JANUARY 2017

BORGARLÍNA - HIGH CLASS PUBLIC TRANSPORT IN REYKJAVIK CAPITAL AREA

PROGRESS REPORT

COWI

ADRESS COWI A/S
Visionsvej 53
9000 Aalborg

PHONE +45 56 40 00 00
FAX +45 56 40 99 99
WWW cowi.dk

JANUARY 2017

BORGARLÍNA - HIGH CLASS PUBLIC TRANSPORT IN REYKJAVIK CAPITAL AREA

PROGRESS REPORT

PROJECT NO.	DOCUMENT NO.
A087187	A087187-2

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
2.0	25. January 2017	Progress Report	MIRI	HVPE/Lilja	BBJA

CONTENTS

1	Introduction	7
1.1	Background	7
1.2	Purpose	10
1.3	Process	10
2	The current transport situation in the Reykjavik Capital Area	13
2.1	Population trends	14
2.2	Tourism trend	14
2.3	Car ownership	15
2.4	Modal split	16
2.5	Traffic situation	18
2.6	Reasons for choice of transport mode	19
2.7	Public transport system	22
2.8	Image problems	27
3	Vision for public transport	28
3.1	Development of the Capital Area	28
3.2	The vision for public transport	29
3.3	Zero-carbon vision for Reykjavik City	32
4	Corridor description and ideas	33
4.1	The process so far	33
4.2	Workshop input	37
4.3	COWI ideas	40
5	Strategy for Borgarlína - service vision and planning principles	48
5.1	Service vision and planning principles	49
5.2	Supporting measures and urban development measures	57

1 Introduction

The interest for improving the public transport system in the Reykjavik Capital Area has increased over the last years. The Regional Plan for the area is therefore aiming for a high class public transport system called Borgarlína. The goal is to develop a solid backbone of public transport in the main corridors in the Capital Area. The concept will be either bus rapid transit (BRT) or a light rail transit (LRT) – in both cases ensuring a high frequent, fast and reliable transport option.

This report aims at giving a brief view of the current traffic situation and gather the work done until now with the corridors for high class public transport. Furthermore, COWI brings a new perspective into the work done so far and address relevant corridors that maximizes the number of passenger without looking at the limitations of the given corridors.

The report ends with a brief introduction into service vision and planning principles that should be set up for the *Borgarlína* to ensure a successful high class public transport system.

1.1 Background

The Reykjavik Capital Area is the only metropolitan area in Iceland with 215.000 inhabitants or 2/3 of the total population. The Capital Area consists of seven municipalities that work together through the association of the municipalities in Greater Reykjavik (SSH) which although is not a legal authority.

The planning setup

In general the Icelandic planning system consists of two-levels. The municipalities are the key actor in detailed planning through the municipality plans, while the state plays an important role in certain overall planning matters, such as transportation, nature conservation and large infrastructure projects.

On regional level however, it is obligatory, since 2010, to have a regional development plan in the Capital Area, adding an extra level to the planning hierarchy; strategic planning then becomes a three-level hierarchy:

- National planning strategy
- Regional development plan
- Municipal plans

The regional development plan guides the way

The new Regional development plan was prepared by the regional association and enacted by the municipalities of the Capital Area in 2015.

The background was increased population in the Capital Area combined with urban sprawl and increased car ridership, which leads to traffic problems – both today and more so when looking 25 years ahead. The Regional development plan is meant to handle these challenges through a strategic regional plan to ensure that the development of each municipality works towards the same goal.

Hence the plan sets the frame for a different planning approach setting up an overall strategy ensuring coordination between municipalities. The plan contains a mutual vision, a range of topic related goals and set of actions.

The main emphasis is on controlling growth and on establishing a new high quality public transport system. Strict urban boundaries set a clear division between urban and rural areas. The main focus is on slowing down the urban sprawl and push for higher density in defined centers. That requires strict integration of land use and transportation.

The Regional Development Plan is hence the background for developing *Borgarlína.* The process started in 2011 with a workshop where the key staff in all 7 municipalities discussed the main challenges the region was facing, followed by a planning theme group which set the main focus and drafted an agreement. This was confirmed in august 2012 where the municipalities signed an agreement about a new Regional Development Plan - the agreement among others is aiming for increased public transport as a key aspect.

During the process three scenarios were assessed (see Figure 1) of which the "*Transit Oriented Development*" was recommended. This meant acceptance to change the course in transport planning in the Region to increase the share of public transport and walking.

'Business as usual'	Transit oriented development	Total densification
The level of densification 40%	The level of densification 85%	The level of densification 100%
Same transportation mode as today.	New public transportation system.	New public transportation system.
76% on private cars 4% on public transportation 19% on foot	58% on private cars 12% on public transportation 30% on foot	50% on private cars 20% on public transportation 30% on foot

Figure 1 Scenarios for the work progress and approval.

In June 2015, the Regional Development Plan was enacted by all seven municipalities and the concept of *Borgarlína* as the core of the new Regional Development Plan was introduced and presented by the board of SSH to be the main project of „sóknaráætlun[1] "2015-19.

SSH and the Road Administration signed an agreement at the same time as the Regional Plan was approved. The collaboration in the *Borgarlína*-project preparing phase is stated where the municipalities and the state will fix the corridors in plans and prepare new *Borgarlína* company.

A delegation from the municipalities and the state went on a study trip to Copenhagen, Strasbourg and Vancouver in September 2016 to learn about successful cooperation in high-class public-transport.

In December 2016, an important step was taken towards *Borgarlína* on the SSH general meeting where all the municipalities signed an agreement on finishing necessary preparation regarding planning and cooperation with the state and others.

Reports

In the period from 2010-2016 several reports have been produced:

- Vaxtarsamningur fyrir Höfuðborgarsvæðið – Framtíð Samgangna, Mannvit, 2013 (*Growth for the capital Area - future of transport*)
- Næstu skref í þróun samgöngukerfa - Svæðisskipulag höfuðborgarsvæðisins 2015-2040, Mannvit, 2014 (*The next step in the development of transport systems - Regional Capital 2015-2040*)

[1] Sóknaráætlun means "attack strategy or attack plan".

- Borgarlínan - Greining Á Bestu Legu - Fasi I, Mannvit, 2015 (*City Line - Analysis Of Best Corridor - Phase I*)
- Public Transport Choices Report, Jarrett Walker, 2016

1.2 Purpose

Based on the Regional Development Plan the purpose is to work towards the Transit Oriented Development (TOD) meaning focus on densification, a new high class public transport system and increased use of sustainable transport modes. The new high class public transport system is called *Borgarlína* (Cityline).

1.3 Process

Even though the work towards *Borgarlína* dates back to 2011, the process is still in the initial phase. The work so far has mainly been preparatory and corresponds to Phase A shown in Figure 2 below.

The process so far consists of the following activities;

- Exploring the need for increased sustainable transport
- Defining what is meant by high class public transport and *Borgarlína*
- Corridor discussions and definitions
- Urban development possibilities and planning policy
- Organization of *Borgarlína* company
- Involving stakeholders in the process

The overall work process towards the operation of the *Borgarlína* consists of Phase A to Phase E pictured in Figure 2.

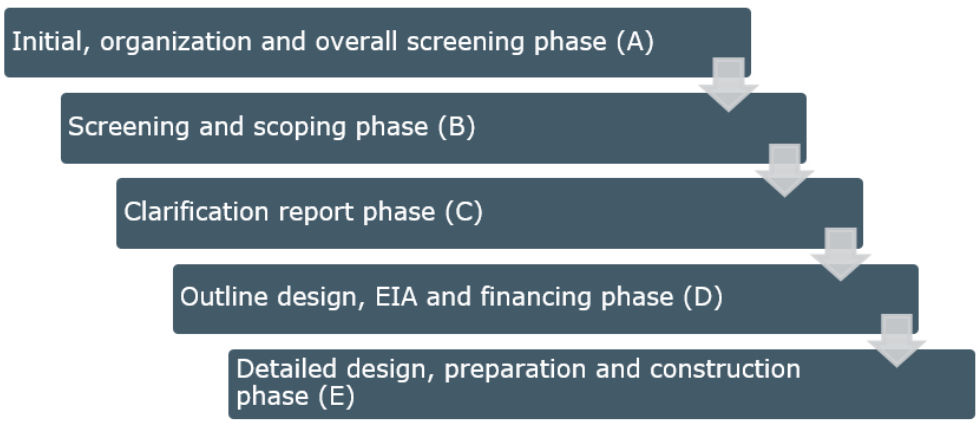


Figure 2 Phases in the process towards the opening of Borgarlína.

The purpose of each of the phases B to E in the *Borgarlína* project is to narrow the project in scope and increase the level of detail for the eventually selected alignment. This journey can be referred to as the "Stairs of knowledge", where the project is moving from a more holistic level to a more detailed level. At the start of the project the knowledge is scarce and the stair small, but as the scope decreases and the knowledge slowly accumulates, the stairs grow and the project moves on through the various phases. The stairs of knowledge also represent the fact that it is impossible to move up a step unless you have gathered the necessary knowledge and information along the way.

This report marks the last part of Phase A and preparation for Phase B.

The purpose of Phase B is to evaluate and prioritize the corridors and potential alignments, identified in Phase A, based on a multi-criteria analysis which makes it possible to;

- choose and prioritize the alignments in the corridors
- narrow the scope of the project down to the most appropriate alignment
- choose which type of technology to use (BRT/LRT)

Thereby the output of Phase B will be a final selection on the first corridor for the *Borgarlína* and a certain alignment. This will enable the start of Phase C, where the selected alignment will be more detailed due to only one alignment to handle. At the end of Phase B, the project will be at a level where it is possible to incorporate *Borgarlína* into municipality plans.

This report sums up existing knowledge as well as input from the workshop held in November 2016. The report identifies the relevant corridors based on the knowledge and information available so far.

The report:

- describes the current transport situation
- sums up the vision for public transport

- sums up corridor description
- defines a strategy for the *Borgarlína*.

2 The current transport situation in the Reykjavik Capital Area

This chapter gives an overview of the current transport situation in the Reykjavik Capital Area based on existing knowledge and the input from the workshop.

The Reykjavik Capital Area consists of seven municipalities, with around 215.000 citizens. It is the only urban area in Iceland and therefore plays an important role as a center of government, work, education and culture for the whole country.

In recent decades, the Capital Area has experienced extensive growth with urban sprawl, increased traffic and longer distances for people to travel.

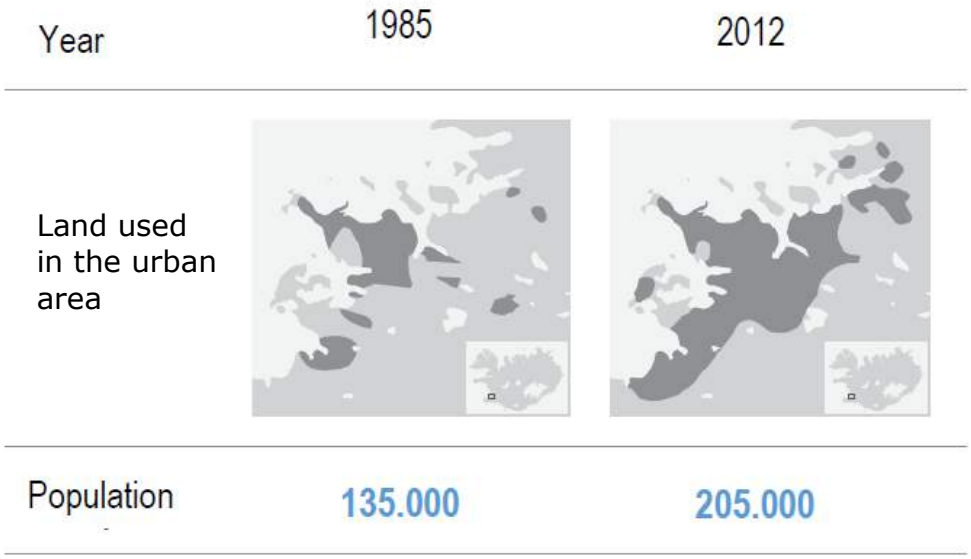


Figure 3 *Urban sprawl, increased population and increased car ridership. Source: 2015-2040 Capital Area Regional Development Plan.*

2.1 Population trends

Over the last 25 years, the population of the Capital Area has increased by 70,000, and populations levels can be expected to continue to rise through to 2040. Looking at the country as a whole, 90% of all population growth occurred within the Capital Area.

The expectations for the future population is an increasing number of inhabitants in Iceland, see Figure 4. This population trend combined with the urbanization trend leads to an increased number of citizens in the Capital Area.

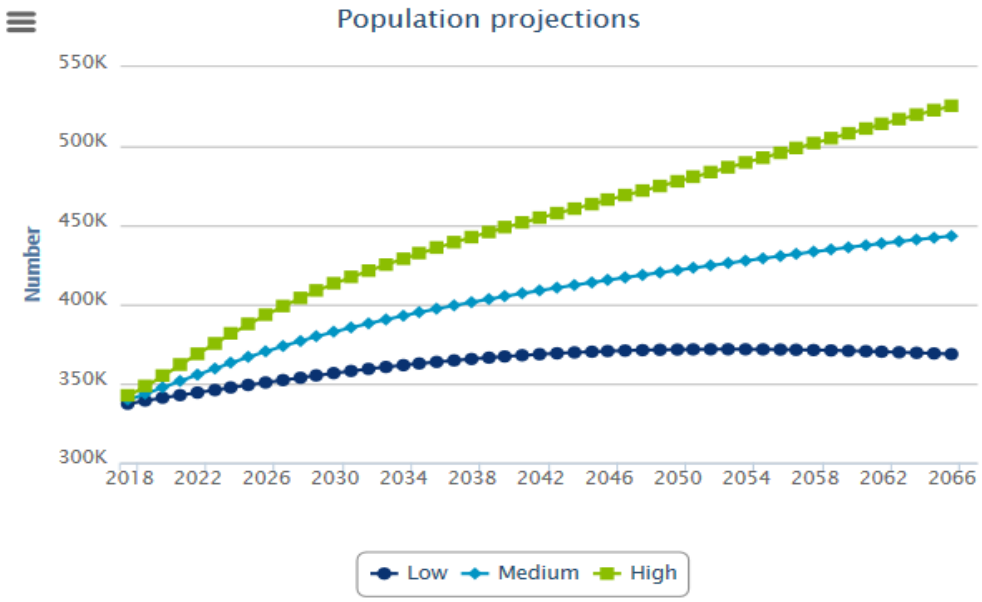


Figure 4 Population projections for Iceland in general. Source: Iceland Statistics.

This means that the number of citizens in the Capital Area is expected to reach approximately 275,000 in 2040 and a 67 % proportion of all Icelanders living in the Capital Area by 2040.

2.2 Tourism trend

The tourism is also growing with up to 50.000 daily tourists during the summer in the Capital Area. The number of tourists tripled in the Capital Area has 3-doubled during the last 5 years from an average of around 5.700 daily tourists in 2010 till 17.600 daily tourists in 2015.

The quick growing number of tourists are important as they could become users of the high class public transport system.

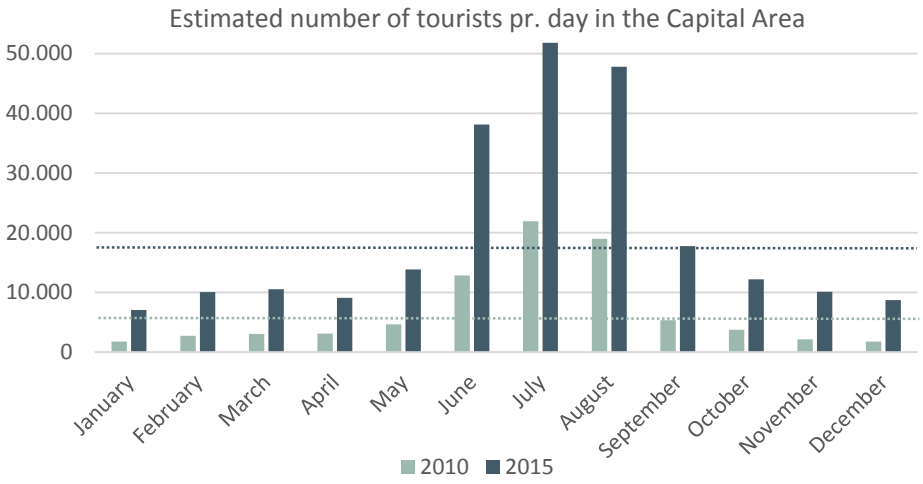


Figure 5 *Estimated number of tourists pr. day in the Capital Area. Source: Icelandic Travel Industry Association.*

Changes in the age distribution of the Capital Area shows that the greatest growth will be seen in the 67+ age group (+38%), whereas the 20-39 age group will see a slower growth (+13 %). This means that 2 out of 3 new citizens in the Capital Area will be above 40 years. Furthermore, the trend foresees that there will be an even greater demand for smaller flats instead of family houses due to the increasing number of elderly and the increasing number of childless families.

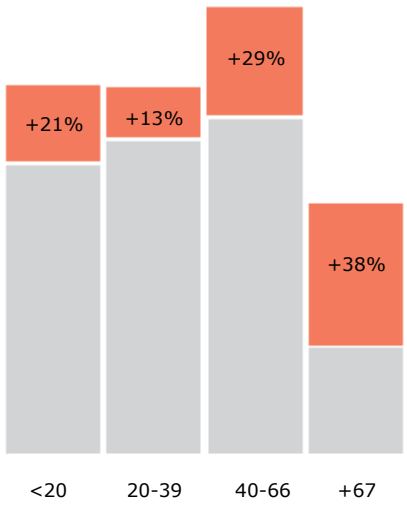


Figure 6 *Changes in the age distribution of Capital Area. Source: 2015-2040 Capital Area Regional Development Plan.*

2.3 Car ownership

The car ownership in Iceland is high and still increasing - 700 cars per 1.000 inhabitants. Compared to other countries car ownership in Iceland is among the highest in the world and close to USA and Australia. The Scandinavian and Northern European countries are at a level of 400-600 cars per 1,000 inhabitants.

During the last 10 years, the car ownership has increased by around 10 %. Car ownership has risen almost constantly since the 1950´s with some minor exceptions due to global crises. It will require significant improvements to the sustainable transportation to break the trend line shown at Figure 7.

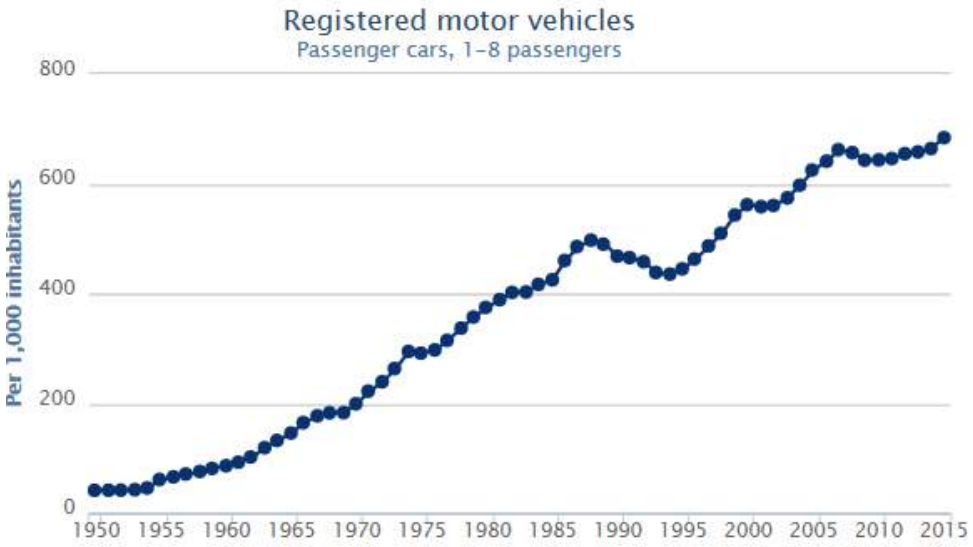


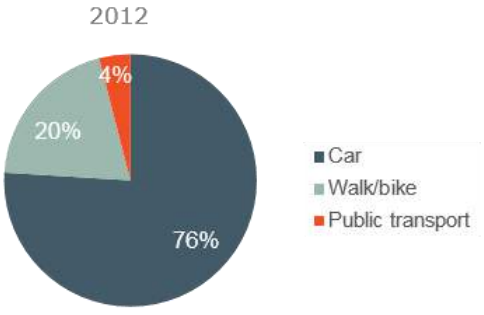
Figure 7 Car ownership. Source: Iceland Statistics.

In the Capital Area, the car ownership is slightly lower – 6 registered cars per 10 citizens. This is however still equal to more than 1.5 cars per home.

The growth in both population and car ownership means that the number of car trips is expected to increase in the future. If car numbers increase in proportion to the future population and transport habits remain unchanged, the number of cars will increase by 1/3 – meaning 40,000 extra cars in the Capital Area by 2040.

2.4 Modal split

The share of car traffic is extremely high with more than 3 out of 4 trips being by car. The public transport has a market share of only 4 % leaving the biking and walking with the remaining 20 %.



This is a very high share of car traffic compared to other comparable cities in Northern Europe.

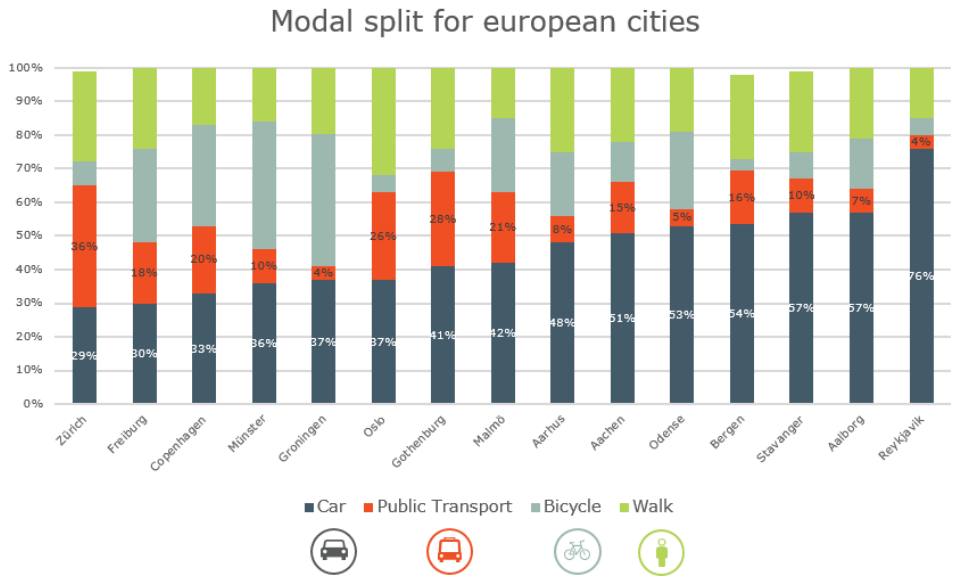


Figure 8 *Modal split for other comparable European cities (size and/or culture).*

The share of sustainable transport in some European cities is as high as 70%. Looking at cities similar in size to Reykjavik (Bergen, Stavanger, Aalborg and Odense) the sustainable transport share is around 40-50%.

A Gallup analysis comparing modal split from 2011 and 2014 levels indicate that the share of car traffic in Reykjavik has actually decreased during the last 3 years, going from 76 % to 71 % in 2014. The share of public transport has slightly increased at the same time fixed and the "soft transportation" has increased from 20 % to 24 %. Although this is based on a small number of respondents, it could indicate that the top has been reached and the citizens use more sustainable transport during the day considering that the car ownership has increased in the same period.

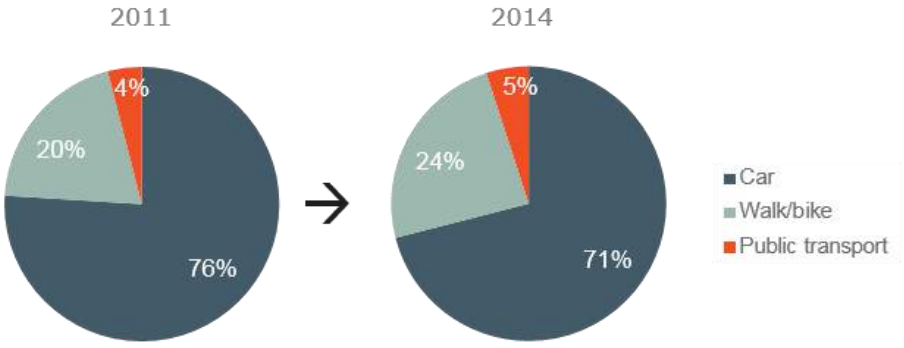


Figure 9 *Change in modal split from 2011 to 2014 for Reykjavik. Source: Capacent Gallup, 2014.*

Looking at the modal split by age categories indicates that when it's possible to get a driver's license 70 % of the citizens travel by car and this increases to 85 % when at the retirement age. The share of citizens using public transport decreases the older the citizens are. At the age group of 13-24 the share of public transport is 11-12 % which then decreases to 2 % when 65 or above.

The share of walking and biking is rather stable for people above the age of 18.

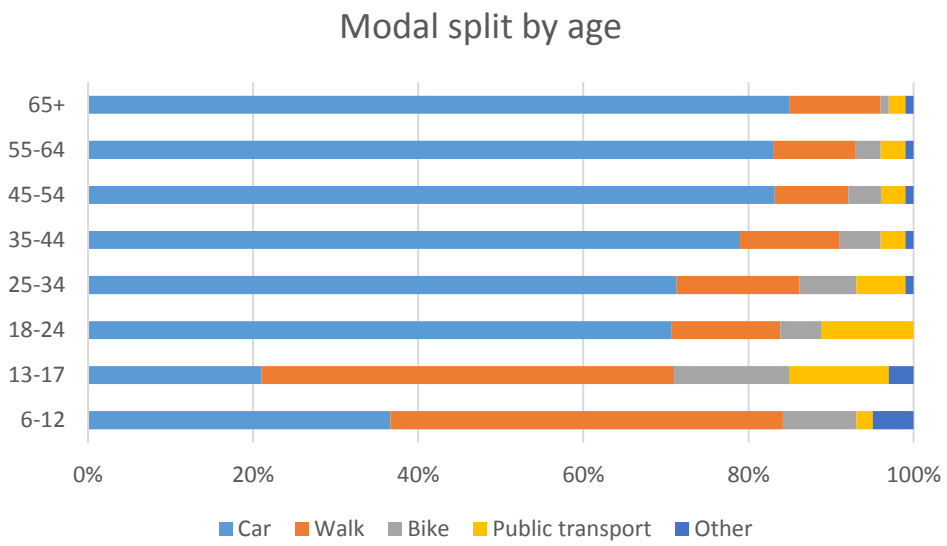


Figure 10 Modal split by age in 2014. Source: Capacent Gallup, 2014.

Around 50 % of inhabitants under the age of 18 walks. The shift from walking to using the car when turning 18 is an interesting point and this is where it is necessary to "catch" passengers for the public transport instead of becoming commuters by car.

This knowledge combined with the changing demographics (Figure 6) emphasizes the need to introduce transport solutions that are attractive alternatives compared to the car.

2.5 Traffic situation

The traffic situation in Reykjavik is based on a very high share of cars and a road network dimensioned to a heavy load of car traffic. There are several large intersections throughout the city that take up a lot of space. It is clear that Reykjavik is a city designed for car traffic. Compared to cities like Aalborg, Bergen and Odense you won't find these large (space-intensive) intersections, but much more signalized intersections.

The Capital Area is characterized by many years of expansion of the land used instead of densifying the city. This is shown in Figure 3 where the number of inhabitants per ha dropped by 35 % from 1985 to 2015, while the population increased by 50% - meaning that the inhabited area grew by some 135 %. This trend leads to more and longer trips which places greater demands on the road network.

The traffic situation in the peak hours in the morning and afternoon is characterized by queues at the intersections on the main arteries of Kringlumýrarbraut and Miklubraut. The peak hour in the morning is steep but short (around one hour) while the peak hour in the afternoon typically lasts a bit longer. Critical traffic jams are though not common but the traffic is growing with increased strain on the road system. At the workshop held in November, the guests

marked the roads in Figure 11 as congested either in the morning or the afternoon.

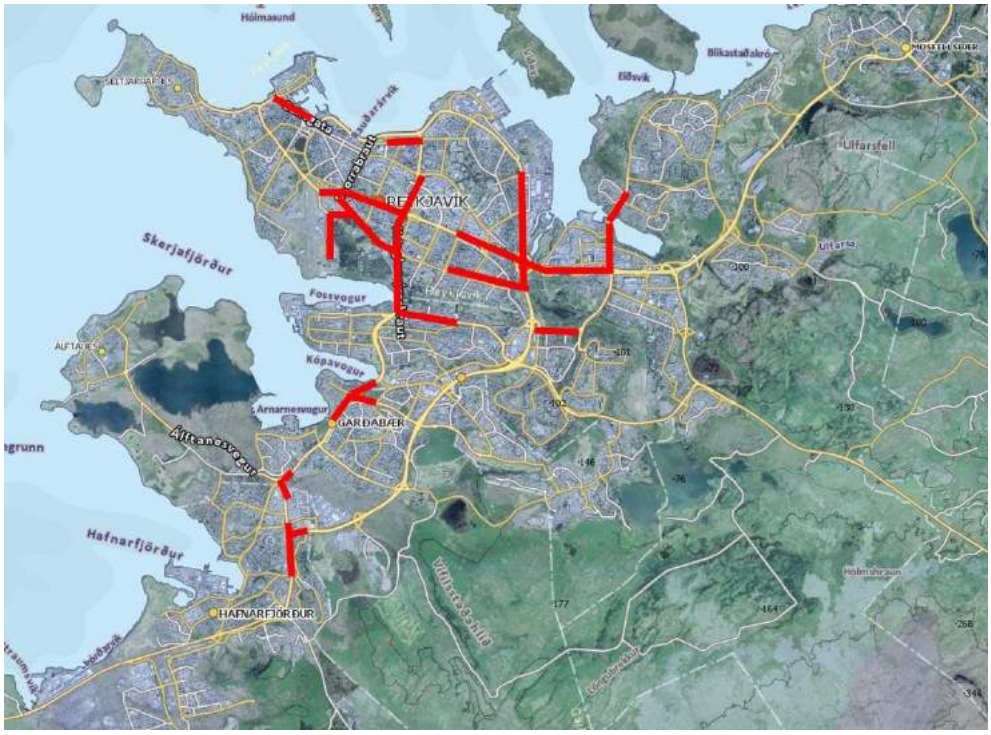


Figure 11 Mark the congested road pointed out by the groups.

2.6 Reasons for choice of transport mode

A study[2] of the traffic situation in Reykjavik indicates reasons for not using the public transport. The majority (around 80 %) said that they use the private transport (car) and therefore do not use the public transport. In densely populated areas (the Capital Area) almost 90 % blamed the access to a car as their reason for not using the public transport. They also appointed poor accessibility to public transport as a reason for not using the buses and the price for using the public transport.

Price for transport

Even though the previous study showed that the price is not a primary reason for choosing the car instead of public transport, it is still an interesting parameter that gives an indication for the incentive to choose one transport mode instead of the other.

Based on data from FIB[3] (The Icelandic Automobile Association) prices for owning a car and marginal cost prices per km can be found. Prices for bus transport are found at Straeto's homepage. These data were used to estimate the yearly and daily marginal costs for car and bus transport, see Table 1.

[2] Data from Iceland Statistics, 2014.

[3] Félag Íslenskra Bifreiðaeigenda.
https://www.fib.is/static/files/rekstrarkostnadur/rekbifjan2016rett.pdf

Data shows that the yearly cost for owning an average car (priced at 3.7 mill. ISK) is 1.3 mill. ISK for yearly transport of 15,000 km per year and 1.8 mill. ISK for yearly transport of 30,000 km per year. Compared to this the yearly cost for transport in the Capital Area is between 0.08-0.3 mill. ISK depending on buying single ride tickets, monthly card or long term passes. This indicates that the car transport is more than 10 times more expensive than public transport.

Looking at the marginal costs (Table 1), the picture is slightly different, but car is still around 4 times more expensive than the cheapest bus solution (9 month card). The single ride ticket is the only public transport option that equals the marginal cost of the car.

Table 1 Yearly and daily marginal costs for car and bus transport. Source: FIB and Straeto.

Transport mode	Yearly cost	Daily marginal costs		
		5 days a week	6 days a week	7 days a week
Car (15,000 km per year)*	1,320,000	952		
Car (30,000 km per year)*	1,780,000			
Bus (1 month cards)	135,600	538	435	365
Bus (9 month card)**	83,400	321	267	229
Single ride tickets (return)	306,600	840	840	840

* Roughly estimated marginal cost for car traffic include petrol, wear on tires, maintenance, cleaning and parking based on a daily journey length of 30 km.

** Straeto: 3 month card (24.700 ISK) + 9 month card (58.700 ISK) - only valid for Capital Area.

Parking and restriction

The only place that charges for parking is the city center of Reykjavík. Where you have to pay, the parking is relatively cheap and the most expensive parking is along Laugavegur shopping street or close to Austurvöllur (red zone at Figure 12). Here the price is 250 ISK per hour and even cheaper in the parking houses.

Blue and orange zones is 125 ISK per hour and orange is 90 ISK for the first two hours and after that around 20 ISK per hour.

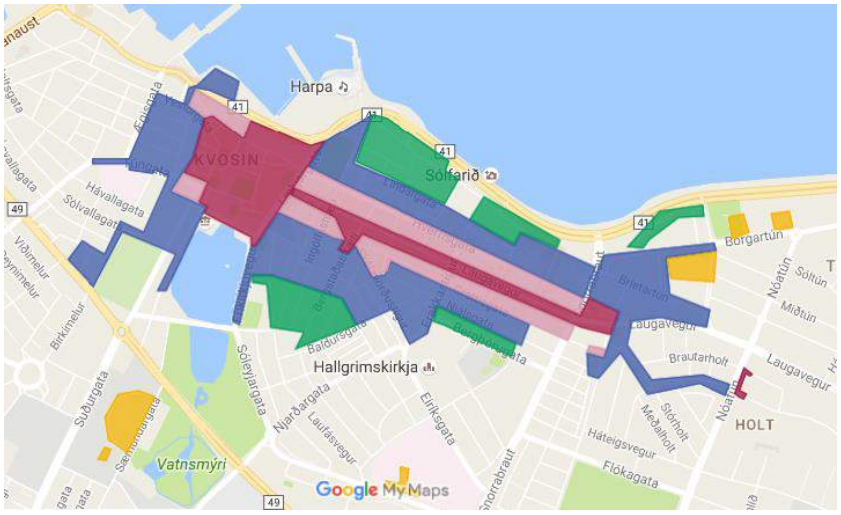


Figure 12 *Parking zones in Reykjavik. Source: www.iheartreykjavik.net.*

In comparison, the parking fees in other Scandinavian cities are at the same level or much higher, see Table 2. It seems like there is link between the parking fees and the car share, based on the thesis that the lower the parking fees are the car share tends to be higher and vice versa.

Table 2 *Parking fee in city centers in comparable Scandinavian cities.*

City	Parking fee (ISK)	Parking fee (€)	Car share
Reykjavik	90-250 ISK/h	0,8-2,1 €/h	76%
Odense	150-200 ISK/h	1,1-1,6 €/h	53%
Malmö	150-350 ISK/h	1,6-4,0 €/h	42%
Aarhus	200-350 ISK/h	1,6-2,9 €/h	48%
Copenhagen	200-500 ISK/h	1,5-4,1 €/h	33%
Bergen	450-600 ISK/h	4,4-5,9 €/h	54%

These are only some examples showing the parking fee and the car share. Other parameters also affect the car share, such as the price for owning a car, the petrol prices, the size of the parking area with parking fees, the weather for biking/walking and the quality of the public transport.

The size of the area for parking fee is very small in the inner city of Reykjavik meaning that within a smaller walking distance the users of car traffic can avoid the parking fee and park for free. The short walking distance and low price are two of the most convenient factors for parking. Studies shows that long walking distance and price are parameters that the car drivers do weight as important when looking for parking lots. The duration of the parking time allowed for is also very important meaning that limited parking time matters.

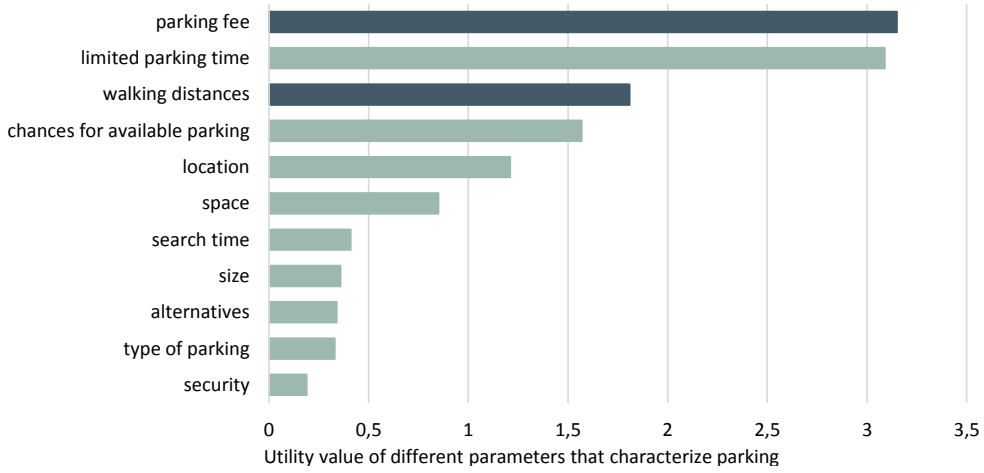


Figure 13 *Importance of different parking parameters. Source: Van der Waerden, 2012.*

This indicates that working with a parking strategy is a sound action to support the effect of implementing high class public transport. A parking strategy is a central element in making the public transport more attractive and the strategy should at least handle the two most important elements;

- time spend for parking
- price for parking

These two elements affect the car traffic directly and indirectly affect the sustainable transport by comparative advantages in terms of time and price.

2.7 Public transport system

The public transport system in the Capital Area has 25 urban bus lines[4] and they ensure a high coverage in most of the relevant areas. The urban lines are supported by some regional lines to Keflavik Airport (Reykjanesbær), Suðurnes, north (west and east) and south (east) Iceland.

Transfer hubs

The bus network has several hubs for transfer between the bus lines. These are marked with a red/yellow "S" at Figure 14. The number of bus lines servicing the hubs are:

- Hlemmur with 14 bus lines (Hverfisgata)
- Mjódd with 10 bus lines
- Ártún with 8 bus lines
- Lækjartorg with 7 bus lines (central Reykjavik)

[4] Line 27 and 29 have a very low number of daily departures and are not included in this coverage of the public transport system.

- Fjörður with 7 bus lines (Hafnafjörður)
- Háholt with 5 bus lines (Mosfellsbær)
- Hamraborg with 5 bus lines (Kopavogur)
- Spöng with 3 bus lines
- Ásgarður with 2 bus lines (Garðabær)

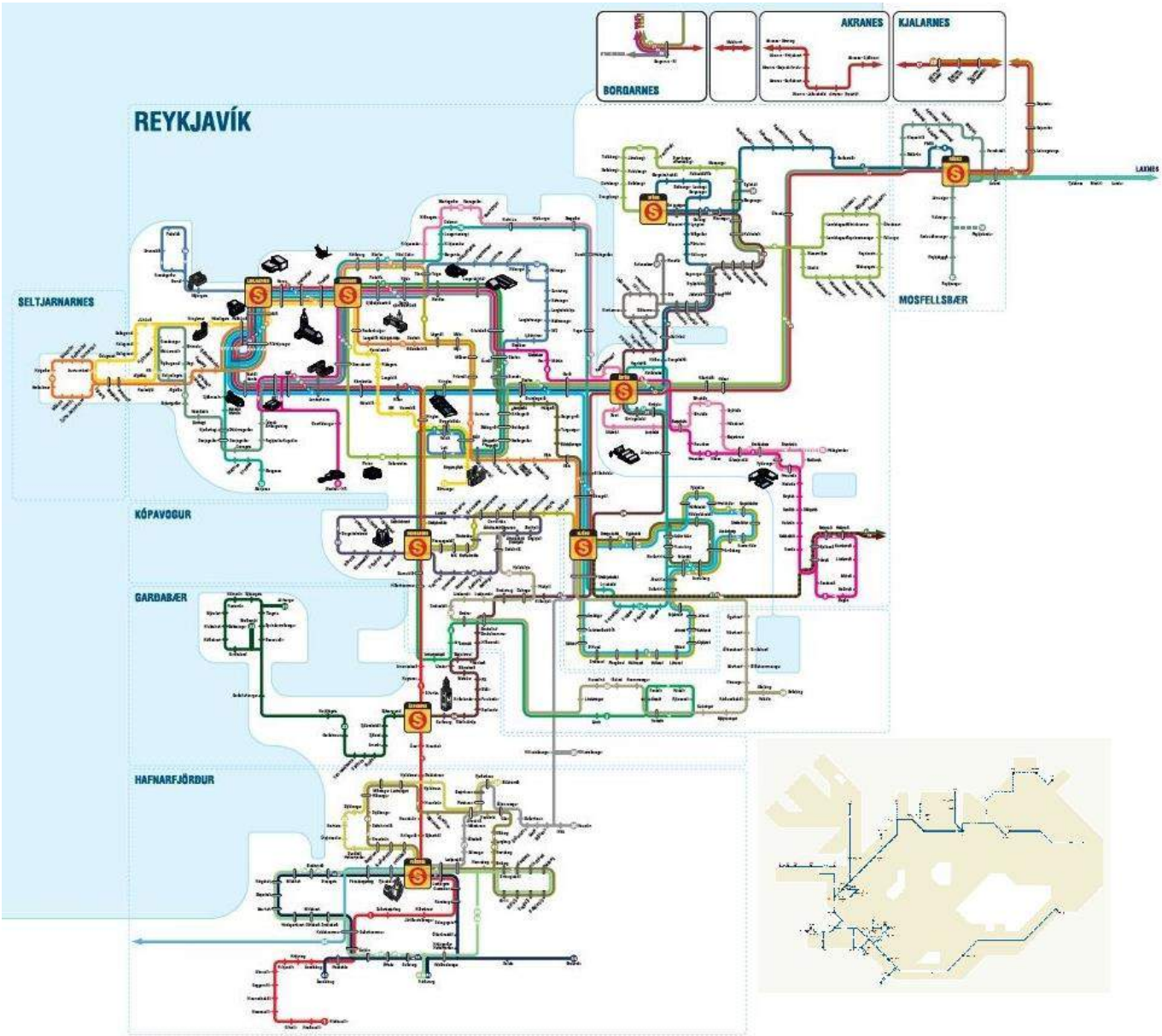


Figure 14 Maps of bus lines in the Capital Area and the regional connections. Source: Straeto.

Service hours

The service hours for the most used bus lines in Reykjavik is shown in Figure 15. The bus service starts at 6 in the morning and lasts until midnight.

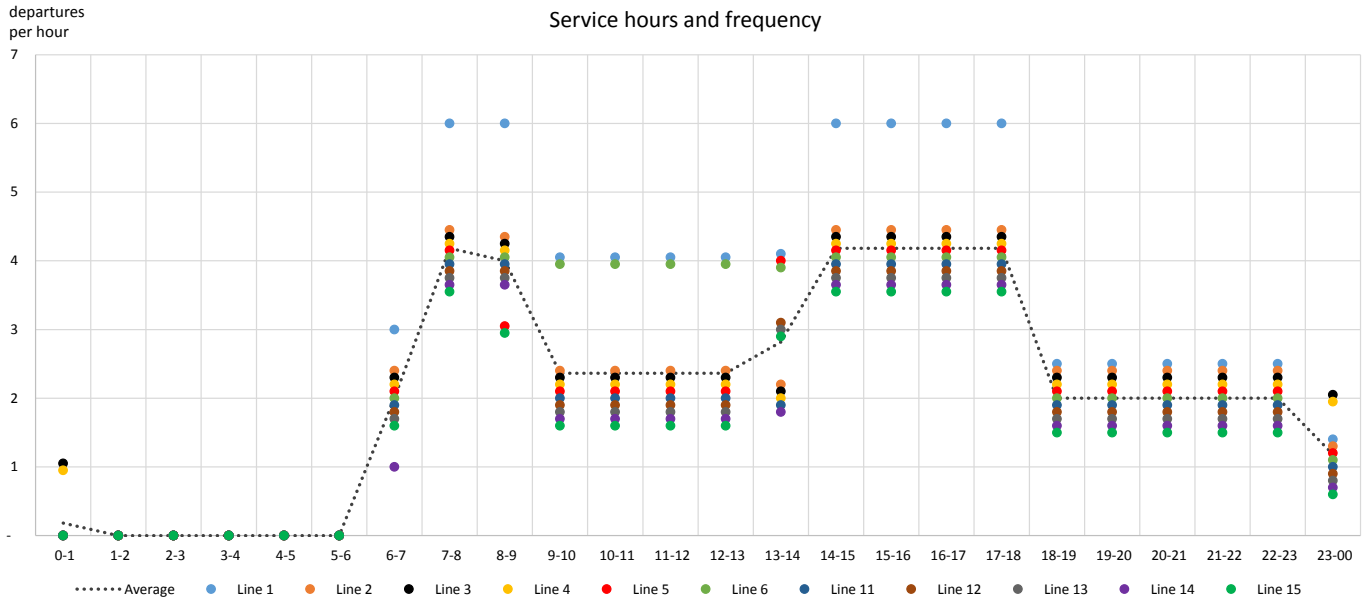


Figure 15 *Service hours and frequency for the most used bus lines in Reykjavik (Line 1-15). Adjacent dots refer to the same whole number. For instance, most lines have 4 departures pr. hour between 7 and 8 am. Source: Time tables from Straeto.*

Frequency

The service level based on frequency shows that 60-70 % of the bus lines have a frequency of 15-minutes or higher in the peak hours. This is illustrated at **Error! Reference source not found.** where the frequency per line and time of day is shown.

Peak hour service

Line 1 offers a 10-minutes service in the peak hours and 15-minutes service in-between the peak hours. This is the most frequent bus line in Reykjavik. 14 bus lines have a 15-minutes service in the peak hours and additional two have a 15-minutes service in the afternoon.

Midday service

In-between the peak hours two bus lines have a 15-minute service (line 1 and 6) whereas most of the bus lines during the midday hours have a 30-minute service. Still a third of the bus lines have less than 2 departures pr. hour.

Evening service

During the evening 15 bus lines have a 30-minute service and the remaining bus lines have no evening service[5].

Weekend service

Two out of three bus lines offer a 30-minute service in the weekends[6] meaning that a larger part of the bus net offers the same level of service during the whole weekend. This is primary the bus lines operating with minimum a 15-minutes service in the peak hours.

No bus lines operate during the night.

[5] Line 22 and 23 has a few evening departures.

[6] A few of them only or mostly Saturday (line 21 and 23).

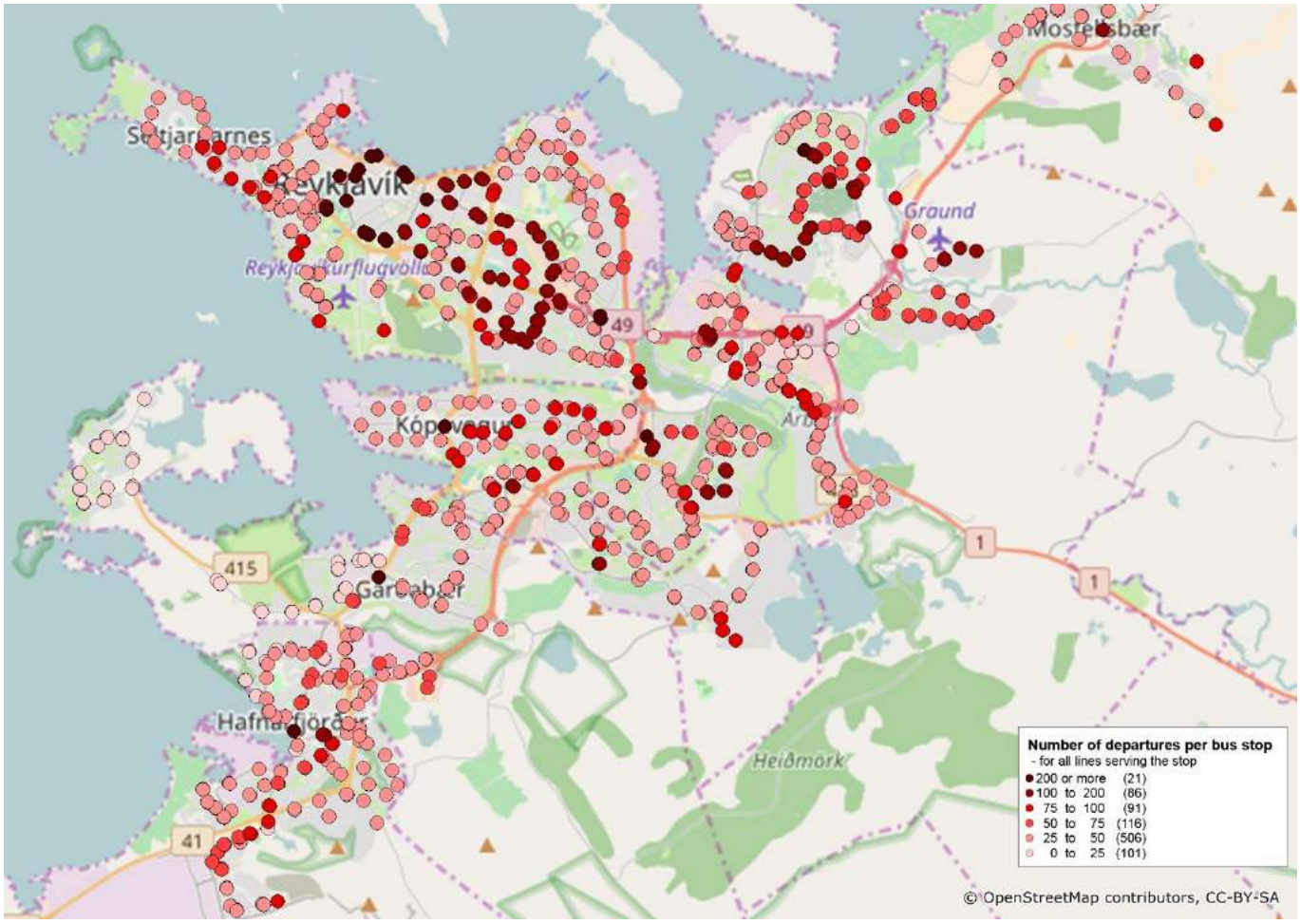


Figure 16 Number of daily departures per bus stop – for all lines serving the stop. Data source: SSH, 2016.

The bus stops with the highest number of daily departures are located around the inner city of Reykjavik where most buses terminate and along the roads Laugavegur, Suðurlandsbraut, Grensásvegur, Bústaðavegur and Miklabraut in city of Reykjavik. Furthermore, the bus stops in Rimar and Foldir along Fjallkonuvegur and Borgavegur have high number of daily departures.

The number of departures around Mjódd and Fell is also high together with the main stops along corridor for line 1 (Fjörður, Àsgarður and Hamraborg).

Passenger numbers

The number of daily (weekday) passengers is around 40,700. Line 1 is the most used bus line with 5,800 daily passengers (14 %) followed by line 6 with 4,300 daily passengers (10 %). Line 1-6 together have around 21,000 daily passengers equal to half of the passengers.

In average, there are 1,630 daily passengers per bus line and 12 bus lines have more passengers than the average.

Most bus lines with a line number above 15 have a low number of passengers (except line 17, 18, 24 and 28). Here we find less than 500 passengers per day and line 22 with only 53 passengers per day. Lines 33, 34 and 43 also have less than 200 daily passengers.

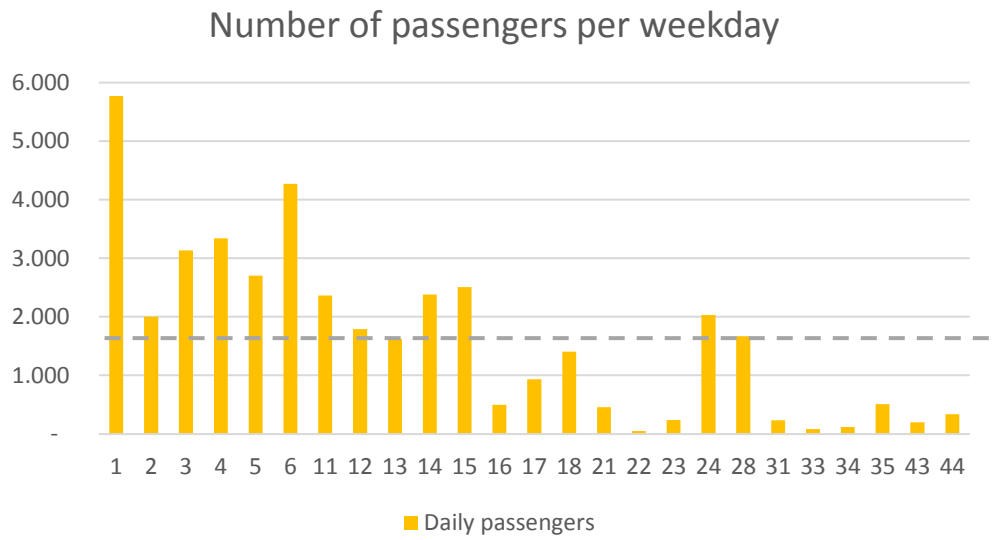


Figure 17 *Daily passenger numbers based on average weekday boardings from 2015. Source: Jarrett Walker / Straeto.*

Line performance

The number of passengers per departure is a way of evaluating the performance of the bus service. Assuming some general time periods[7] for the day types gives an idea of the bus production. The average number of passengers per trip is around 43 and 8 out of 25 bus lines have a performance above the average.

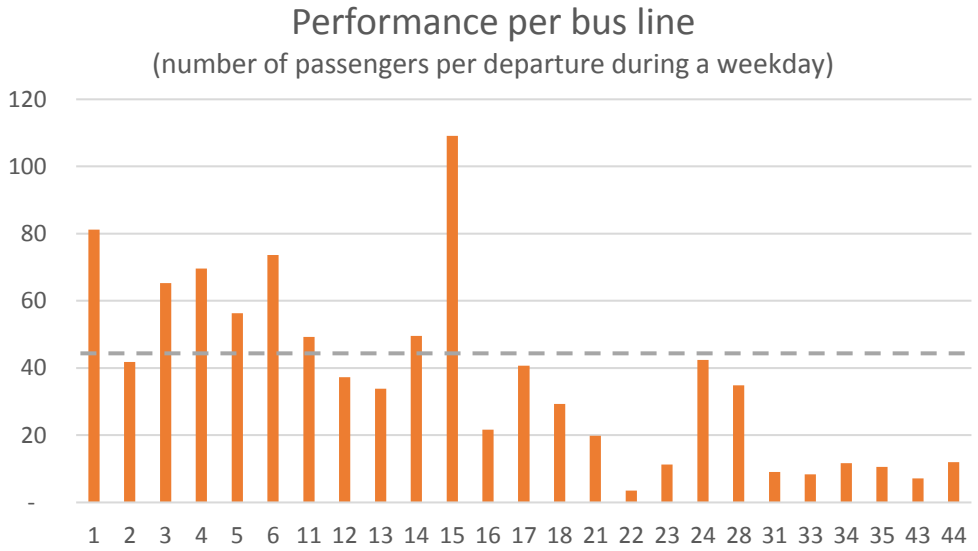


Figure 18 *Performance per bus line seen as number of passengers per departure during a weekday.*

Line 15 is performing very well with 110 passengers per weekday trip followed by line 1, 5, 3 and 4 with 60-80 passengers per trip.

Most bus lines with a line number above 20 are performing low with low number of passengers per trip (except line 24 and 28). Here we find less than 20 pas-

[7] Morning peak: 6:30-9:00, Midday: 9:00-14:00, Afternoon peak: 14:00-18:00 and Evening: 18:00-00:00.

sengers per trip and line 22 with only 3 passengers per trip. Also line 31, 33 and 43 have less than 10 passengers per trip.

2.8 Image problems

The image of the public transport seems to be a problem and the low share of public transport trips supports this thesis. This image problem was acknowledged at the workshop where it was discussed during the group sessions. Some groups said that the public transport should be:

"hip and cool"

"easier to use than the car"

"practical, feasible and tempting"

And the public transport should:

"change the image of PT from not to hot"

"promote sustainable lifestyle – new way of thinking"

All these statements show that the image is low and the potential passengers think of the public transport as something that is difficult to use and understand.

Most Icelanders above 17 have a driving license (96.5 %) and 90 % of those do have a car at disposal. This easy access to a car from a rather early age makes it at challenging task to get the inhabitants to change to public transport.

3 Vision for public transport

This chapter gives an insight to the vision for urban development in the Capital Area and the vision for the public transport based on existing knowledge and the input from the workshop.

3.1 Development of the Capital Area

The new Regional Development Plan "*Capital Area 2040*" is a common vision for growth over the next 25 years. It is a comprehensive plan laying down strategies or policies for many organizational aspects and is aimed at promoting better planning decisions.

The common vision for growth is defined based on policies under 6 themes;

- Smart growth
- Efficient transportation
- Competitiveness
- Health environment
- Complete communities
- Successful cooperation

Smart growth

Smart growth is about defining clear boundaries between urban development areas and rural areas. Development within existing urban areas supports better utilization of basic public transport systems, utilities and public services and reduces pressure for developing uninhabited areas. Proportion of residential in these areas should rise from 30% to 66%. Urban centers are defined and the goal is to connect them with frequent transit development corridors.

Efficient transportation

The future Capital Area public transport system ensures efficient transport for residents, business and visitors. The focus is on fostering cost-effective green forms of transport which do not put extra pressure on trunk roads. Create trunk routes for all modes of transportation to form a holistic integrated system successfully linking the municipalities of the Capital Area and the main districts thereof.

Competitiveness

A basis for improving the competitiveness of the Capital Area is by targeted planning integrating effective transport and attractive development areas and by directing investment into infrastructure contributing to diversifying economic development.

Health environment

Secure citizens easy access to diverse common recreational areas surrounding the city and protect areas in the Capital Area to be reinforced and made more accessible. The Capital Area to always enjoy sufficient supply of clean untreated water by systematic protection of water sources and increased coordination in resource utilization

Complete communities

The Capital Area is made up of various districts offering different environments for individuals, families and business. Sustainable district units are based on diverse housing options and mixed land use, with available services within walking distance and access to a strong public-transport system.

Successful cooperation

The municipalities of the Capital Area are engaged in close, lasting cooperation and work together on urban development, focusing particularly on integrating urban planning, transport and service supply.

The policies set out should be interpreted and aligned with municipal land-use plans taking due account of the planning factors laid down in the Regional Development Plan or on which a general policy is formulated;

"A key aspect of the policies is that this growth should be smart and should not impair environmental quality for locals. Forecast population growth must therefore be dealt with without car traffic increasing by the same rate and without uninhabited land being encroached upon to the same degree as in previous decades."

"Urban development will go hand-in-hand with a good transport network. Housing and employment will be located as far as possible in areas with good public transport. The potential passenger base for public transport will be broader, creating the necessary conditions for improved service."

3.2 The vision for public transport

The vision from the new Regional Development Plan "*Capital Area 2040*" is to secure efficient transportation and a modern transport system where travel needs will be met in an efficient and diverse way. Population growth will be addressed without proportional extra pressure on the trunk-road system.

"A new high-quality public-transport system – known as 'Borgarlína' – could play a key role in this and link together the municipalities with frequent transit development corridors. Borgarlína will be an efficient public-transport option, providing locals with a high-quality public transport system and enabling them to travel quickly throughout the Capital Area."

Efficiency is based on integrating transport and urban development and promoting greener and more economical transport. Therefore, urban development in conjunction with a good transport system is at the heart of Capital Area 2040.

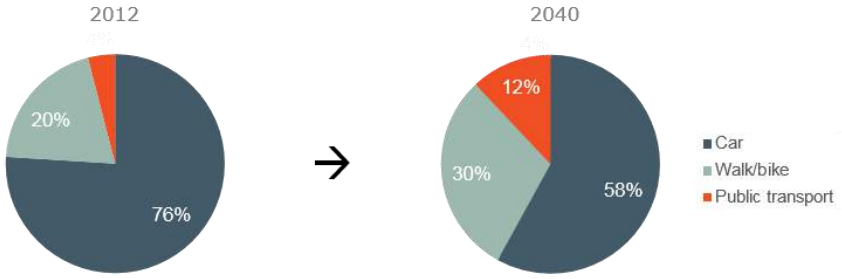
The share of efficient transport will rise if growth is concentrated in urban centers and transit-oriented development areas. This reduces travel distances and times for everyday activities and promotes greater supply of available services. Greatly increasing focus on efficient, green transport helps bring about a greater choice of modes of transport and transport options which, in turn, creates better conditions for denser urbanization.

"The advent of Borgarlína and transit-oriented development in specific parts around the Capital Area will strengthen all parts of the Area. Pressure on the city center is alleviated by creating new attractive areas linked to high-quality public transport."

High-quality public transport system means providing a high level of service for people between the area's main centers and selected development areas. Running in separate lanes and enabling smooth transit regardless of car traffic. Stops in the high-quality system will be planned with pedestrian and cycle access in mind. Basic aspects of providing good car access to termini in the high-quality system will be explored. The traditional bus network will be adapted to the high-quality system and will form a network covering the area's urban zone.

Tripling the public transport share

The vision for the public transport in Capital Area is aiming at tripling the public share from todays 4 % to 12 % public transport trips in 2040.



The number of citizens in Capital Area is today around 215,000 and the population is expected to reach around 275,000 in 2040 equal to an increase of around 28%. This means that the vision will increase the number of daily passengers on weekdays by around 3-4 times from todays 40.700 daily passengers to around some 156.000 daily passengers in 2040.

Table 3 *The effect of the vision for the public transport on the number of public transport trips.*

	Today	2040	*Change*
Citizens	215.000	275.000	*+28 %*
Public transport share	4 %	12 %	*Triple*
Daily passengers	40.700	156.000	***+284 %***

A larger part of the growing number of tourists will also become customers in the high class public transport system. Today the tourists have poor information about the public transport system as it is not a part of Googles services such as Google Maps, where many customers find their information.

The new Regional Development Plan "*Capital Area 2040*" also introduces the concept of "20-minute neighborhood" which aims to form urban areas based on certain criteria. Strong neighborhoods are a key factor in successfully integrating urban patterns with greater use of public transport. This is achieved by strengthening local surroundings such that residents are able to conduct their daily activities close to their home.

> *"In the heart of each neighborhood is an area of dense urbanization with diverse activities and a public-transport center. It contains the neighborhood's high street, with an environment conducive to bustling life. The Borgarlína and/or a high-frequency bus route runs through the center. Emphasis is placed on a walking and cycle-friendly environment from the center to the outer neighborhoods."*

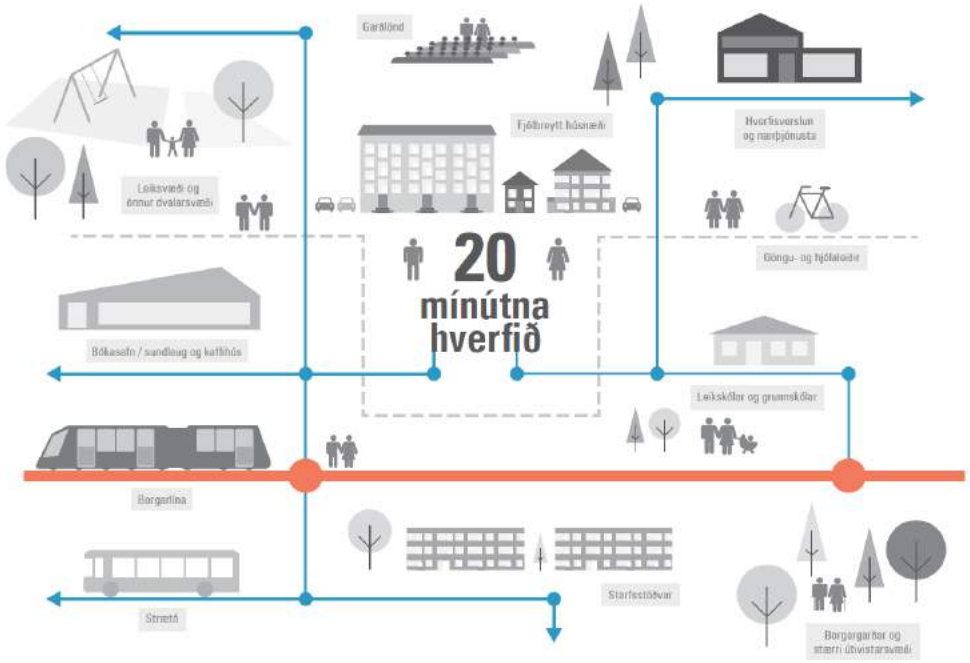


Figure 19 *There will be a good supply of diverse housing options and all major services with twenty minutes' walk. Source: 2015-2040 Capital Area Regional Development Plan.*

This means that neighborhoods should have good access to and from its center where the Borgarlína or high class public transport runs through. Access should be good especially for pedestrians and cyclists but also the supporting public transport system.

3.3 Zero-carbon vision for Reykjavik City

Reykjavik City has set up a vision to be carbon neutral by 2040. Since all electricity (hydroelectric power) and heat (geothermal) is produced carbon neutral, the focus is primarily on reducing emissions from the transport sector. This is an ambitious goal since the share of car traffic is among the highest in the world.

4 Corridor description and ideas

This chapter describes briefly the suggested corridors and brings up new ideas for corridors for the further process towards implementing a high class public transport system.

4.1 The process so far

Main center in the transit oriented development

The vision for the high class public transport system is defined in the new Regional Development Plan based on the main cores/centers and the growth boundaries for Capital Area 2040. These main cores and centers are where the urban development should mainly take place and these have schematically been connected to form the main corridors relevant for the high class public transport system, see Figure 20.

This means that neighborhoods should have good access to and from its center where the Borgarlína or high class public transport runs through. Access should be good especially for pedestrians and cyclists but also the supporting public transport system.

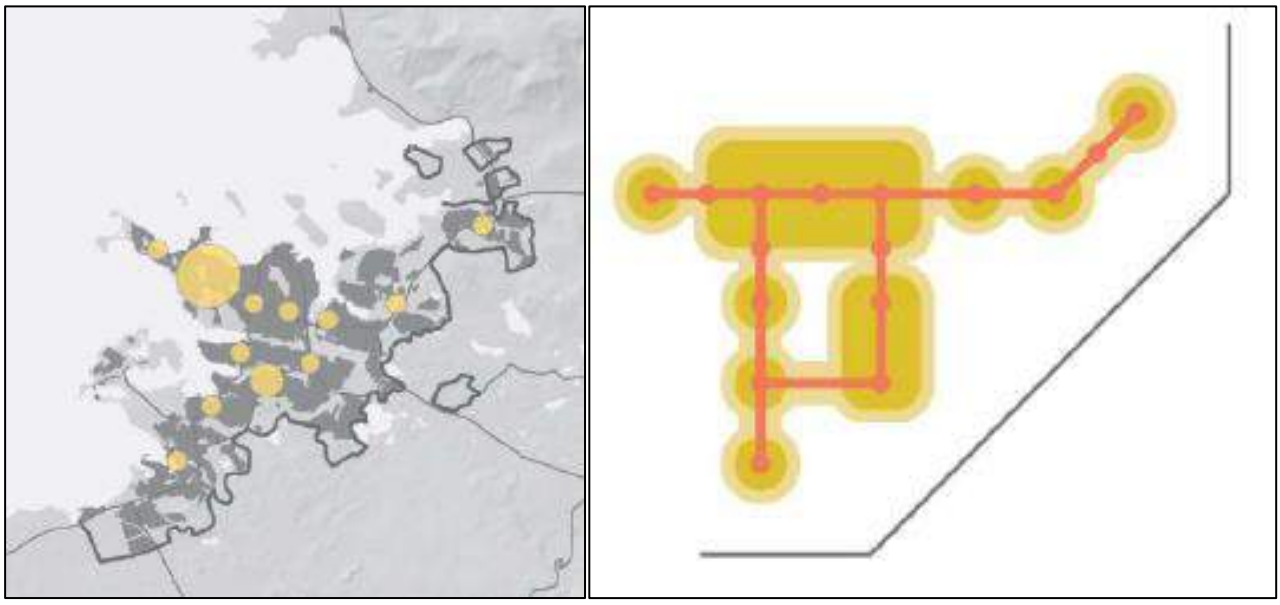


Figure 20 Main cores and growth boundaries for Capital Area 2040 and a schematic connection of the centers.

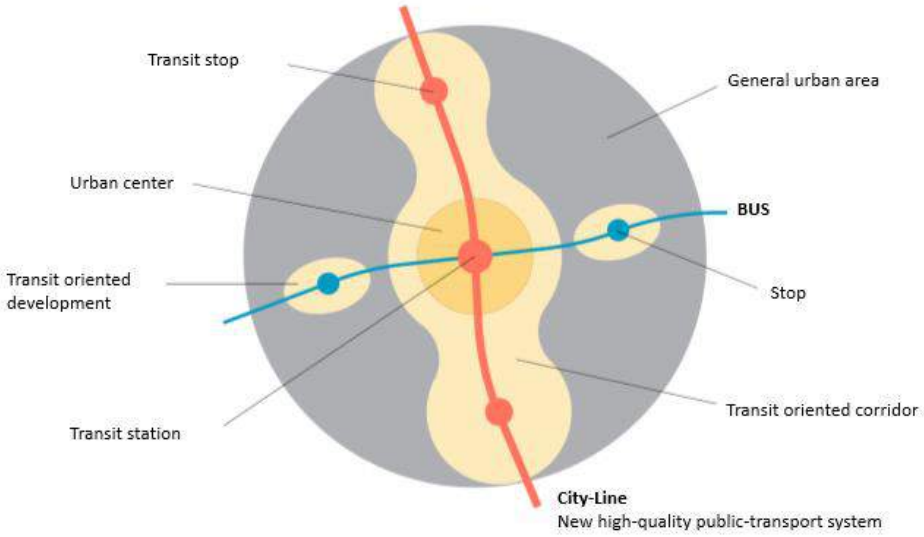
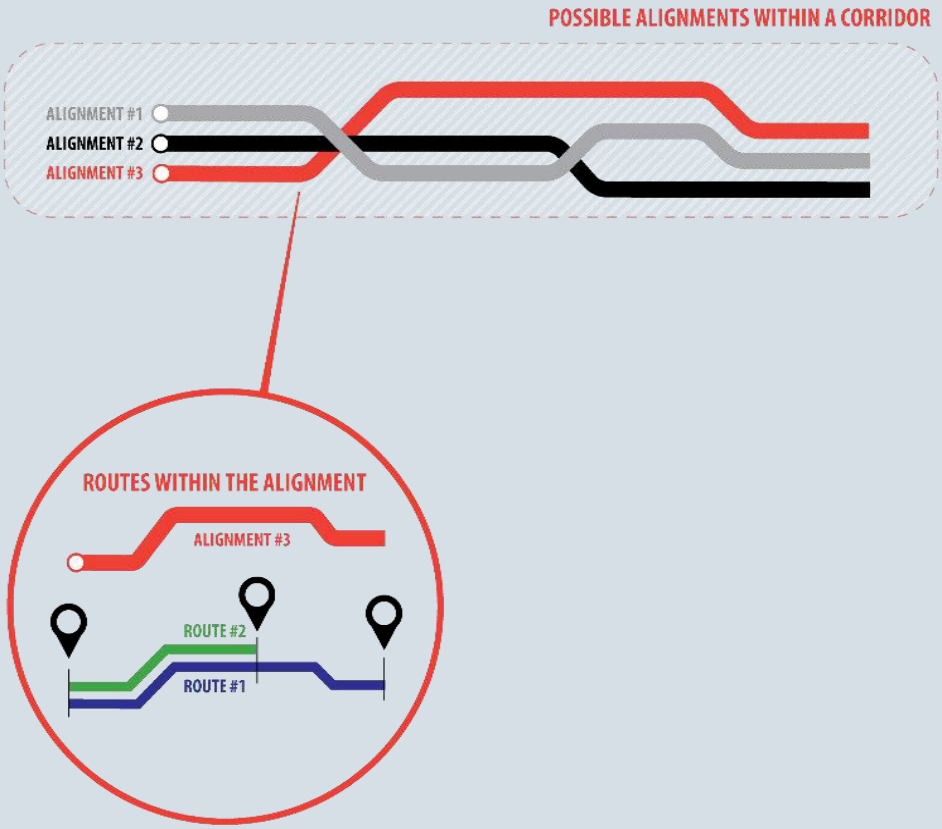


Figure 21 Main concept of transit oriented development

Definition of corridor, alignments and routes

Corridors are in this report defined as a broad band where one or more alignments could be fitted in, depending on the requirements and consequences for the Borgarlína.



The chosen alignment will end up as the infrastructure for the Borgarlína and within this alignment (or infrastructure) different routes could be operated.

The studies of the Borgarlína so far have been based on an analysis of the given corridors[8]. The analysis was split up into 12 sections;

- Vellir – Fjörður
- Fjörður – Garðabær
- Garðabær – Hamraborg
- Garðabær – Smárinn
- Smárinn – Mjódd
- Mjódd – Vogar
- Hamraborg – Miðbær (BSÍ)
- Hamraborg – Miðbær (Harpa)
- Seltjarnarnes
- Vogar – Harpa
- Vogar – Keldur
- Keldur – Háholt.

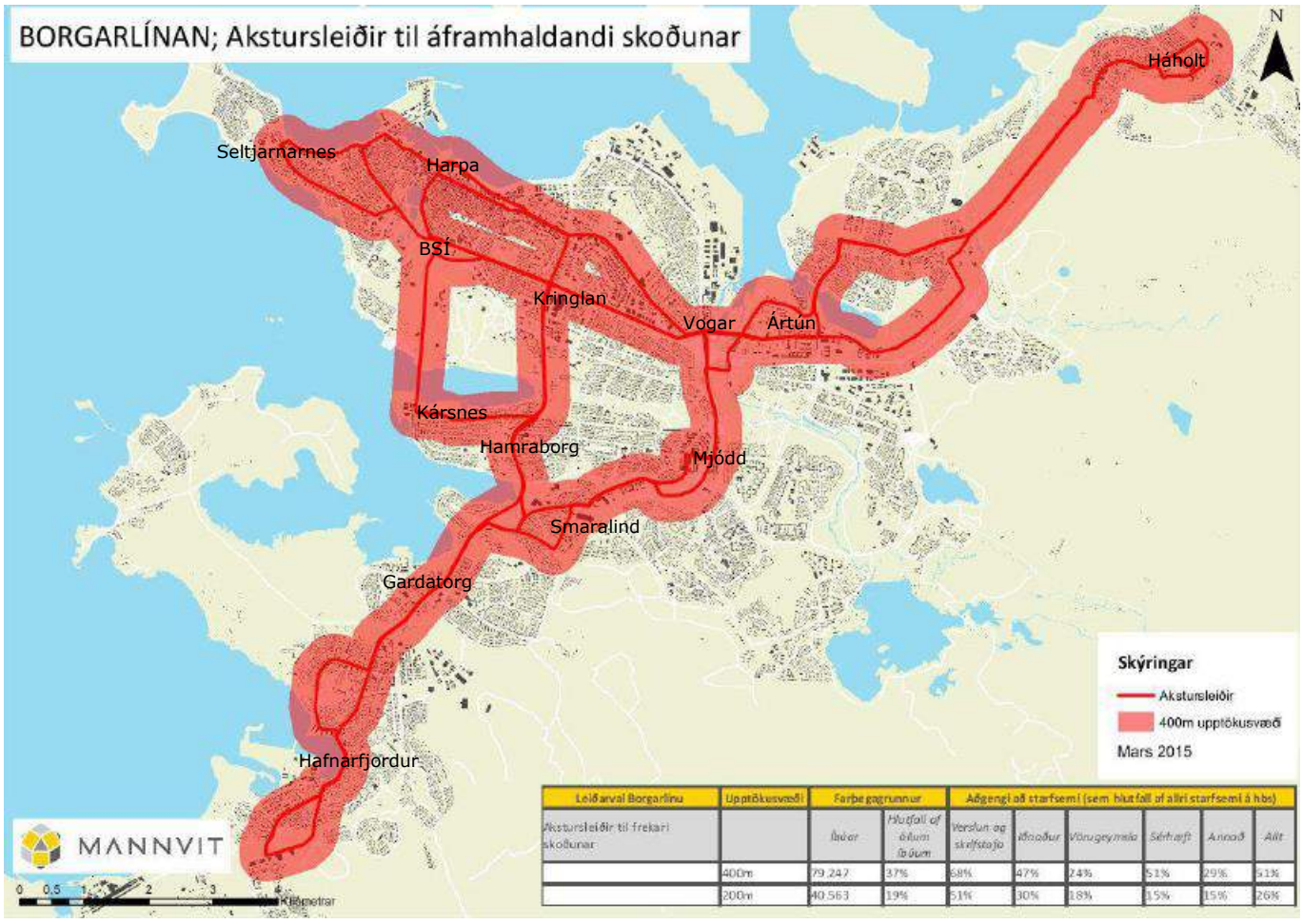
[8] Borgarlínan - Greining Á Bestu Legu - Fasi I, Mannvit, 2015.

In each section, several alignments have been analyzed based on factors like proportion of route with separate track, number of larger intersections on the route, barriers, travel time and catchment area for citizens and business square meter.

It's given in the Regional Plan that the frequent transit corridor should connect all centers and thereby define possible alignment between the 12 centers. The background analysis for the 12 sections for the most part assumes that the Borgarlína should run on existing roads and interrupt the existing urban space as little as possible.

Based on the findings in the analysis, several of the sections do not have room for 100 % separate lanes for the Borgarlína based on the given assumptions. Only 5 of the 12 sections have identified alignments that allows for 100 % separate lanes. The section with the lowest proportion of separate lanes have only 40-50 % separate lanes.

The proportion of separate lanes for the Borgarlína should be as high as possible to be fast and thereby attract the most passengers. This is important to keep in mind when planning a high class public transport system and necessary to reach the goal in the Regional plan of 12 % share of public transport in the Capital Area.



Leiðarval Borgarlínu	Upptökusvæði	Forþegagrunnur		Aðgengi að starfsemi (sem hlutfall af allri starfsemi á höf)					
Akstursleiðir til frekari skoðunar		Íbúar	Hlutfall af öllum íbúum	Verslun og skrifstofa	Iðnaður	Vörugeymsla	Skrifstf.	Annað	Allt
	400m	79.242	37%	68%	47%	24%	51%	29%	51%
	200m	40.563	19%	51%	30%	18%	15%	15%	26%

Figure 22 Alignments within the relevant corridors.

The analysis selects 26 out of the 34 analyzed alignments for the further process. The given alignments are shown in Figure 22. This analysis is preliminary and the selection of alignments was done after a round of meetings with the municipalities at an early stage of the Borgarlína project.

The overall picture is corridors for high class public transport between:

- Hafnarfjörður – Garðabær (Gardatorg)
- Garðabær (Gardatorg) – Kópavogur (Hamraborg)
  - Hamraborg – Kringlan – BSÍ (Reykjavik bus terminal) – Seltjarnarnes
  - Hamraborg – Kársnes – BSÍ (Reykjavik bus terminal) – Seltjarnarnes
  - Hamraborg – Kringlan – Hlemmur – Harpa – Seltjarnarnes
- Garðabær (Gardatorg) – Smáralind – Mjódd – Vogar
- Mosfellsbær (Háholt) – Ártún – Vogar
  - Kringlan – BSÍ (Reykjavik bus terminal)
  - Hlemmur – Harpa

4.2 Workshop input

During a two-day workshop process in November 2016 around 45 persons from the municipalities, the Road Administration, the bus company (Strætó) and more took part in discussing challenges and possibilities regarding *Borgarlína*. During a half day work session they discussed, in groups, corridors and possible alignments. All groups managed to point out relevant corridors and prioritize them as well – the results are summed up below and in Figure 23 and Figure 24 as well in a workshop sum-up-report.

All groups pointed out corridors between (marked with blue at Figure 23):

- Hafnarfjörður – Garðabær (Gardatorg)
- Garðabær (Gardatorg) – Hamraborg – Kringlan
- Mosfellsbær (Háholt) – Ártún – Vogar
- Suðurlandsbraut (Vogur – Kringlumýrarbraut)
- Smáralind – Mjódd – Vogur

Furthermore, most groups (4-5 groups) pointed out corridors between (marked with red at Figure 23):

- Vellir – Hafnarfjörður
- Kringlan – BSÍ – Reykjavíkurtjörn – Lækjargata
- Laugavegur (Kringlumýrarbraut – Lækjargata)
- Hafnarfjarðarvegur (Kópavogur) – Smáralind (two possible options)

Several groups (2-3 groups) pointed out corridors between (marked with green at Figure 23):

- Vellir – Hafnarfjörður
- Miklabraut (Vogur – Kringlan)
- Hamraborg – Kársnes – Reykjavíkurflugvöllur (domestic airport)
- Eiðsgrandi (Seltjarnarness – Hringbraut)

Corridors suggested by only one group between (marked with grey at Figure 23):

- Hringbraut – Harpa
- Hringbraut – BSÍ (Reykjavik bus terminal)
- Snorrabraut (Hringbraut – Laugavegur)
- Laugavegur – Sæbraut – Kringlumýrarbraut
- Reykjanesbraut (Kaplakriki – Smáralind)
- Kársnes – Brekkur – Mjódd – Fell - Norðlingaholt (Kársnesbraut – Nýbýlavegur - Breiðholtsbraut)
- Ártún – Rimar – Korpúlfsstaðavegur

Figure 23 Workshop input from all groups.

The majority of the groups have the following priority of the appointed corridors:

- Priority 1: Hafnarfjörður – Hamraborg – Kringlan – BSÍ
- Priority 2: BSÌ – Laugavegur – Suðurlandsbraut – Ártún – Víkurvegur

› Priority 3: Vogur – Mjódd – Smáralind - Garðabær (Gardatorg)

In the longer perspective, the east-west corridor should be extended to Mosfellbær. Also, the domestic airport and Kársnes are prioritized in the longer perspective and Seltjarnarnes should be connected to the corridors. Rimar, Fell and Norðlingaholt are interesting in the longer perspective due to the density of population and business. A corridor along the Reykjanesbraut has very little catchment area on the eastern side and thereby a lower potential for passengers.

Figure 24 Workshop priority from all groups.

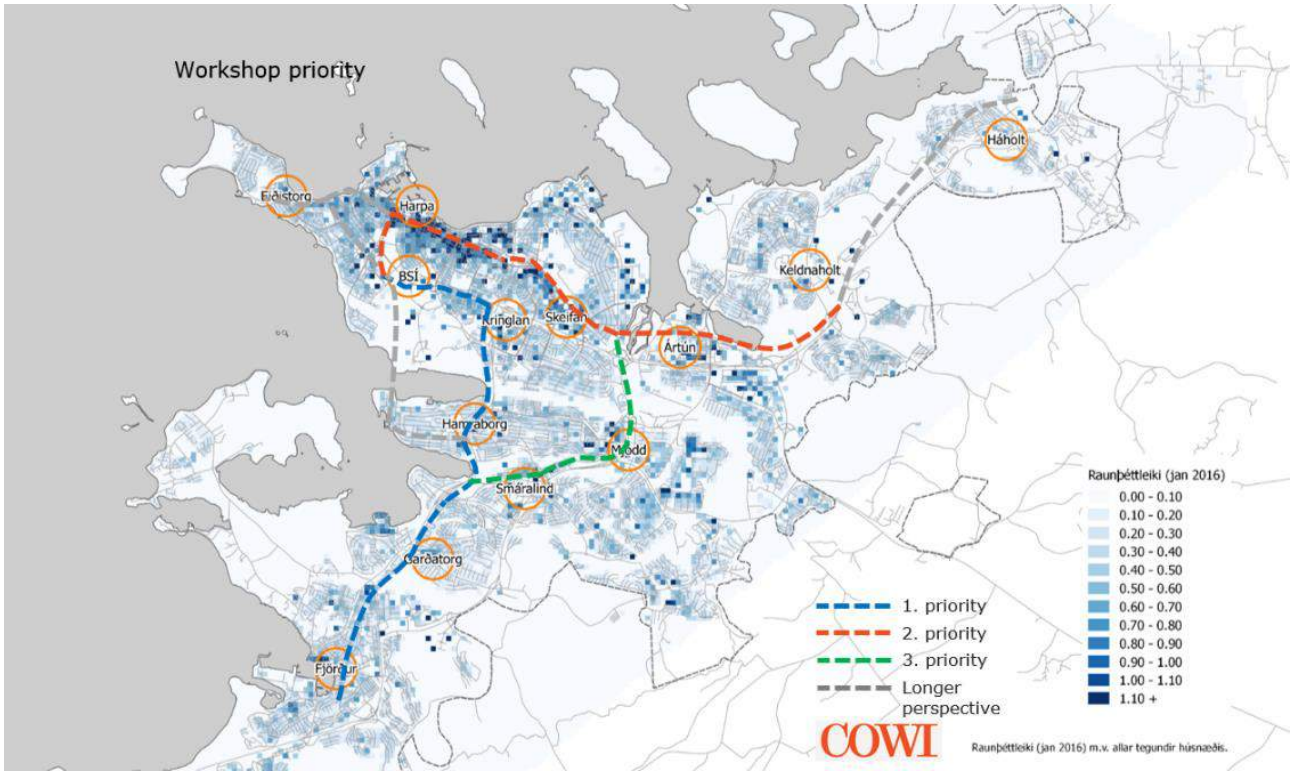


Figure 25 Workshop priority from all groups and density for population and employment.

4.3 COWI ideas

Based on the currently available information on transport need and the current public transport system, as well as input from the workshop, COWI has elaborated some additional ideas for desired lines or corridors, to ensure a full assessment of possible, relevant corridors.

These ideas derive from an overall assessment of were *Borgarlína* ideally should be built to address the biggest passenger potentials. Hence, the ideas are on a very overall corridor level detached from detailed practical issues. Hence the ideas do not stick to existing roads, take terrain slopes into account or look for space to implement the high class alignment. They only give a view of the ideal corridor location with focus on attracting the most passengers.

The ideas can be seen as an external review or an indication of how the first planning step towards a Borgarlína could look like if someone not involved in the process so far should point out the overall corridors with potential for high class public transport.

The appointed corridors are based on maps showing the density for housings and business (square meter) for the exiting situation. Furthermore, plans for future development of housing and business are interesting to have in mind when planning the corridors.

We have gathered information regarding the existing transport pattern showing that the transport pattern is primarily to and from the city center of Reykjavik

which indicates that the need for high class public transport is mostly in a radial direction. There is a low need for transport in a ring perspective looking at OD-data. This information is based on an OD survey[9] and a smaller survey extracting these data from Hafnarfjörður.

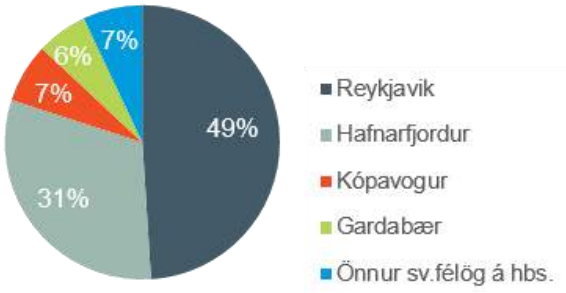


Figure 26 Housing-work transport from Hafnarfjörður, 2012. Source: Viaplan, 2015.

Both of these surveys have some uncertainty built into them, but viewing them together although shows some distinct pattern where the main need for public transport is in a radial direction.

[9] Transport relation based on 2011 and 2014 gathered data. Source: Mannvit 2015.

4.3.1 Population and employment density

The map shows the density of the existing population and employment together with the main city centers/cores defined in the new Regional Development Plan. The densities have inspired to appoint some overall corridors with a potential for a high number of passengers. The ideas are radial corridors to and from Reykjavik city that follows the trend of the transport pattern and ensures transfer-possibilities between the appointed corridors.

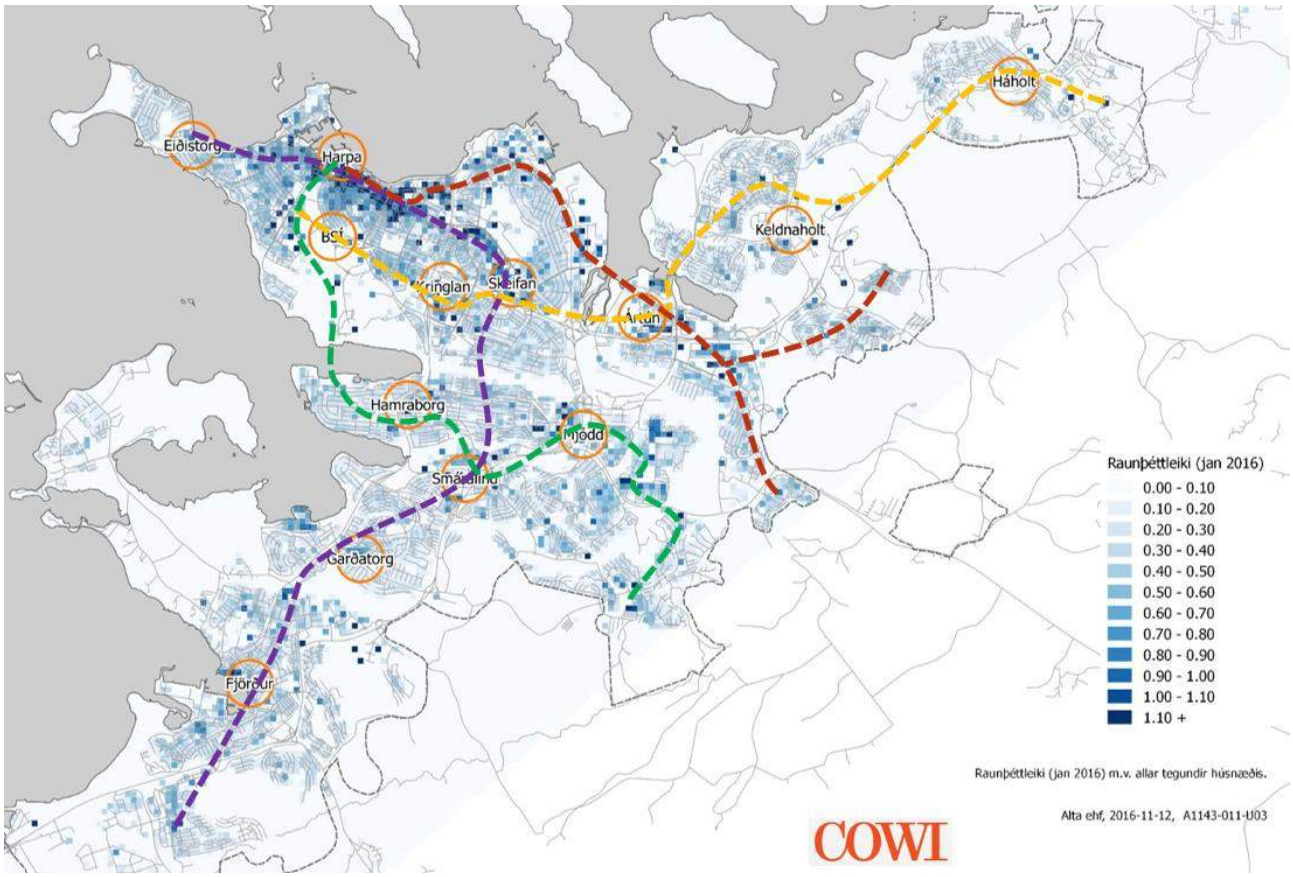


Figure 27 *COWI-ideas for potential corridors for high class public transport presented with a population and employment density background.*

This has led to an idea of four corridors (not presented in prioritized order):

- Yellow line: Hafnarfjörður – Gardatorg – Smáralind – Skeifan – Harpa – Hlemmur – Seltjarnarnes
- Green line: Vatnsendi – Fell – Mjódd – Smáralind – Hamraborg – Midborg (city airport) – University – Harpa
- Red line: Árbær – Ártun – Laugarás – Hlemmur – Harpa
- Orange line: Háholt – Keldnaholt – Ártun – Skeifan – BSÍ (bus station)

4.3.2 Population density

The map shows the density of the existing population. The corridor ideas are located where the existing citizens are living and thereby give a good potential for high passenger volume.

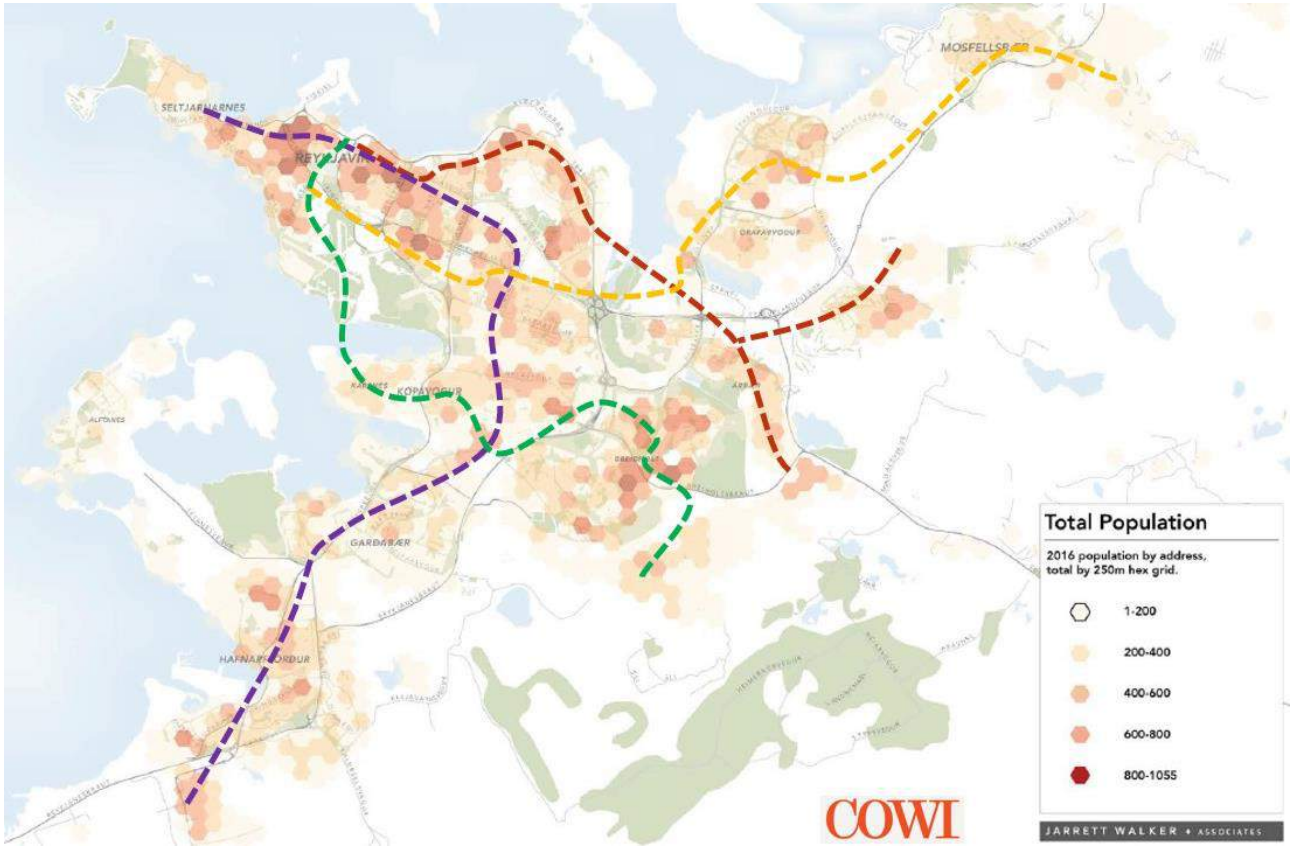


Figure 28 *COWI-ideas for potential corridors for high class public transport presented with a population density background.*

4.3.3 New housing location

The map shows the potential/planned location of new houses in the Capital area and the volume of the number of housings. The corridors are located where new housing projects are planned and thereby gives a good potential for a sustainable urban development and a high passenger volume.

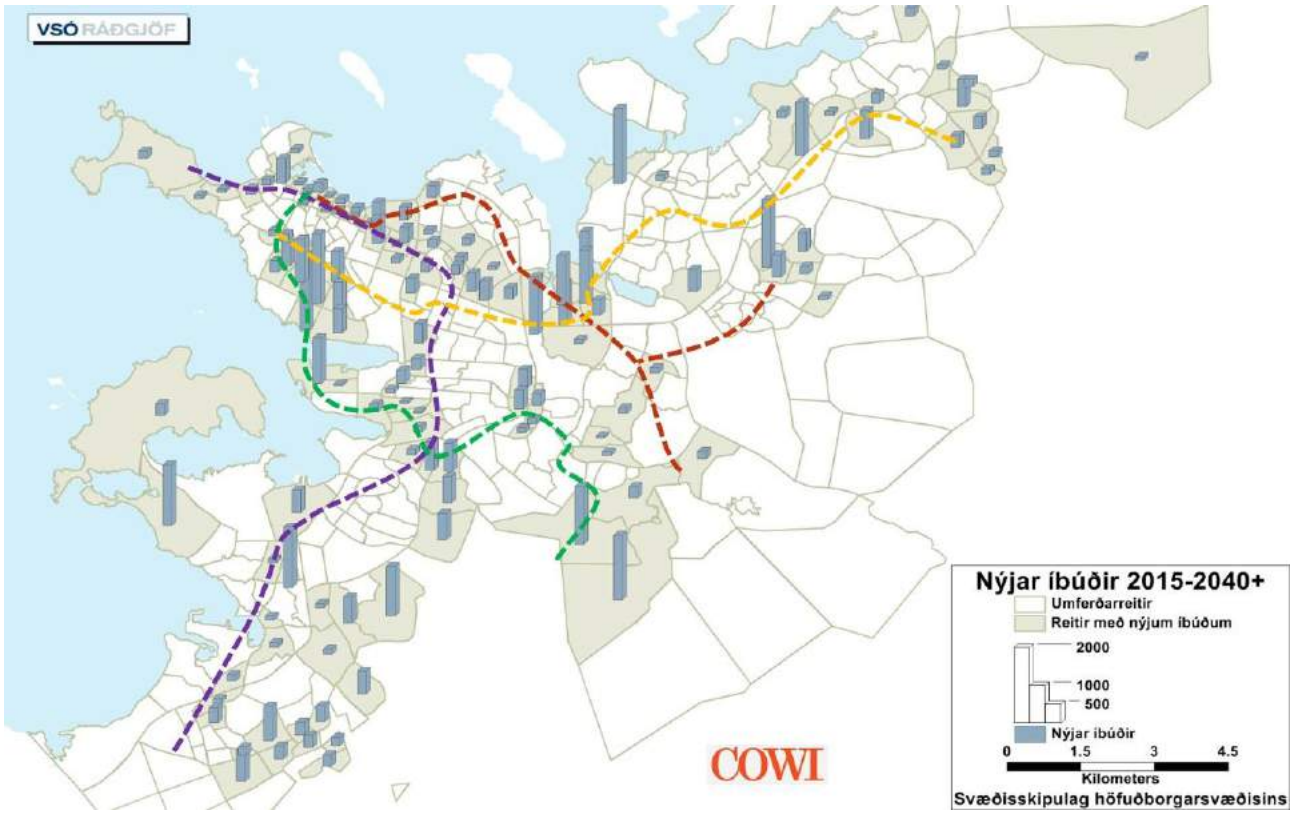


Figure 29 *COWI-ideas for potential corridors for high class public transport presented with potential new housings as background.*

4.3.4 Employment density

The map shows the density of the existing employment (given as square meters of business floor space). The corridors are located alongside existing employment and thereby give a good potential for high passenger volume.

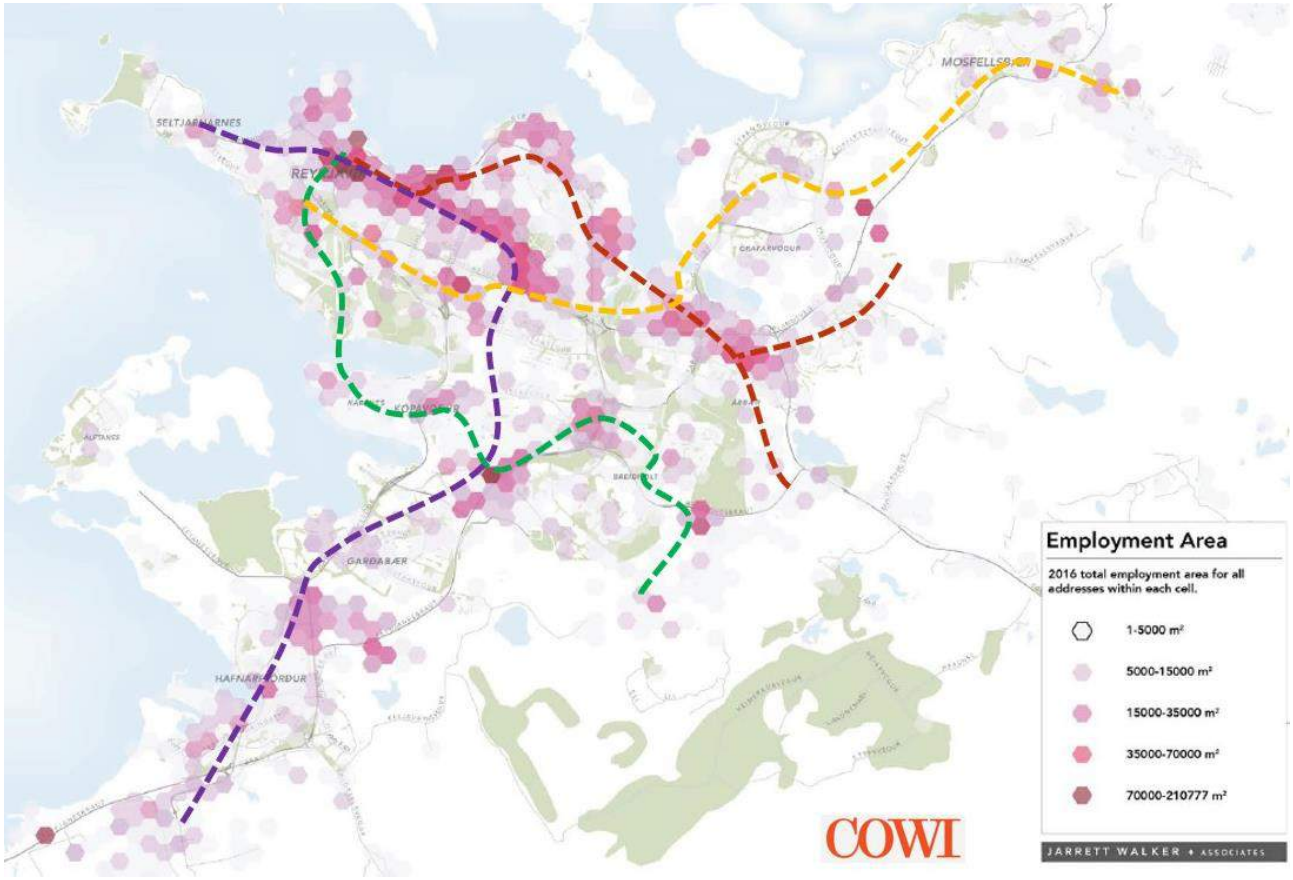


Figure 30 *COWI-ideas for potential corridors for high class public transport presented with an employment density background.*

4.3.5 New employment location

The map shows the potential/planned location of new employment in the Capital area and the volume of the number of business (given as square meters of business floor space). The corridors are located where the new employment is planned for the most part, and thereby give a good potential for a sustainable urban development and a high passenger volume.

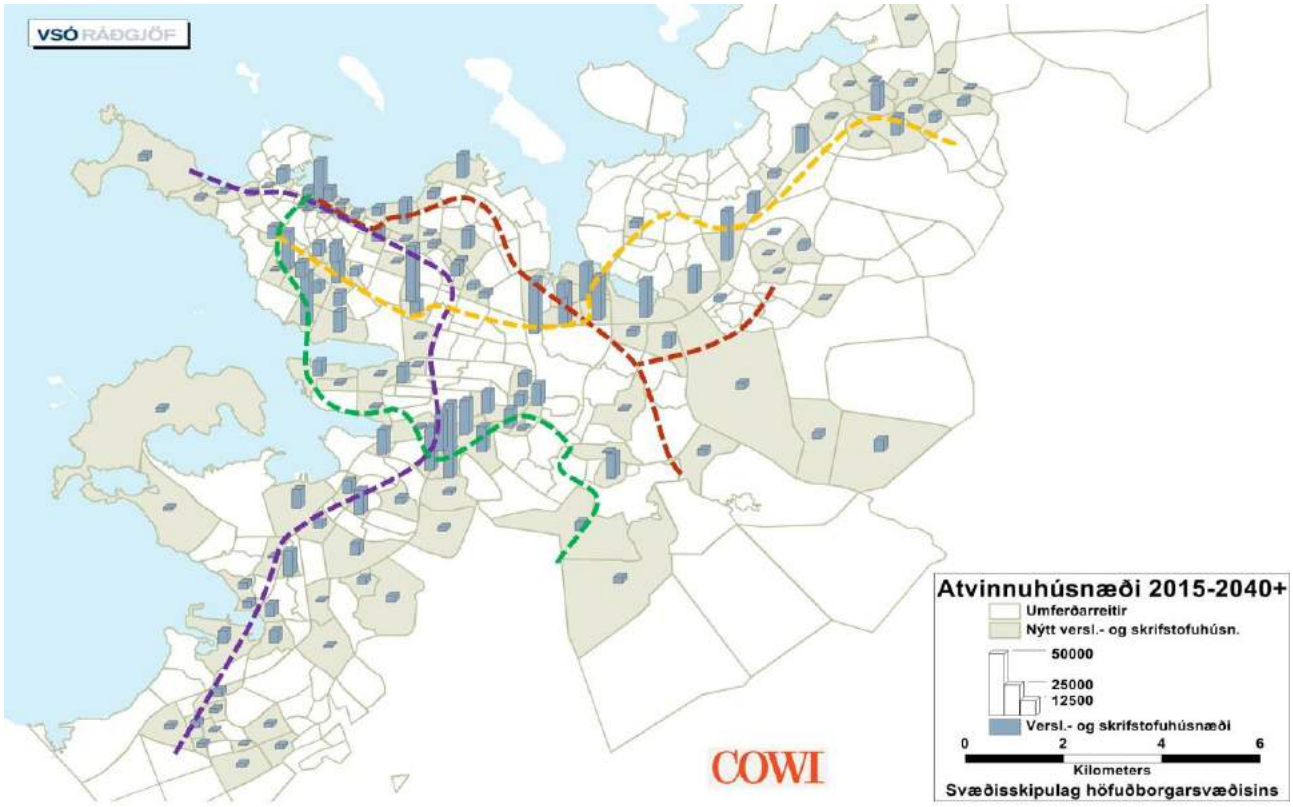


Figure 31 *COWI-ideas for potential corridors for high class public transport presented with potential new employment location as background.*

4.3.6 Education and other regional POI

The map shows the location of universities and education institutions together with shopping malls and the National Hospital. These regional functions are important for the public transport and vice versa as there is a high potential for use of public transport to and from these functions.

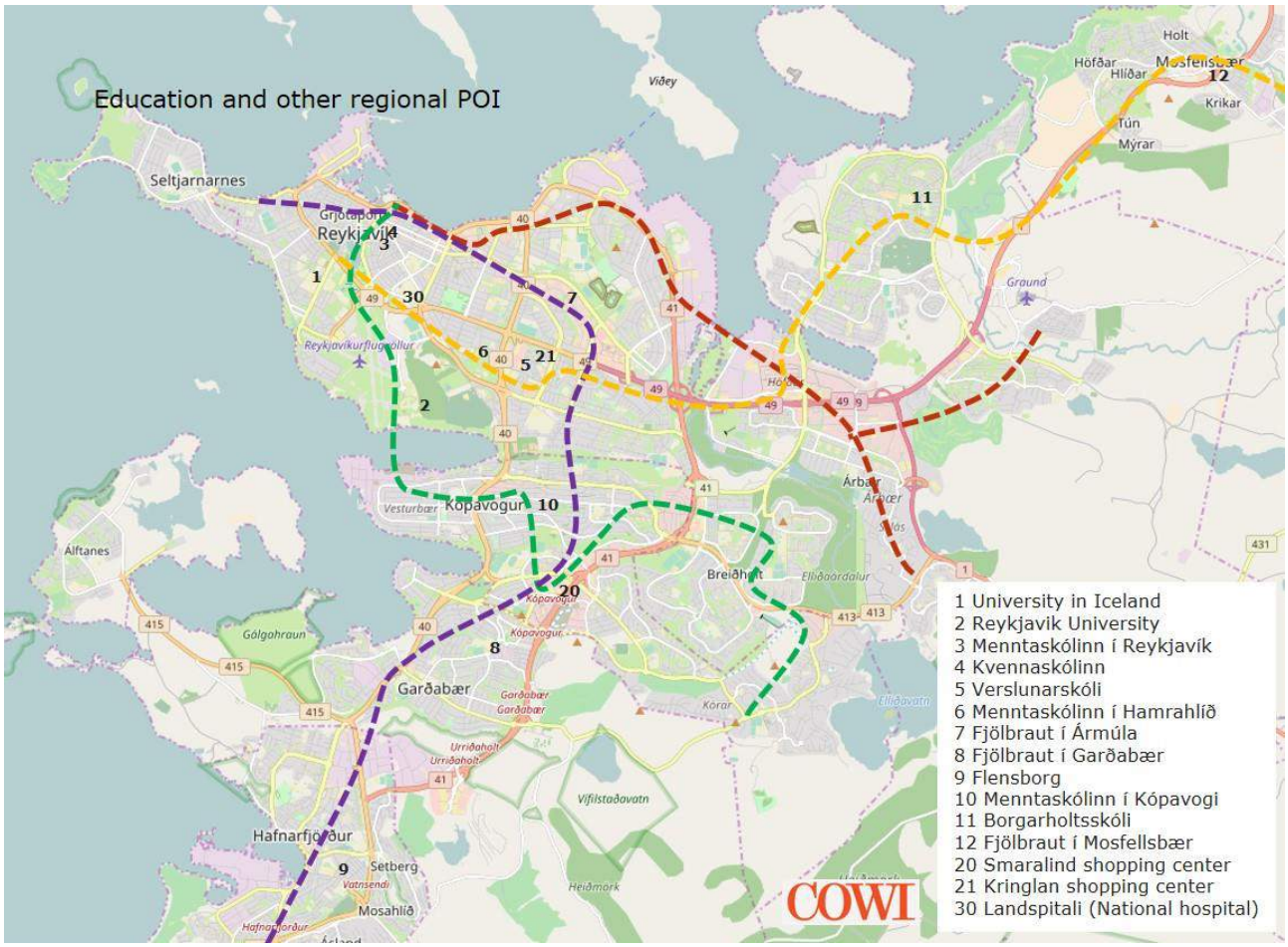


Figure 32 *COWI-ideas for potential corridors for high class public transport presented with education and other regional Points of Interest as background.*

As seen on Figure 32 most of these functions are close to the potential high class corridors for public transport.

5 Strategy for Borgarlína - service vision and planning principles

This chapter describes the strategy for the Borgarlína – setting up the service vision and planning principles for giving the best conditions for an attractive high class public transport. Furthermore, supporting measures and urban development measures should be integrated to ensure a successful high class public transport system.

The different aspects of service vision and planning guidelines is based on the features and measures of Figure 33 that needs to be considered when planning for a successful and attractive high class public transport system.

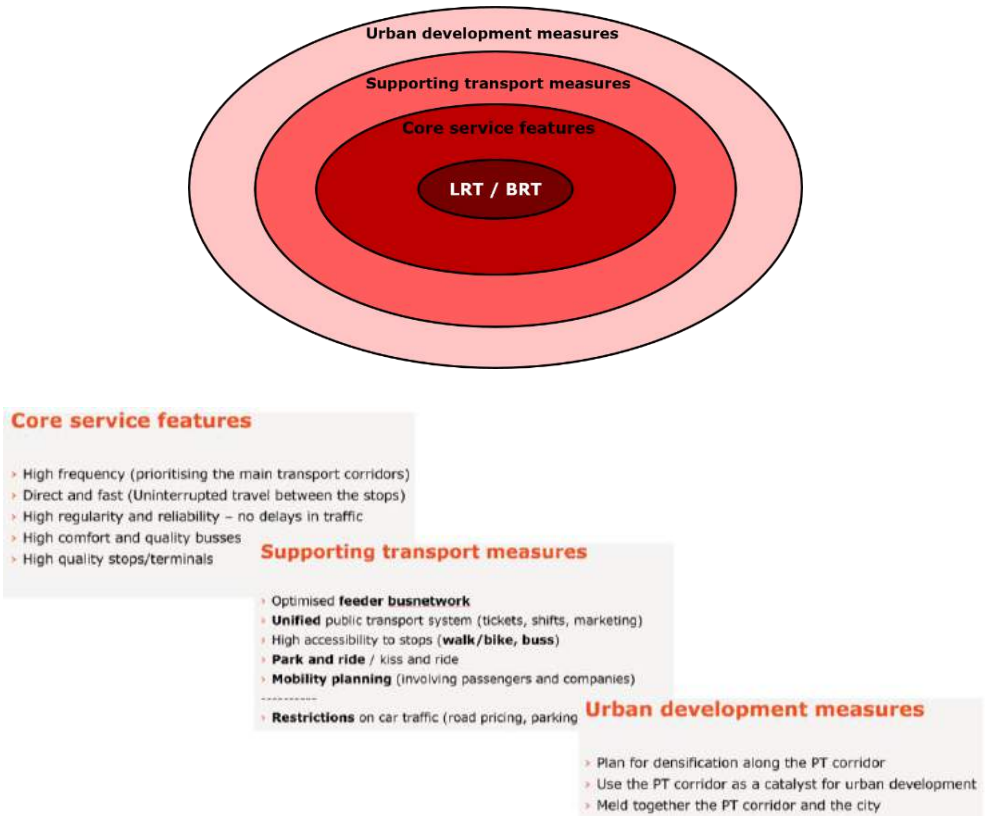


Figure 33 Features and measures to make an attractive public transport system.

5.1 Service vision and planning principles

The vision for the public transport and the urban development strategy needs to be based on some clear goals and guidelines for the development of the future public transport. This process is important to ensure a high class system that is tailored to the situation in Reykjavik and will benefit attracting as many passengers as possible. Furthermore, this process is good practice to ensure uniform principles for the overall planning of the future public transport system.

The overall vision is a new high-quality public transport system that ensures efficient transport, high frequency, quick travel and integrates effective transport and attractive development areas. This is in line with the overall international best practice principles to create a public transport system that is demand-oriented and seeks optimal utilization of the resources.

The design of a successful public transport system could be based on these planning principles;

- Simple and direct network structure
- High frequency and long service hours
- Low travel time and regularity
- Coordinate convenient transfers
- High comfort and quality for buses and stops/terminals
- Integrated mobility – the seamless travel

Planning principle 1: Simple and direct network structure
First of all, it is important to establish a simple and stable network of public transport lines that is intuitively comprehensible to users and in particularly to prospective users too. This is organized on the principle of 'one section – one line', where a consolidation and concentration of multiple similar adjacent lines into fewer and simpler lines is undertaken where possible.

A network with lines that follow direct routes in order to support fast operating speeds and attract passengers and with clear nodal points at intersections with other lines has to be established. The straighter the lines, the faster service. The network has to display clear and logical service frequencies during the day so that users can easily grasp the timetables for key periods (relevant to their travel).

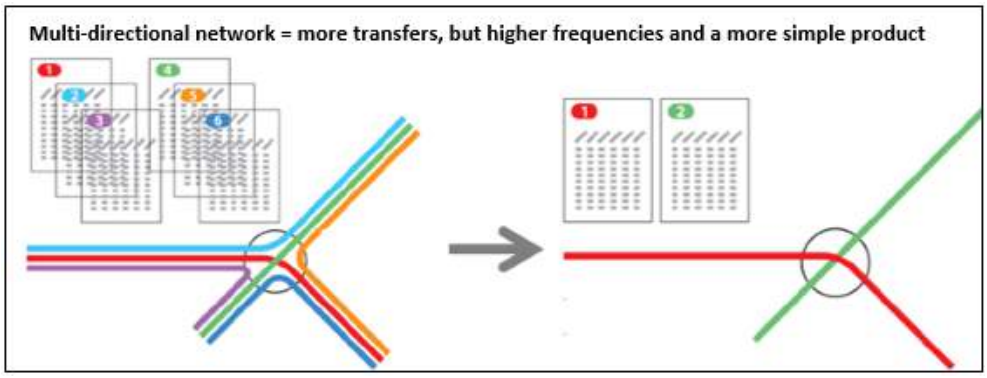


Figure 34 *A simple product can be achieved by prioritizing the resources on fewer lines with higher frequency and easy shift. Source: HiTrans, Best Practice Guide, 2005.*

Borgarlína
Focus at a direct line that goes through the most important and dense areas. This will attract most passengers and enable fast service.

Better to have one line with high frequency.

Planning principle 2: High frequency and long service hours
Public transport networks require a high frequency to be attractive both in terms of total travel time and inconvenience for transfer between bus lines. A high frequent line increases the probability for a departure that fits all passengers and potential users and increases the comfort knowing that the next departure runs within a short time. The period of service is also important so the passengers can use the public transport for more than transport to and from work.

Normally a transfer between two lines is a major impediment to public transport use, partly because of the psychical inconvenience of changing buses and the waiting times this entails and partly due to the increasing travel time this normally implies. The more lines that have a high frequency the better conditions for interchanges allowing the passenger easier access to large network.

At best, such a network functions without the need for the passenger to look at timetables at all. This is based on a minimum service every 5-10 minutes throughout the day (=interval timetabling). This is the interval that gives the optimal frequencies and an even higher frequency does not give any remarkable reduction in travel time. A frequency worse than 10-minutes service leads to high average time spend waiting for the next bus, and the need to consult timetables and plan your journey becomes important.

Due to optimal resource utilization, the high frequencies should be prioritized along the corridors with high demand for transportation as this is where the potential for attracting new passengers is highest.

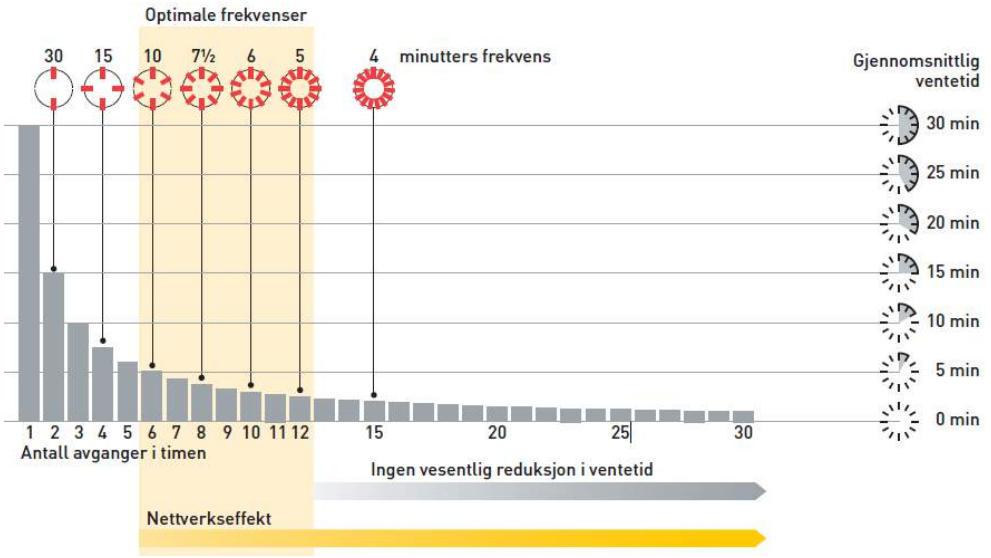
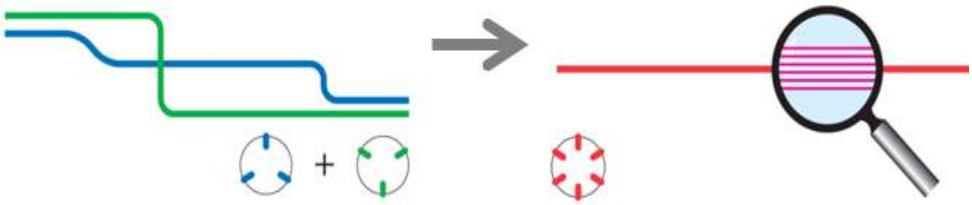


Figure 35 *Optimal frequency for bus service indicating the number of departures per hour and the average time spend waiting for the next bus. Source: Ruter, 2011.*

The simple, direct (fast) and high frequent bus network means low travel time for most passengers, but leads to longer walking distances and more transfer between bus lines.



The long service hours are necessary to attract as many types of passengers as possible. The public transport should be for all possible customers and thereby have service hours that enables customers travelling outside the most used service hours. This could be late service offered combined with transport to and from for example visits to the cinema, theater and dining out or simply having late/early meeting times. If the public transport is not available in one direction of the total journey the traveler will not use the public transport at all.

We carried out a review (Figure 36) of the service hours and frequencies for chosen high class public transport systems in Scandinavia. The reviewed high class public transport systems are:

- Loop City - Copenhagen (future LRT)
- Aarhus (future LRT)
- Odense (future LRT)
- Aalborg (future BRT and existing bus line 12)
- MalmöExpressen (BRT)
- Lund (bus line 3 and 4 – separated bus lanes)
- Bergen (Bybane and bus line 2)
- Stavanger (bus line 1 and 5)

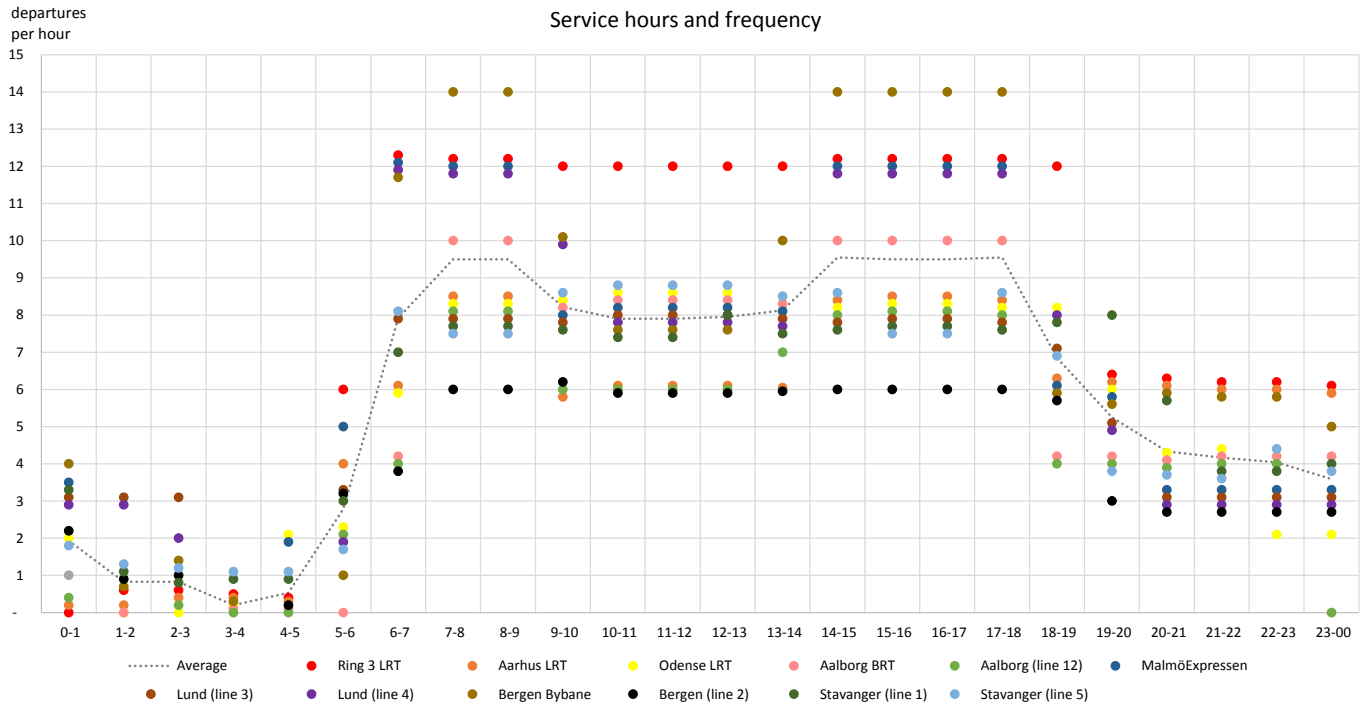


Figure 36 *Service hours and frequency for high class products in Scandinavia. The LRT/BRT systems in Denmark are based on the proposed operational plans.*

The review shows following trend:

- few systems have 24 hours service (only Stavanger)[10]
- the majority offer service from 5 in the morning until midnight
- 2 out of 3 offer service until 1 in the night
- nearly half of the cases do offer service between 1 and 3 at night
- high service is offered in peak hours – average of 6,5-minutes service (minimum 10-minutes service and up to 4-minutes service)
- service during daytime is also high – average of 7,5-minutes service (minimum 10-minutes service and up to 5-minutes service)

[10] More systems are supported by night buses – not necessary running along the whole high class public transport line.

Borgarlína
Offer long service hours to accommodate for most transport needs – at least between 5 and 1.

Frequency at weekdays:
- Peak hour service: 8 minutes service as a minimum
- Daytime service: 10 minutes service as a minimum
- Evening service: 15 minutes service as a minimum
- Night service: 30 minutes service as a minimum

Reduced frequency at weekends - but 24-hour service.

Planning principle 3: Low travel time and high regularity
In general, public transport planning should aim for reducing the travel time to a level where it is comparable to car transport.

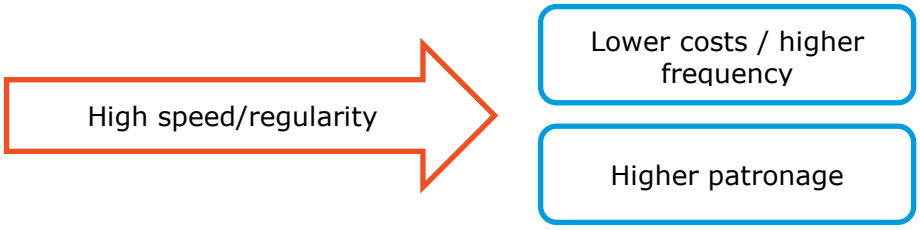
The travel time is one of the most important arguments for choosing the car instead of the public transport system and experience from Denmark shows that when the travel time is lower for public transport most people choose to use the public transport system.

Though travel time is important for the passengers, it is often even more important to ensure high reliability. If the travel time varies many passengers will lose faith in the system, and will use other means of transport especially on trips where the arrival time is important.

Keeping travel time low and reliable requires interventions to support priority for public transport, e.g.;
- Dedicated bus lanes
- Priority through signalized crosses
- Advanced priority stops at intersections
- Optimized stop-distance
- Optimized boarding/ticketing

The most common measure to ensure low travel time is to improve the accessibility (pass ability) by introducing bus lanes and priority in signals and stops. This will also ensure good regularity meaning it's possible to trust that the public transport service is reliable and on time.

The distance covered between stops can be critical. Every stop takes time and increases the total travel time. A balance of good accessibility to public transport everywhere contra high travel speed must be determined.



The higher the speed and regularity the more passengers will use the system. This has the benefit that the costs for the offered service will decrease (faster and more revenue) and this saved cost can be used to increase the frequency and thereby again increase the number of passengers. This is the positive spiral that leads to cost-effective green forms of transport.

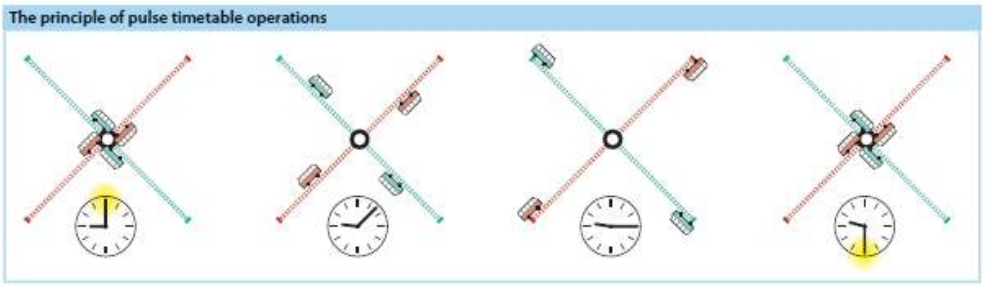
Borgarlína
Focus on high speed and regularity by:
- dedicated bus lanes
- priority through signalized crossings
- optimal stop pattern – aiming at an average distance of 600m (lower where the passenger potential is high)

Goal: Maximum 50% longer travel time with Cityline than car in the corridor

Planning principle 4: Coordinate convenient transfers
Even though the idea is to have as high frequency as possible the resources should be put into those lines with the highest passenger potential. This leaves some lines with a lower frequency and these lines should be planned to support the total public transport system and make the use of it as easy as possible for the passengers.

Therefore, the coordination of convenient transfers is vital for having a successful public transport system. When using low frequent buses feeding to high frequent lines the transfer is not an issue as there will rarely be long time to the next departure on the high frequent line. On the other hand, when going in the other direction towards the lower frequent buses the transfer needs to be planned and thereby as convenient as possible.

This can be done by using techniques such as 'timed transfers' or 'pulse' timetabling to ensure simplicity and minimal waiting times.



The first step is to coordinate the timetables between the services to render transfers easy.

Next the physical conditions at hubs, minor and major terminals and stations must be designed to be manageable and to possess the necessary qualities that generally support switching bus. This means short, secure and manageable

points of access between different bus lines and different modes of transportation.

Additionally it is very useful to offer the travelers real-time information on transfer times at bus stops, terminals, stations in the buses and on mobile platforms.

Borgarlína
Focus on coordinating the supporting buses with each other and with the Cityline.

Information in buses and at mobile platforms about transfer options as well as real time information to keep the passengers updated about their transfer.

Planning principle 5: High comfort and quality for buses and stops
The quality and comfort for users of the public transport system is important to make it attractive and therefore focus has changed towards offering attractive conditions for the passengers.

The increased quality of the buses make it comfortable for the passengers to travel. The car is the alternative and the car is characterized by high comfort and offering you privacy during the journey. To compete with that it is important that the buses are not crowded and generally offer good seating (standing) conditions. Extra service features such as WIFI is also a way of making the public transport more attractive. For longer journeys good working conditions is the clear benefit of using the public transport compared to a car.

The quality of the stops and terminals is also very important as it is often the first encounter with the public transport system. Therefore, it is important that the stops and terminals are well-arranged, easy-to-use, comfortable, clean and offering exact the information that each passenger needs. This means that the shelters and interior should be of a high quality and the information given should be targeted information. An example could be real time information showing the next departure (count-down) or operational disturbances, which is a convenient way to keep the waiting passengers well informed.

There should be good parking conditions for bikes (Bike and Ride) and cars if Park and Ride is available.

The journey should offer a comfortable flow with as high speed as possible to be fast and attractive. This places great demands on the given infrastructure in form of right of way and prioritizing in signals to avoid or reduce uncomfortable braking.

Borgarlína
Focus on offering sufficient capacity as passengers prefer privacy instead of crowded buses and secure comfortable seating.

Be aware of the practical capacity instead of technical capacity in the vehicles given by supplier.

Provide WIFI onboard.

Ask the passengers (existing and potential) what else they prefer as services onboard.

Plan for good bike facilities – including parking (e.g. Bike and Ride).

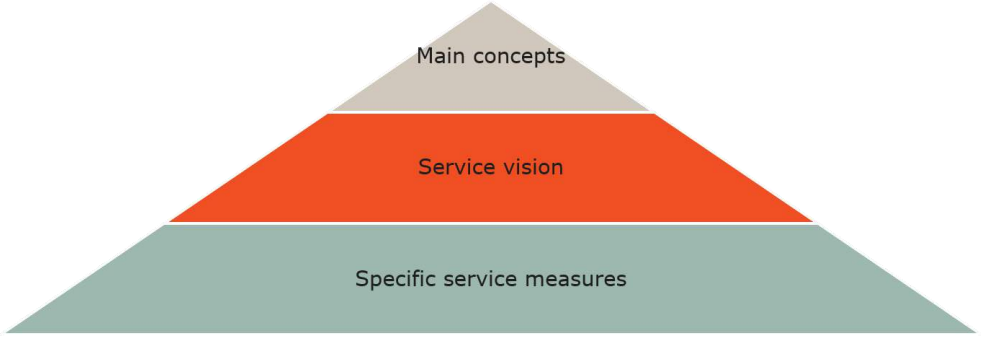
Planning principles
These principles should lead to an attractive public service that ensures that the resources are used optimally and that public transport in different areas can be treated in a consistent manner. Local circumstances may make it difficult or impossible to implement all principles fully in all situations - at the same time, the principles may sometimes contradict each other. These principles therefore need to be seen as guidelines.

These planning principles have been used widely for many years and support the policies from the new Regional Development Plan. Furthermore, these planning principles are in line with the indicators given from the Jarrett Walker report (2016) which are density, walkability, linearity and proximity.

This service vision and planning principles were discussed in the groups during the workshop for public transport (November 2016). The participants were given the task to discuss what the service goals (for the core service features) should be in Capital Area to develop a high class experience.

5.1.1 Workshop input

A lot of service visions and planning principles came up at the brainstorms during the workshop and these were presented in a prioritized order. The service goals had different levels; from main concepts to specific service measures.



Main concepts:

- Must be easier to take public transport than car
- Practical, feasible and tempting
- Public transport should be the natural first choice
- Promote sustainable lifestyle – new way of thinking
- Change the image of public transport from not to hot (hip and cool)

Service visions/planning principles:

- Frequency between 10 min and 5 min headway
- High speed – few stop; e.g.: Hafnarfjörður-city center – 10 stops
- High reliability
- High coverage is important – prioritize coverage where the need is
- Maximum one transfer on the way
- Must bind together the nodes from a direct line

All these elements are covered by the planning principles set up.

5.2 Supporting measures and urban development measures

The overall vision is a new high class public transport system that ensures efficient transport, high frequency and fast travel. This is supported by high mobility for the green transportation and integrates effective transport with attractive urban development areas.

5.2.1 Supporting measures

To support the public transport system it is very important to ensure the best possible connection between all the sustainable transport modes. This will enhance the accessibility to the stops and the more convenient the facilities are for transfer between the sustainable transport modes, the better. This will help to increase the ridership for public transport and reduce car ridership.

Furthermore, the combination of car and public transport use, should be enhanced by giving good facilities for using the car where the public transport service is low and then transfer to the public transport system where the service is high. The relevant measures to enhance this support are:

- Optimized feeder bus network
- Unified public transport system (tickets, shifts, marketing)
- High accessibility to stops (walk/bike, bus)
- Park and ride / kiss and ride
- Mobility planning (involving passengers and companies)
- Restrictions on car traffic

The high accessibility to stops is very basic and one of the most important measures. This goes both for walking and cycling and focus should therefore be on improving the bike & ride facilities since that is a good way to increase the catchment area of the public transport system. Further the bike lanes and foot-

paths between the stations and where the passengers are should be direct, easy, safe and attractive. At stations with potential for bike and ride passengers, there should be bike facilities for parking the bike (roofed and/or locked) close to the station and cycle pumps. Good quality shelters are also important in making the public transport attractive.

The public transport users are dependent upon the system being seamlessly tailored together to meet everyone´s transport pattern.

Attracting car drivers to use the public transport by park & ride and kiss & ride-facilities helps to increase the number of passengers. This is especially relevant for a high class (high frequent) system that is in line with the high transport flow. To make the public transport more attractive, restrictions to the car traffic should be considered. This could be by implementing road pricing/toll road, change conditions for parking and decrease accessibility for car traffic by limiting the capacity towards the most attractive locations and/or increase the travel time by giving the priority to the public transport instead of the car traffic.

We recommend to optimize the feeder bus network and create high and easy accessibility to all stops. This should be supplemented by working with mobility plans for larger companies and institutions as well as implementing a parking strategy that favors the use of the public transport by changing the supply of parking lots and price for parking.

5.2.2 Urban development measures

The integration of the public transport system and the urban development is vital to ensure a system that will benefit the Capital Area as a whole. The public transport will benefit from a higher customer base and the resources will be put into corridors with a high demand for transportation. The urban development will have a strong public transport to build upon and be able to develop in a more environmental way.

This is the basis of transit oriented development which is the main goal of the regional development plan, where *Borgarlína* is the main concept.