *Walking*
9.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> adalah **bagian** dari jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **part** of the answer for question number 6.* Kenapa anda berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you choose to walk? (multiple answers are possible)*	☑ Murah | *Cheap* ☐ Dekat | *Nearby* : _____ meters ☐ Susah cari parkir | *Hard to find parking place* ☐ Mahal bayar parkir berulang kali | *Expensive to pay multiple parking fee*
10.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> **bukan** salah satu jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **not** part of the answer for question number 6.* Kenapa anda tidak mau berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you reject to walk? (multiple answers are possible)*	☐ Kondisi trotoar | *Condition of pedestrian line* : _____ ☐ Malas, capek | *Lazy, exhausting* ☑ polusi | *pollution* ☑ Cuaca: panas, hujan | *Weather: hot sunshine, rain* ☐ Lainnya | *others* _____

	Umur *Age*	15 Years
	Jenis kelamin *Sex*	☐ Laki-laki | *Male* ☑ Perempuan | *Female*
	Tempat tinggal *Place of living*	
	Pekerjaan *Occupation*	pelajar
	Jumlah kendaraan yang dimiliki oleh keluarga anda *Number of personal vehicles*	☐ Mobil | *Car* 3 Unit/s ☑ Sepeda Motor | *Motorcycle* _____ Unit/s ☐ Sepeda | *Bicycle* _____ Unit/s ☐ Lainnya | *Others* _____ Unit/s

Day/date of interview : 11 Mei / 2017 / kamis

Time of interview : 11.30

3

Questioner | Page 1
Pejalan kaki di pusat kota lama Banda Aceh
Pedestrian in the old-city center of Banda Aceh

Questioner ini ditujukan bagi pejalan kaki (orang yang berdiri/melalui trotoar) secara random.
This questioner is randomly addressed to pedestrian (person who is standing/walking) in pedestrian lane.

1.	Tempat apa yang paling sering anda kunjungi di kawasan ini? (tujuan utama) *Which destination do you visit mostly in this area? (main destination)*	Mesjid Raya
2.	Seberapa sering? *How often?*	☐ Setiap hari | *Every day* ☑ 2-4 kali seminggu | *2-4 times per week* ☐ Sekali seminggu | *Every week* ☐ Jawaban lain | *Others* _____
3.	Jam berapa? (gunakan format 24 jam) *What time? (please use 24 h format)*	13.00 WIB
4.	Naik apa anda ke sana? (Boleh lebih dari 1 jawaban) *How do you go there? (Multiple answers are possible)* Keterangan tambahan (kalau ada): *Additional information (if possible)* _____	☑ Bus Transkotaradja | *City bus* ☐ Labi-labi | *Other public transportation* ☐ Becak/taksi/ojek | *pedicab/taxi/taxibike* ☐ Mobil | *Car* ☑ Sepeda motor | *Motorcycle* ☐ Berjalan kaki | *Walking* ☐ Jawaban lain | *Other* _____
5.	Selain tempat tersebut, kemana lagi anda pergi di kawasan ini? (boleh lebih dari 1 jawaban) *What is your second destination? (multiple answers are possible)*	Taman Sari
6.	Naik apa anda bergerak di sekitar sini? *How do you move from one to other places in the city center?*	☐ Labi-labi | *Other public transportation* ☐ Becak/taksi/ojek | *pedicab/taxi/taxibike* ☐ Mobil | *Car* ☐ Sepeda motor | *Motorcycle* ☑ Berjalan kaki | *Walking* ☐ Jawaban lain | *Other* _____
7.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> adalah bagian dari jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **part** of the answer for question number 6.* Kenapa anda berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you choose to walk? (multiple answers are possible)*	☐ Murah | *Cheap* ☑ Dekat | *Nearby:* _____ meters ☐ Susah cari parkir | *Hard to find parking place* ☐ Mahal bayar parkir berulang kali | *Expensive to pay multiple parking fee* ☐ Jawaban lain | Other reason _____

8.	Pertanyaan ini diajukan bila <u>berjalan kaki</u> **bukan** salah satu jawaban pertanyaan nomor 6. *This question is asked, if <u>walking</u> is **not** part of the answer for question number 6.* Kenapa anda tidak mau berjalan kaki? (boleh lebih dari 1 jawaban) *Why do you reject to walk? (multiple answers are possible)*	☐ Kondisi trotoar | *Condition of pedestrian line:* _____ ☐ Malas, capek | *Lazy, exhausting* ☐ polusi | *pollution* ☐ Cuaca: panas, hujan | *Weather: hot sunshine, rain* ☐ Lainnya | *others* _____
9.	Kalau kondisi trotoar dibuat menjadi lebih lebar dan nyaman, apakah anda mau berjalan kaki di sekitar sini? *Do you willing to walk if the pedestrian lines are wider and more comfortable?*	☑ Ya, tentu saja | *Yes, indeed* ☐ Mungkin | *Perhaps* ☐ Tidak | *No*

	Umur *Age*	24 tahun/*years*
	Jenis kelamin *Sex*	☐ Laki-laki | *Male* ☑ Perempuan | *Female*
	Tempat tinggal *Place of living*	Merduati, B. Aceh
	Pekerjaan *Occupation*	Mahasswa
	Jumlah kendaraan yang dimiliki oleh keluarga anda *Number of personal vehicles*	☑ Mobil | *Car* 1 Unit/s ☑ Sepeda Motor | *Motorcycle* 1 Unit/s ☐ Sepeda | *Bicycle* _____ Unit/s ☐ Lainnya | *Others* _____ Unit/s

Day/date of interview : Kamis / 20.06.2019

Time of interview : 09.35 WIB

Location : Taman Sari

Europass Curriculum Vitae

Personal information

First name(s) / Surname(s)	**Mufti Ali / Nasution**
E-mail	mufti.ali.nst@gmail.com
Nationality	Indonesian

Work experience

Dates	September 2012 – February 2016
Occupation or position held	Lecturer in Architecture Department In Universitas Muhammadiyah Aceh, Indonesia
Dates	January 2012 – December 2014
Occupation or position held	Technical Assistance Staff of the Mayor of Sabang Municipality, Indonesia; in the field of spatial planning (Supported by Centre for International Migration and Development (CIM) Germany), Sabang, Indonesia
Dates	November 2007 – December 2008
Occupation or position held	Senior Staff (April 2008 – December 2008) Technical Assistant (November 2007 – Maret 2008) In Directorate of Spatial Planning, Reconstruction and Rehabilitation Agency of Aceh and Nias, Indonesia
Dates	July – September 2007
Occupation or position held	AutoCAD Operator in PT. Reka Desindo Mandiri, Aceh, Indonesia
Dates	September 2006 – May 2007
Occupation or position held	Junior Planner for Village Spatial Planning projects, in Hassal and Associates International, Aceh, Indonesia

Education

Dates	April 2016 – July 2022
Title of qualification awarded	Doctoral Student
Principal subject skills covered	Pedestrian system development, urban mobility
Name and type of organization providing education	Department of Înternational Planning System, Technische Universität Kaiserslautern, Germany
Level in national or international classification	International program
Dates	October 2009 - July 2011
Title of qualification awarded	Master of Architecture
Principal subject skills covered	Architecture and planning; rural and urban development
Name and type of organisation providing education	Hochschule Anhalt (FH), Dessau, Germany
Level in national or international classification	International program
Dates	September 2000 - July 2006
Title	Bachelor of Engineering (Architecture)
Name and type of organisation providing training	Universitas Sumatera Utara, Medan, Indonesia
Level in national or international classification	National