

## **0 Executive Summary**

In the Østerbro area, which is in front of the new cultural hub “Nordkraft”, the City of Aalborg has established a shared space area to provide for soft modes. The reconstructed area covers two perpendicular streets: 200m of Østerbro street and 40 m of the crossing street, Kjellerupsgade.

The use of the surrounding area has totally been changed during the last years and a number of activities and attractions have been established along the harbour front. Therefore, a redesign of the street was necessary to facilitate this increased activity in the area and the associated expected increased traffic. Thus, redesign of the area was done to contribute to general traffic safety in the area.

Overall, the area is redeveloped with shared space for cars and cyclists and an area is allocated to pedestrians. Since, it is a ‘shared space’ where the areas are not separated by kerbs, but instead marked out by different kinds of pavement. In accordance with this, the thought behind shared space is to make the different modes of transport aware of each other and hence to take each other into consideration and lower their speed.

The measure has been evaluated through traffic counts, registration of accidents and through an attitude among cyclists and pedestrians using the area. Results of the evaluation show that:

- The number of vehicles at the street has increased with nearly 13% as expected due to the changed use of the harbour front, especially Nordkraft. However, the average speed level in the area has decreased by 3,1 km/h and the 85% quartile has decreased by 5,8 km/h. The decrease in speed level indicates that the redevelopment has had the intended positive effect on the speed levels and thus on traffic safety.
- The number of cyclists in a normal weekday counted in May 2010 before the reconstruction of the street was 3400 cyclists. After the reconstruction in September 2011 the number of cyclist was 3050 cyclists, and in September 2012 the daily number of cyclists was 2350. This indicates a decrease in the number of cyclists. The redevelopment of the area had as a consequence that dedicated cycle lanes were removed and cycling were integrated in the shared space traffic, including the growing numbers pedestrians in the area. These changes have in fact caused that the cyclist feel less safe than before. As a consequence some of the cyclists now prefer alternative routes.
- In the survey, most of the respondents are young cyclists and frequent users of the area. In general, most respondents (82 %) are satisfied or very satisfied with the area. The respondents think it is safe for pedestrians to travel in the area (80 %) while they regard it as rather unsafe for cyclists (44 %). It is remarkable that a high share of the respondents (48 %) state that the shared space is not functioning very well.
- The number of accidents registered in a year after the end of the construction work is lower than expected, both outside the rebuild area, and none accidents with pedestrians or cyclists is registered. However, there are statistically uncertainties related to this short time, and even though the results indicates a positive effect on the safety, no firm conclusions on the effect can be given.

## **A Introduction**

### **A1.1 Objectives**

The measure objectives are:

(A) High level / longer term:

- To reduce the number of casualties as a result of roadside accidents.
- To ensure a safe environment for pedestrians and cyclists.
- To increase accessibility of public transport.
- To increase quality of urban space and prioritise safe, secure and clean collective modes.

(B) Strategic level:

- (1) To reduce the number of accidents resulting in injuries or death in the corridor by 40 % in 2012 with the baseline in 2005.

(C) Measure level:

- (2) To provide a safe environment for soft modes in the city.

### **A1.2 Target groups**

- Pedestrians
- Cyclists
- Public transport

Target area:

- City level

## **A2 Description**

In the Østerbro area, which is in front of the cultural hub “Nordkraft”, the City of Aalborg has established a shared space area to provide for soft modes. The street is approximately 200 metres in length and around 40 metres of the crossing Kjellerupsgade has also been reconstructed. The street functions as an important route for cyclists, commuting between the City Centre and the University, related with the “Cycle motorway” implemented in measure AAL51. Also, two bus lines run along the street.

The use of the surrounding area has been changed during the last years and a number of activities and attractions have been established along the harbour front. Therefore, a redesign of the street was necessary to facilitate the increased activity in the area and the associated expected increased traffic. Thus, redesign of the area was done to contribute to general traffic safety in the area.

Overall, the area is redeveloped with shared space for cars and cyclists and an area is allocated to pedestrians. Since, it is a shared space concept where the areas are not separated by kerbs, but instead marked out by different kinds of pavement. In accordance with this, the thought behind shared space is to make the different modes of transport aware of each other and hence to take each other into consideration and lower their speed. The experience with this way of designing the street is that the increased awareness results in improved safety even though it can result in that the people using the area experiences a larger degree of insecurity and reduced perceived safety.

### **A3 Person in charge for evaluation of this measure**

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## **B Measure implementation**

### **B1 Innovative aspects**

The innovative aspects of the measure are:

- **Targeting specific user groups:** To rebuild a street, so that cars have the same terms to act in the streets as other means of transportation. Safe and secure environment for soft modes, on expense of car traffic. Increase accessibility of public transport.

### **B Planning of Research and Technology Development Tasks**

Not relevant.

### **B3 Situation before CIVITAS**

The project area is marked on Figure 1 and is located in the city centre in connection to the harbour front. The central section of the harbour front in Aalborg is currently under re-development. Within a 1 kilometre section, the old harbour front has been redesigned. Nordkraft – the new Civic Centre for multiply cultural activities, and nearby the new city beach constructed in autumn 2011. Between Nordkraft and the waterfront, a concert house, House of Music, is under construction and is planned to be finished in 2013. On the southern side of the street is the former Tivoli, Karolinelund, which in the future will also be redeveloped. A few hundred metres to the east is a green area, Østre Anlæg, and another redevelopment area, Østre Havn. In front and to the west, there is a new city park with more activities, an open-air harbour-bath, more restaurants, an exhibition centre including (among other things) a part of the university.

To promote this area's new role as an attractive recreational area, and to ensure road safety for vulnerable road users in the area, it is the ambition to manage the traffic more on the terms of the soft road users. To achieve this, a main road (Nyhavnsgade) separating the city centre and the waterfront has been narrowed from 4 to 2 lanes, to encourage cars to choose the alternative ring road. And as an output of the ARCHIMEDES measure 42, the road Østerbro, at one side of the Nordkraft Civic Centre, has been redesigned and reconstructed as a Shared Space road.

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Figure 1: The redevelopment of Østerbro and Kjellerupsgade streets is marked with red, whereas the surrounding areas are written in white.



Figure 2: Østerbro in front of Nordkraft before the redevelopment.

## B4 Actual implementation of the measure

The measure was implemented in the following stages:

**Stage 1: Planning the area (15 Sept. 2008 – 14 Aug. 2010)** – A company with an specialist architect and road safety expertise were chosen to design the redevelopment of the area. The same company was responsible for the redevelopment of two areas: Teglgårdsplads and the area in front of and behind Tivoli (Karolinelund) to achieve a unique and coherent design.

First, the landscape architecture company made a sketch of the area in dialogue with people from the ARCHIMEDES team and from the Project Engineering Department. During this process, a range of different ideas were discussed, the principles for the shared space concept were chosen and the speed limit and the physical measures and design were fixed.

In the next phase, the company made the detailed drawings for the project and for this part they teamed up with the Danish Consultant company, COWI, as they are experts in traffic planning. The landscape architect company designed the project in dialogue with COWI and the Project Engineering Department, Afterwards COWI made a traffic safety revision to the project. During this period of detailed planning the elements of the project were discussed with the local police and with the bus operators. These discussions secured that the design elements, especially the speed reduction measures, were effective while at the same time still acceptable for car and bus traffic.

Once the planning completed, the implementation was tendered out. Five companies made an offer and Hirtshals Entreprenør Forretning were chosen to be the constructors.

Knowing the problems the Danish winter can cause for infrastructure work, the implementation schedule in the contracts was setup so all the infrastructure work could be finished before the start of winter, even though the official deadline according to the DoW was set to 14<sup>th</sup> March 2011.

**Stage 2: Implementing of the street adjusted to slowly moving traffic (15Aug. 2010 – 14 June 2011)** – Implementing the solutions, so the street will be safe for soft mode and buses.

Several features are part of the redevelopment of Østerbro and Kjellerupsgade into a road with provision for soft modes. In general the overall objective of the project was to make the road a shared space area, which means that there is no physical separation between the different modes of transport and no signals. Instead an integrated, people-oriented understanding of public space is strived for. An outline of the road is shown in Figure 3.

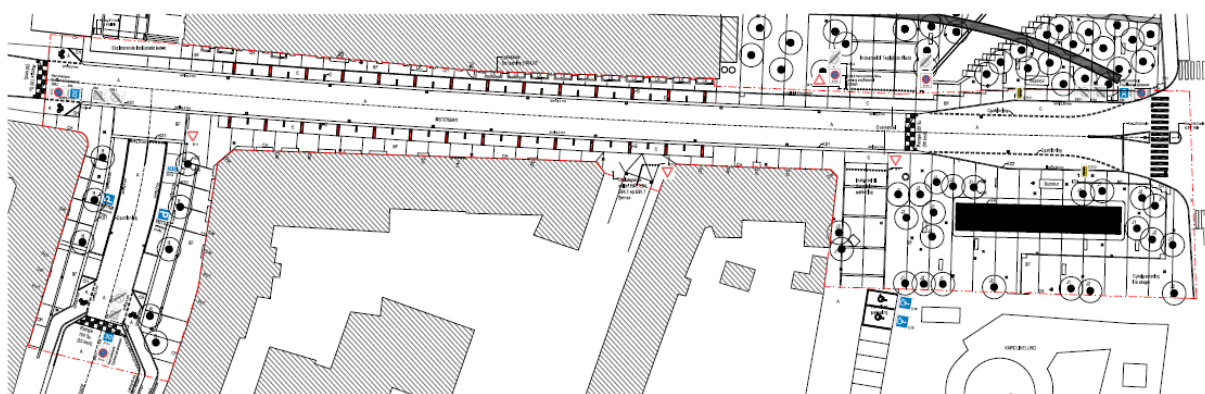


Figure 3: Detailed outline of the area.

Some of the main aspects of the project are highlighted below

### 1. Removal of traffic lights

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The traffic lights at the intersection Østerbro/Kjellerupsgade have been removed. This has been done in coherence with the shared space concept, and to ensure that in all parts of the road, the road users have to pay attention to each other. The removal of the traffic lights also secures a good flow of traffic for cyclists and buses driving east - west, which previously had to stop at the intersection.



Figure 4: 'Before picture' of the removal of traffic lights



Figure 5: 'After picture' of the same intersection

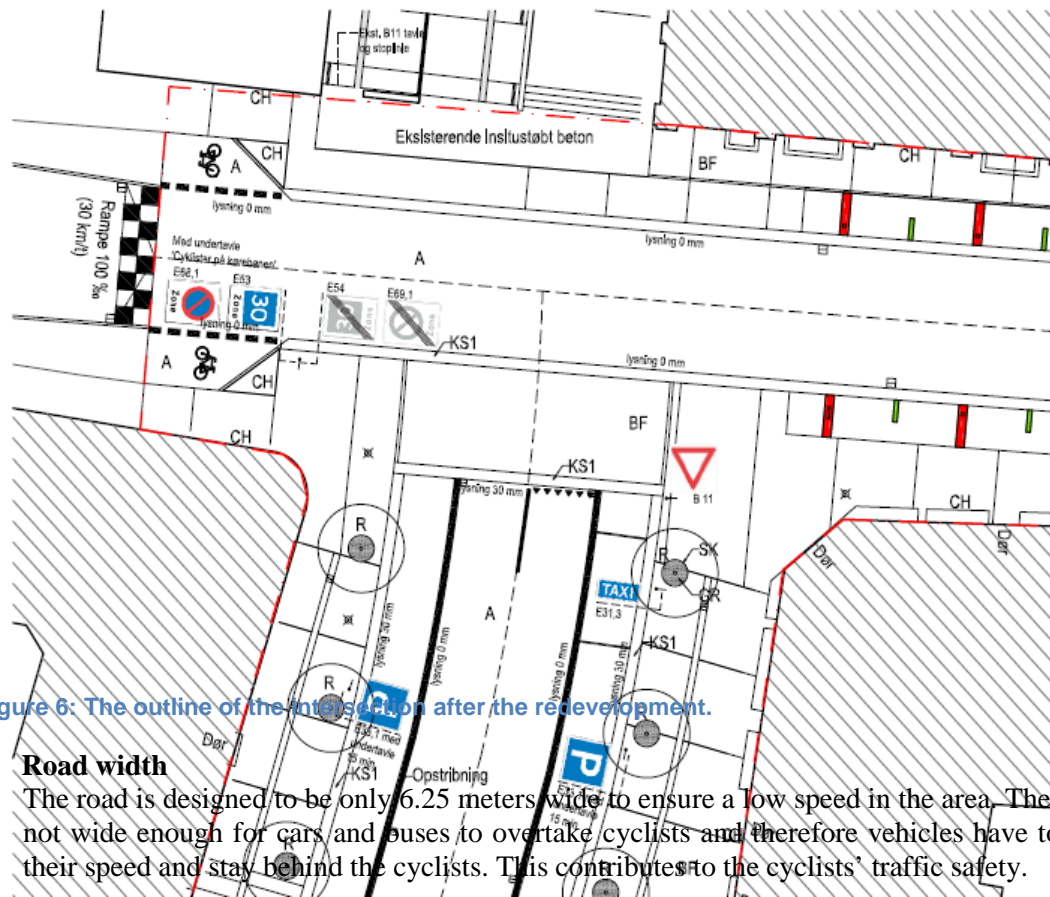


Figure 6: The outline of the intersection after the redevelopment.

## 2. Road width

The road is designed to be only 6.25 meters wide to ensure a low speed in the area. The road is not wide enough for cars and buses to overtake cyclists and therefore vehicles have to lower their speed and stay behind the cyclists. This contributes to the cyclists' traffic safety.



Figure 7: Narrow road profile to secure Shared Space use.

The narrow road leaves a wider area for pedestrians, which provides good facilities for all the pedestrians that are expected to use the area.



Figure 8: The reconstruction allocates a wide area to the pedestrians.

### 3. 30 km/h zone

In the entire shared space area, the speed limit is 30 km/h whereas in the surrounding areas the speed limit is 50 km/h. This is to improve traffic safety for the vulnerable road user.



Figure 9: In the Shared Space area speed is limited to 30 km/h and parking of cars is prohibited.

To mark the area and to lower the speed from the west and south entrances, the area is provided with a ramp that is comfortable for cars only if they run at 30 km/h or less.





Figure 10: The car speed in the area are slowed down by use of ramps

#### 4. Different kinds of pavement

Different kinds of pavement are used to reserve areas for pedestrians, cars and bicycles. Normally in Denmark a kerb is used to separate areas for different modes of transport; a kerb between pedestrians and cyclist areas and a kerb between areas for cyclists and cars. In this area, only two different pavements are used, which means that cyclists and cars have to share the road.



Figure 11: Both the area with pavement tiles and the grey area are dedicated to pedestrians. The pavement consists of seven different kinds of stone.

#### 5. Design

Besides reconstructing Østerbro and Kjellerupsgade streets, Teglgårdsplads and the area in front of Karolinelund have been reconstructed with the same design. An extra effort was done to make the area appealing and attractive. Examples of this are that trees are planted along Kjellerupsgade and that the pavement in some areas consists of seven different kinds of stone. (see Figure 11). Coloured lighting bollards, as shown in Figure 12, are placed along Østerbro on both sides of the road.



Figure 12: Bollards with coloured lights all along the shared space

The pavements on both sides on the road are decorated with red and green graphics.

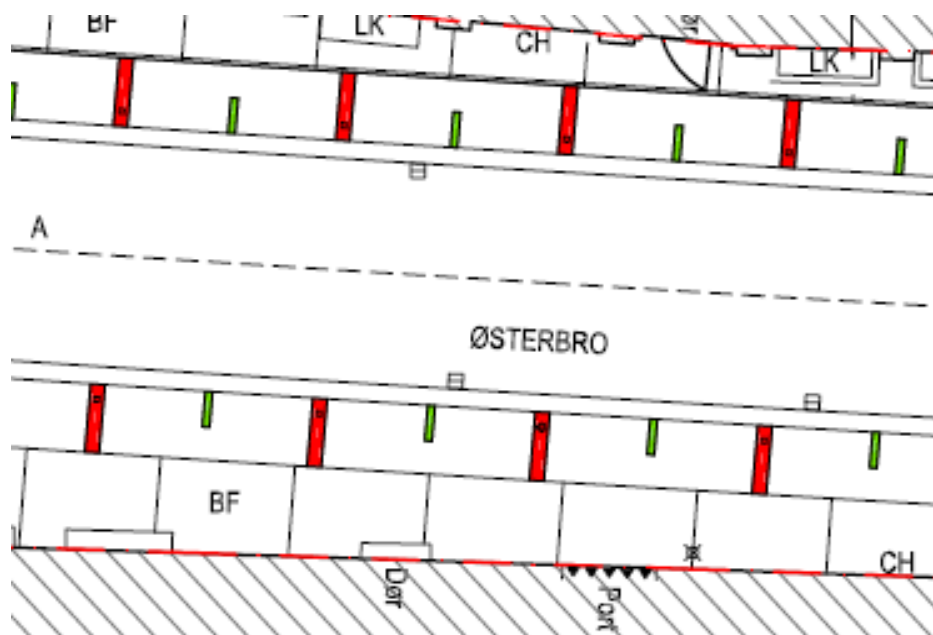


Figure 13: Design drawing showing the red and green decoration of the grey part of the pavement. The small dots on the red graphic are lighting bollards. The area marked "BF" is made of seven different kinds of stones. The areas marked with "LK" along Nordkraft marks the light shafts.

Another design element in the area is light shafts along the south side of Nordkraft on Østerbro. The light shafts installed in the basement of Nordkraft are made from glass and illuminated with light. (see Figure 14).

As design landmarks, clocks have been placed at both ends of the street.



Figure 14: some of design landmarks, one of the watches and the light shafts

The construction work began in the middle of August 2010. After a few weeks of construction, two problems appeared. Existing heating pipes were lying so high in the ground that it was not possible to reuse the existing elevation of the street. So, the final surface level had to be raised. In addition, the plan was to lay the new road on top of the old pavement, but due to the quality of the existing substructure this turned out to be impossible. Therefore, new level calculations and new plans had to be made and the infrastructure work had to be more comprehensive than originally planned. As a result, the implementation process had to be rescheduled and instead of the entire project being finished by the end of November it had to be rescheduled to be finished by the end of December 2010.

Had the winter been a normal winter, the project would have been finished within the timeframe of the DoW project plan, but in the middle of November the first snow fell and a lasting period of frost started. Even though the continuation of the construction work was attempted more times, the work had to be paused from the middle of November 2010 to March 2011.

**Stage 3: Operation of the street** (from 15 June 2011 onwards) The area was opened for the intended use since June 2011. At the 20<sup>th</sup> September 2011 the formal opening of the reconstructed area was celebrated together with the opening of the Cycle Motorway (ARCHIMEDES measure 51) that connects the to the university area.

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## **B5 Inter-relationships with other measures**

This measure is strongly integrated with measure AAL 51, the design of a commuter route for cycling in the corridor between the city centre and the university to create coherence in the system. (Task 6.1).

It also relates to measure AAL 52, the implementation of a city bike scheme for visitors to the city and daily commuters (Task 6.2)

As a cross learning experience at the measure level there are links with the Road Safety Pact being established by DSS 46+47 in San Sebastian to promote the implementation of proposed measures from their Road Safety Plan.

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## C Planning of Impact evaluation

### C1 Measurement methodology

#### C1.1 Impacts and indicators

##### C1.1.0 Scope of the impact

The changes of Østerbro from Kjellerupsgade to Karolinelundsvej contributes to a safer environment for soft modes in the redeveloped area at the harbour front. The high level/long term objectives of the measure are to reduce the number of casualties as a result of roadside accidents and to provide a safe environment. In addition the measure seeks to increase the quality of urban space and prioritises safe, secure and clean modes.

##### C1.1.1 Selection of indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	<b>SOCIETY</b>					
14		<b>Acceptance</b>	Acceptance	Acceptance level	Attitude survey of current acceptance of the measure	Index (%), qualitative, collected, survey
15		<b>Accessibility</b>	Spatial Accessibility	Perception of accessibility	Perception of physical accessibility of service	Index(%), qualitative, collected, survey
		<b>Safety</b>	Safety	Perception of safety	Perception of safety when moving in the speed reduction zones.	Index, qualitative, collected, survey
	<b>TRANSPORT</b>					
20		<b>Safety</b>	Transport Safety	Injuries and deaths caused by transport accidents	Number of accidents, fatalities and casualties caused by transport accidents	No, Quantitative, measurement
21		<b>Transport System</b>	Traffic Levels	Traffic flow by vehicle type - peak	Average vehicles per hour by vehicle type - peak	Vehicle per hour, quantitative, measured
22				Traffic flow by vehicle type - off peak	Average vehicles per hour by vehicle type - off peak	Vehicle per hour, quantitative, measured

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### C1.1.2 Methods for evaluation of indicators

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
14	Acceptance	<p>To ensure a safe environment for pedestrians and cyclists.</p> <p>To increase accessibility of public transport.</p>	<p>Acceptance level was covered by conducting interviews. The indicator was combined with the same indicator for measure 51 Cycle Motorway.</p> <p>The target group was adults walking or cycling in the area. The survey was done in the afternoon on two weekdays during May 2012. In the afternoon the area is expected to be used by the broadest variety of users. In total 239 of the persons stopped on the street agreed to participate in the interview. The interviewer was equipped with a paper questionnaire, asked the questions and filled out the questionnaire in order to make the participation as easy as possible for the interviewees.</p> <p>The evaluation method has been a street survey with interviews with pedestrians and cyclists in the area, in order to get these user groups' perception, since these modes of transport are important in the area and the city centre in general.</p> <p>.</p> <p>The Acceptance questions focused on how the different parts of the project were perceived by the soft road users in the area (cyclists and pedestrians). For instance the perception of the design elements, etc..</p> <p>Only one survey was done since the use of the area before the redevelopment was totally different from the use today. Before the redevelopment there were no attractions in the area and in addition the road was closed for car traffic for a longer period in relation to the construction work in Nordkraft. Due to these circumstances it did not make sense to compare this situation to the after situation in terms of perceived safety.</p>	1 time
15	Perception of accessibility	<p>To ensure a safe environment for soft modes in the speed reduction zones</p>	<p>Perception of accessibility was covered by conducting interviews. The indicator was combined with the same indicator for measure 51 Cycle Motorway.</p> <p>The target group was adults walking or cycling in the area. The survey was done in the afternoon on two weekdays during May 2012. In the afternoon the area is expected to be used by the broadest variety of users. In total 239 of the persons stopped on the street agreed to participate in the interview. The interviewer was equipped with a paper questionnaire, asked the questions and filled out the questionnaire in order to make the participation as easy as possible for the interviewees.</p> <p>The evaluation method has been a street survey with interviews with pedestrians</p>	1 time

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No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
			<p>and cyclists in the area, in order to get these user groups' perception, since these modes of transport are important in the area and the city centre in general.</p> <p>Only one survey was done since the use of the area before the redevelopment was totally different from the use today. Before the redevelopment there were no attractions in the area and in addition the road was closed for car traffic for a longer period in relation to the construction work in Nordkraft. Due to these circumstances it did not make sense to compare this situation to the after situation in terms of perceived safety.</p> <p>The perception of accessibility questions focused on how the cyclist and pedestrians felt when mowing in the area.</p>	
	Perception of safety	To ensure a safe environment for soft modes in the speed reduction zones	<p>Perception of safety was covered by conducting on street interviews. The indicator was combined with the same indicator for measure 51 Cycle Motorway.</p> <p>The target group was adults walking or cycling in the area. The survey was done in the afternoon on two weekdays during May 2012. In the afternoon the area is expected to be used by the broadest variety of users. In total 239 of the persons stopped on the street agreed to participate in the interview. The interviewer was equipped with a paper questionnaire asked the questions and filled out the questionnaire in order to make the participation as easy as possible for the interviewees.</p> <p>The evaluation method was on street interviews with pedestrians and cyclists in the area in order to get these user groups' perception of the area, since these modes of transport are important in the area and the city centre in general</p> <p>The Perception of Safety questions focused on how cyclists and pedestrians experience the narrow road profile with broad pavements and the decreased speed limit in the area.</p> <p>Only one survey was done since the use of the area before the redevelopment was totally different from the use today. Before the redevelopment there were no attractions in the area and in addition the road was closed for car traffic for a longer period in relation to the construction work in Nordkraft. Due to these circumstances it did not make sense to compare this situation to the after situation in terms of perceived safety.</p>	1 time
20	Transport Safety	To reduce the number of accidents resulting in injuries or death in the corridor by 40 % in 2012 with the baseline in 2005.	Information on accidents with injuries and deaths are continually collected in the City of Aalborg's statistics. Place and type of injury are registered.	2 times

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No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
21	Traffic Levels: Traffic flow by vehicle type - peak	To increase quality of urban space and prioritise safe, secure and clean collective modes.	<p>Traffic level registration, speed and flows. Automatic registration of cars and heavy vehicles through spool counts and manual registration of cyclist. The counts are conducted in the middle of the stretch of Østerbro between Kjellerupsgade and Karolinelundsvej. In each automatic registration data for one week is collected.</p> <p>Manual bicycle counts one day, at the stretch of Østerbro between Kjellerupsgade and Karolinelundsvej. The counts took place in the daytime from 7-17. Manual bicycle counts were chosen since the new layout of the street was not suitable for automatic counts of cyclists.</p> <p>However, an adjusted version of the automatic counts through spools became available for the counting in 2012 and therefore the evaluation was supplemented with an automatic count in September 2012. The automatic count was conducted over a whole week and thereby gives a more precise view of the cycle flow compared to manual counts.</p> <p>In summary the following counts have been conducted:</p> <p>April 2010: Automatic car count May 2012: Automatic car count</p> <p>May 2010: Manual cycle count September 2011: Manual cycle count September 2012: Automatic cycle count.</p>	2 times (One extra cycle count in 2012).
22	Traffic Levels: Traffic flow by vehicle type - off peak	To increase quality of urban space and prioritise safe, secure and clean collective modes.	<p>Traffic level registration, speed and flows. Automatic registration of cars and heavy vehicles through spool counts and manual registration of cyclist. The counts are conducted in the middle of the stretch of Østerbro between Kjellerupsgade and Karolinelundsvej. In each automatic registration data for one week is collected.</p> <p>Manual bicycle counts one day, at the stretch of Østerbro between Kjellerupsgade and Karolinelundsvej. The counts took place in the daytime from 7-17. Manual bicycle counts were chosen since the new layout of the street was not suitable for automatic counts of cyclists.</p> <p>However, an adjusted version of the automatic counts through spools became available for the counting in 2012 and therefore the evaluation was supplemented with an automatic count in September 2012. The automatic count was conducted over a whole week and thereby gives a more precise view of the cycle flow compared to manual counts.</p>	2 times (One extra count in 2012).



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No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
			In summary the following counts have been conducted: April 2010: Automatic car count May 2012: Automatic car count  May 2010: Manual cycle count September 2011: Manual cycle count September 2012: Automatic cycle count.	

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### C1.1.3 Planning of before and after data collection

EVALUATION TASK	INDICATORS INVOLVED	COMPLETED BY (DATE)	RESPONSIBLE ORGANISATION AND PERSON
Baseline data collection	20, 21, 22	M 24	City of Aalborg, Anne Marie Lautrup Nielsen
Collection of after data	20, 21, 22	M 42	City of Aalborg, Anne Marie Lautrup Nielsen
D12.2 Baseline and first results from data collection	All indicators	Month 38	
D12.3 Draft results template available	All indicators	Month 47	
D12.4 Final version of results template available	All indicators	Month 49	

## **C1.2 Establishing a baseline**

Baseline data have been collected as described for the indicators related to transport safety and traffic levels. For both of the indicators, baseline data were collected in spring 2010 (April and May) before the reconstruction of the street began in August 2010.

The after data for traffic levels were conducted in spring 2011 and for bicycles in September 2011 and September 2012. Weather conditions etc. at this time of the year were comparable to before data collected in spring 2010.

The data for transport safety were collected in the period 2005-2009. A five year period is chosen to avoid statistical fluctuations.

## **C1.3 Method for Business as Usual scenario**

As described in section B3, a lot of redevelopment and development are taking place in the area. With the opening of Nordkraft a lot of pedestrians were attracted to the area. In Nordkraft there is a lot of events and when a concert or a movie in the cinema are over, a lot of visitors are lead out in the street at the same time, which could lead to dangerous situations, if there is not enough room on the pavement, and the pedestrians therefore moves on the street.

Taking into account the redevelopment and the changed use of the area, maintaining the road space in front of Nordkraft as it was before would cause chaos. Therefore, a business as usual scenario cannot be established by looking at historical data since the area is undergoing these radical changes right now. It is also not realistic to compare the road with other areas since the use of the area is unique.

## **C2 Measure results**

As the measure has focussed on providing safe and good facilities for soft modes, these modes will be the focus of the evaluation. Especially in relation to the evaluation of the safety (perception of safety), accessibility and acceptance, cyclists and pedestrians will be the target groups.

### **C2.1 Transport**

#### **Safety**

The City of Aalborg collects continuously data on accidents from police records. Data includes information about types of road users involved, place, time, and seriousness of accident. As everywhere there is some random fluctuation in the level of accidents from year to year. As before data, the number of accidents in a five years period from 2005 to 2009 has been used. The registered accidents are shown on the maps below.

In total 12 accidents have been registered on the street in the period between 2005 and 2009. Cyclists have been involved in 6 of these accidents, while pedestrians have not been involved in any: 4 accidents with cyclists/mopeds with personal injuries, while 2 was with only material damage. Most of the accidents were located in the intersection Østerbro / Kjellerupsvej, in the middle of the later rebuild stretch. Looking at the accidents statistics between 2005 and 2009 it is important to notice that the use of the area was totally different than the use today.

As after data, the number of accidents has been registered from June 2011 where the construction work finished until June 2012 e.g. one year. The number of accidents in this year is 2 accidents both in the intersection between Østerbro and Karolinelundsvej just outside the rebuild area. None of them included pedestrians or cyclists, and no accidents happened on the rebuild stretch.

Compared to the numbers from 2005-2009, statistically one accident with pedestrians/cyclists should be expected and also another accident in the intersection Kjellerupsgade-Østerbro should be expected. However, the period after the reconstruction is only one year, which means that there are statistically

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uncertainties related to working with such a relative short period, and even though the results indicates a positive effect on the safety, no firm conclusions on the effect can be given.



Figure 15: Accidents registered from 2005-2009



Figure 16: Accidents registered from June 2011 – June 2012

**Traffic Levels**

The number of cyclists counted in May 2010 before the reconstruction of the street was during a normal weekday 3400 cyclists. After the reconstruction the daily number of cyclists was 3050 cyclists in September 2011 and 2350 in September 2012. This indicates a decrease in the number of cyclists. The redevelopment of the area had as a consequence that dedicated cycle lanes were removed and cycling were integrated in the shared space traffic, including the growing numbers pedestrians in the area. As shown later in Figure 22 these changes have in fact caused that the cyclist feel less safe than before. As a consequence some of the cyclists now prefer alternative routes.

The automatic traffic counts showed that the traffic level in April 2010 was 5.044 vehicles per day during weekdays, indicating a yearly average of 4.537 vehicles per day. During peak hour between 15pm and 16pm on weekdays an average of 460 vehicles per hour was registered in April 2010.

The average speed of the vehicles on the street before the reconstruction was 35,9 km/hour, while the 85% quartile was 46,9 km/h. Before the reconstruction the speed limit was 50 km/h.

In May 2012 a new traffic count was conducted. This count showed a yearly average of 5.113 vehicles per day. The average speed of the vehicles in this count was measured to 32,8 km/hour, while the 85% quartile was 41,1 km/h. This counting indicates that the number of vehicles at the street has increased with nearly 13%. However, the average speed level in the area has decreased by 3,1 km/h and the 85% quartile has decreased by 5,8 km/h. These results show that the increased level of activity in Nordkraft also has resulted in an increase in the number of cars on Østerbro. However, the decrease in speed levels indicates that the redevelopment has had a positive effect on the speed levels and thus on the traffic safety.

**Table C2.1.1: Summary of evaluation results in terms of transport**

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After –Before	Difference: After – B- a-U
20 Safety	12 accidents in the area of which 6 included cyclists and none included pedestrians (2005-2009)	N/A	2 accidents – none with pedestrians or cyclists included (June 2011-June 2012)	-16%  (Too short time period after to make statistical significant conclusions)	
21 Traffic Level – peak	460 vehicles/hour	N/A			
22 Traffic Level – off peak	4537 vehicles pr. day in average  3400 cyclists pr. day (2010)	N/A	5113 vehicles pr. day in average  3050 cyclists pr. day (2011)  2350 cyclists pr. day (2012)	+13%  -11% (2011 vs. 2010)  -44% (2012 vs. 2010)	

## C2.2 Society

As described in section C1.1.2 a survey was completed in spring 2012. The survey focused on acceptance, accessibility and safety among the cyclists and pedestrians moving in the area.

### Results from the survey

The 229 respondents of the stop interview survey consist of around 60 % women and 40 % men and about 50 % are 18-29 years old. These figures in the sample are estimated to be fairly representative for the population using the area. More than 40 % use the bike as the daily mode of transportation, 30 % walk as the most common mode of transportation, around 15 % use the car as the daily mode of transport while 10 % use the bus as the daily mode of transportation.

Initially, the respondents were asked about the origin and destination of their current travel. Around 30 % of the respondents came from or were on their way to the city centre, and nearly 20 % came from or were going to the multi-cultural centre, Nordkraft. Close to 15 % stated their dwelling as the origin or destination while the remainder of the respondents indicated other start- and end points for their ongoing travel. This implies that a large part of the road users are travelling through the area and that the origin or destination most likely is located in the city centre. However, the fact that 20 % stated Nordkraft as the origin or destination of the current travel indicates that Nordkraft generates many trips.

As Figure 17 shows, around 85 % of the respondents are frequent users of the urban space at Nordkraft/Østerbro. Furthermore, it seems that the area is more used in the afternoon between 12.00 and 18.00 than in other periods of the day. However, this result may be invalid as the interviews took place in this particular time of the day.

Summarised, most of the respondents are young cyclists and frequent users of the area. This underlines that the respondents are familiar with the area. 20 % of the travels in the area have Nordkraft as origin or destination and the area is mostly utilised in the afternoon. This underlines Nordkraft's role as a magnet for recreational purposes.

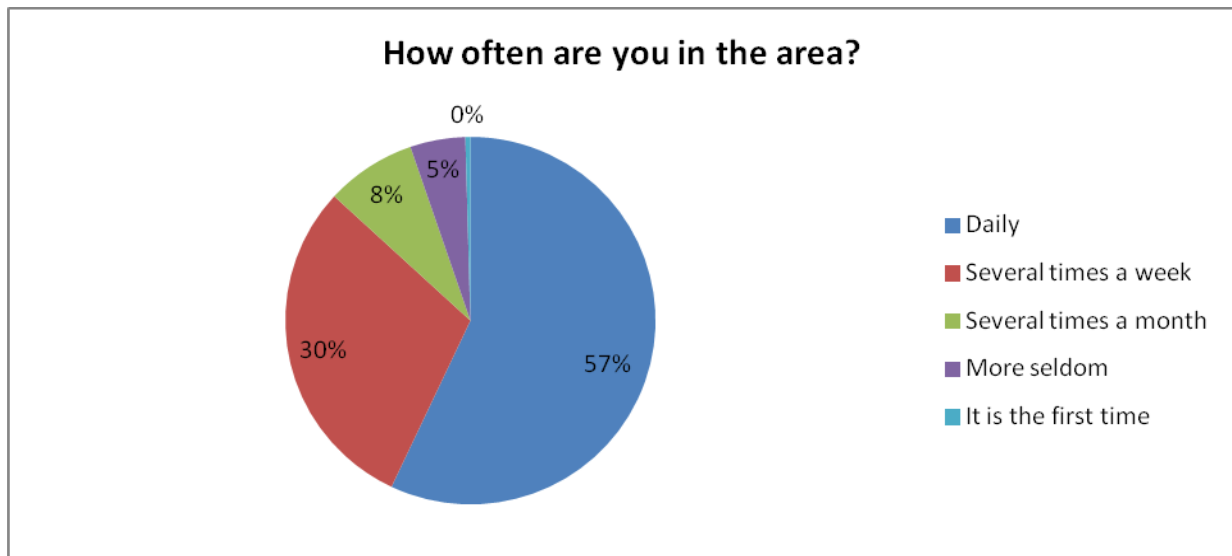


Figure 17: Most respondents reply that they are daily users of the area.

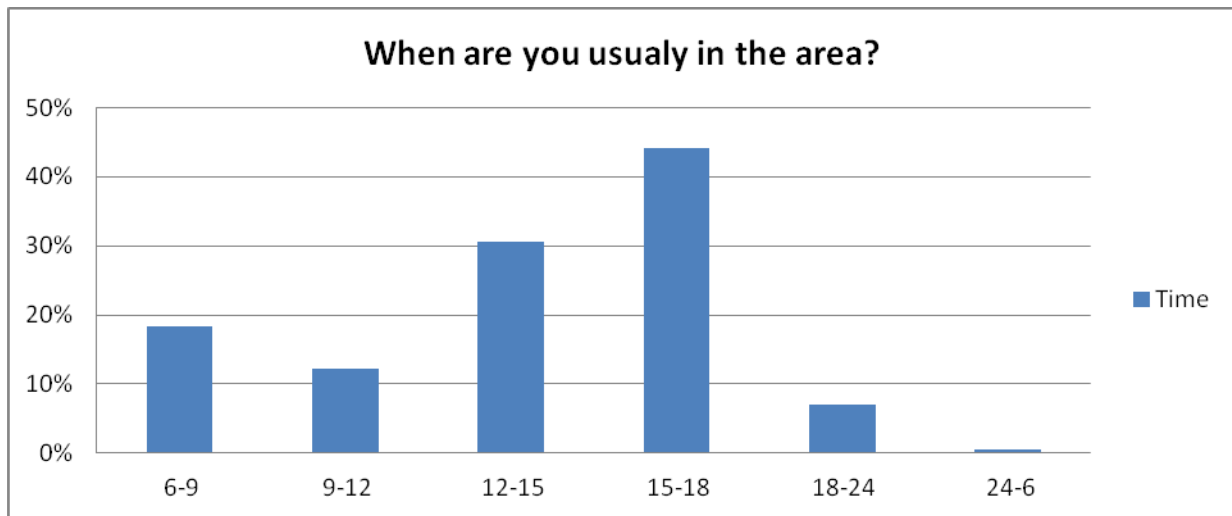


Figure 18: Most respondents are in the area between 12.00 and 18.00.

When it comes to the experience of the urban space at Nordkraft / Østerbro, especially the lighting and the decorations are successful initiatives as around 75 % of the respondents agree or strongly agree that they like these initiatives.

Some (18 %) disagree or strongly disagree in liking the two stories biking racks east of Nordkraft. 22 % of the respondents don't know whether they like the biking racks or not. Compared to the two other initiatives, to which the respondents in general have taken a positive stand, the biking racks score highest in 'Neither/Nor', 'Disagree' and 'Don't know'. This implies that the awareness of the biking racks could be somehow low or that the respondents are indifferent towards the biking racks as a positive initiative.

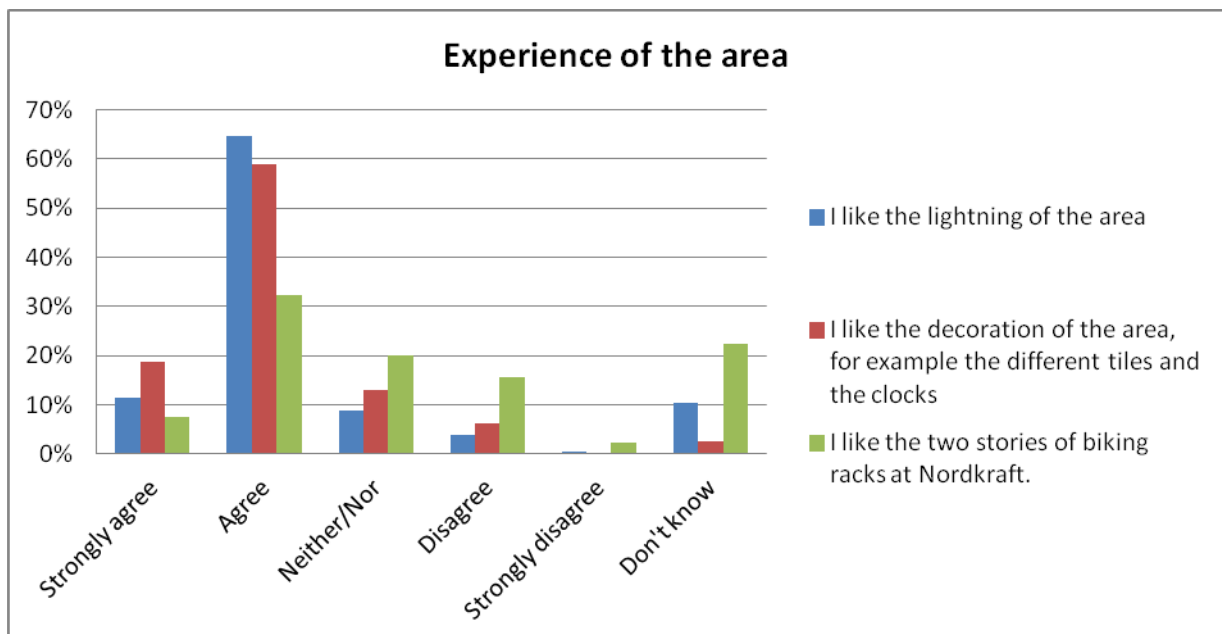


Figure 19: The respondents especially agree in liking the lighting and the decorations of the area.

**Perception of safety.**

As Figure 20 shows, the perceived safety is very different for pedestrians compared to cyclists. The respondents regard it as safe for pedestrians to travel in the area (80 %) while they regard it as rather unsafe for cyclists (44 %).

It is remarkable that a high share of the respondents (48 %) state that it is their opinion that the shared space is not functioning very well. However, 32 % thinks that the shared space is working well. Comments from the respondents reveal a desire for a pedestrian crossing at the intersection Østerbro/Kjellerupsgade in order to improve the safety for pedestrians. This indicates that the concept behind the Shared Space approach has not been understood and accepted among the pedestrians.

Other comments relate to a desire for a dedicated biking path along Nordkraft and to poor lighting conditions for cyclists. Many respondents add additional comments to the perceived missing biking lanes and express a feeling of unsafe when biking in the area. The comments relate to the confusion of where to bike and to an experienced feeling of unsafe around the intersection Østerbro/Kjellerupsgade, where the biking path ends and cars enter the area. Again, this indicates that the concept behind the Shared Space approach has not been clearly understood or accepted among the cyclists, either.

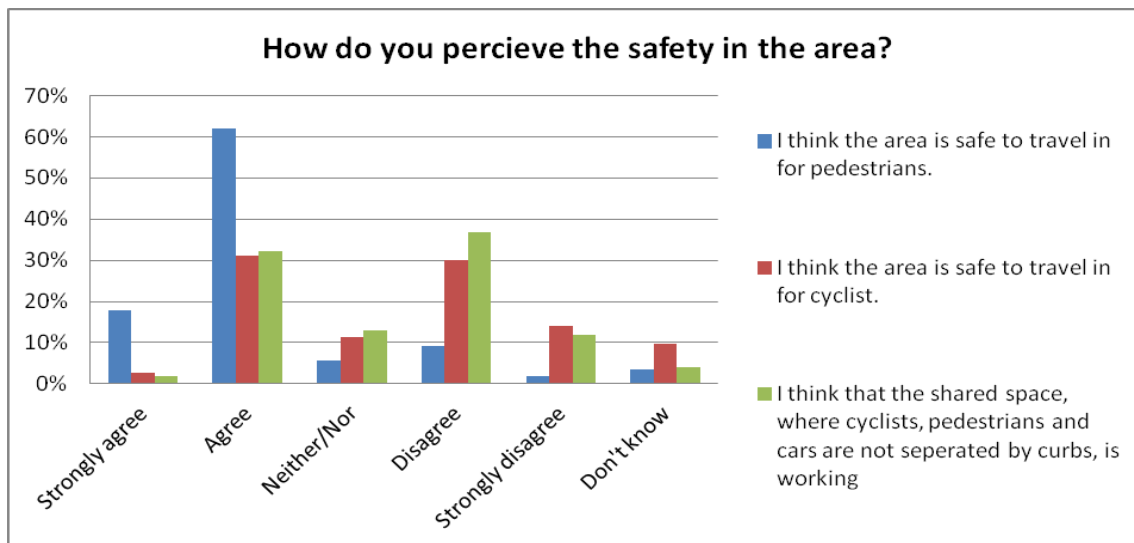


Figure 20: The respondents think it is safe for pedestrians to travel in the area while they regard it as unsafe for cyclists.

The respondents were asked to their daily mode of transportation in the area. When combining the answers regarding mode of transportation with the answers of perceived safety it is clear that pedestrians feel safe, cyclists feel unsafe and both groups have divided opinions regarding the shared space, see Figure 21, Figure 22, and Figure 23. However, the tendency is that the cyclists dislike the shared space the most.



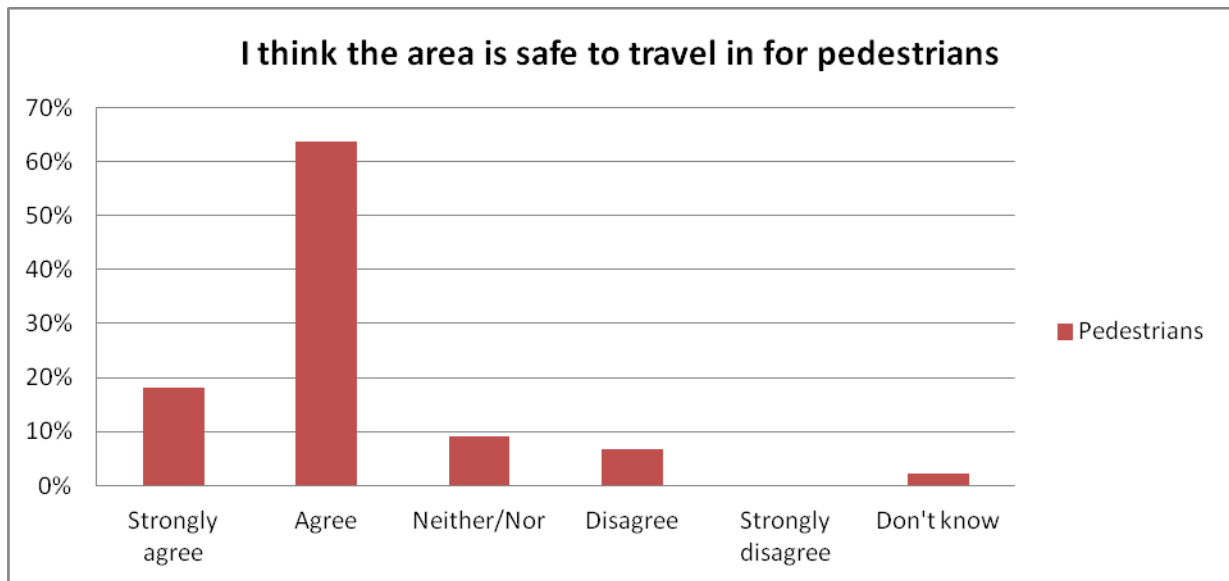


Figure 21: Pedestrians feel safe in the area.

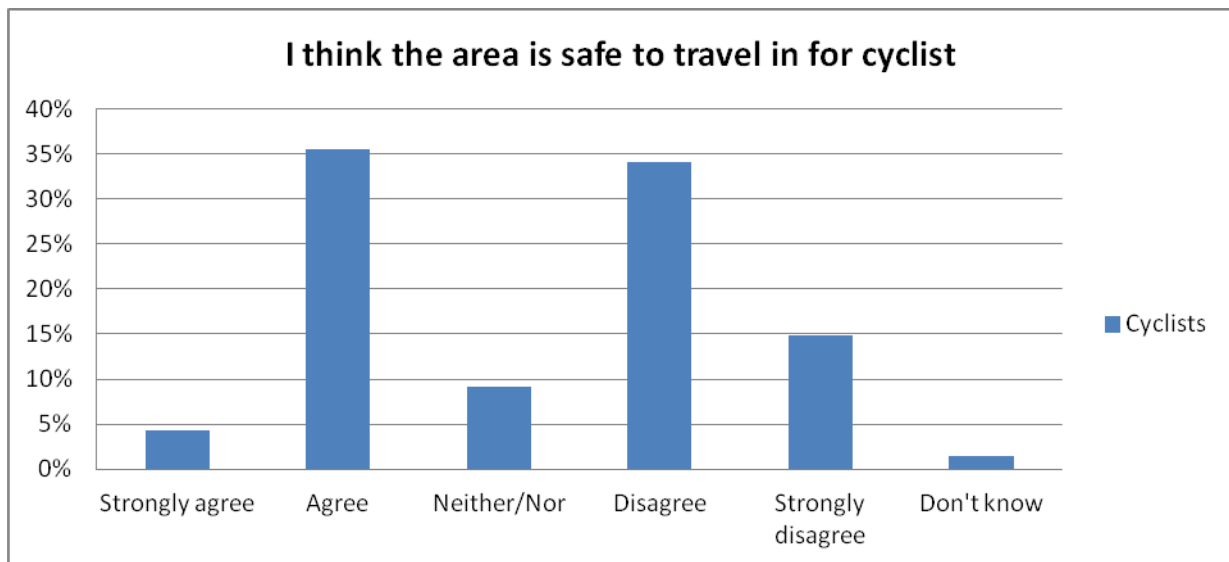


Figure 22: Cyclists feel unsafe in the area.

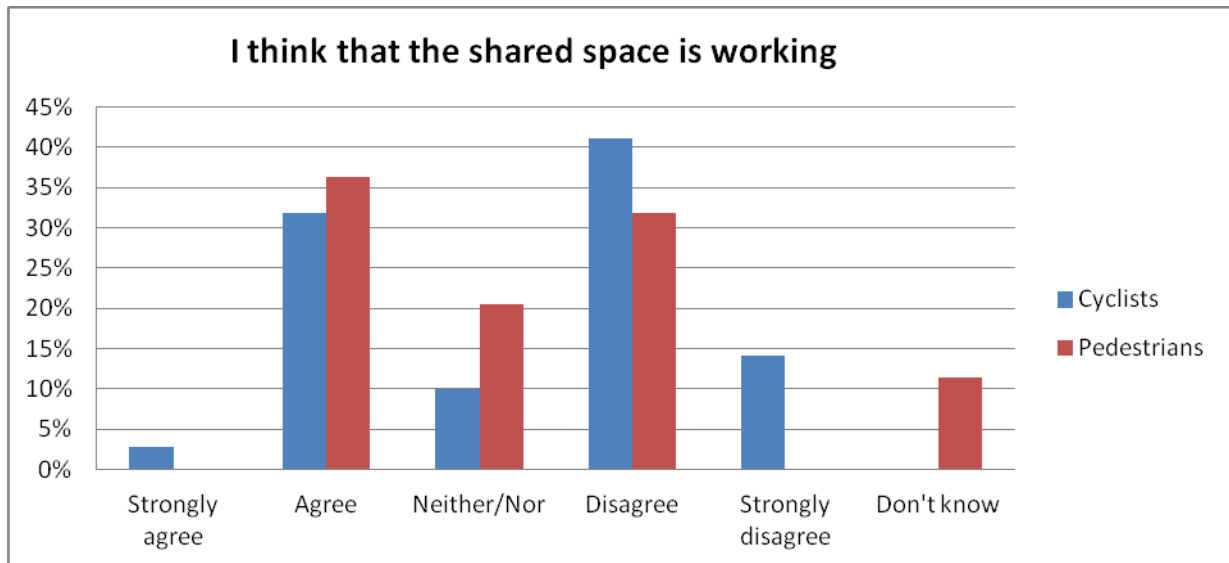


Figure 23: The respondents are divided regarding the stand towards the shared space.

As Figure 24 shows, there is no clear picture of the perceived safety compared to the before situation. The most common answer to the question of whether the safety conditions have improved due to the refurbishment of the area is 'Don't know'. This answer is naturally related to the fact that the use of the area before as described was totally different with no activities or attractions that would encourage cyclists/pedestrians to notice or stop in the area.

Having problems with comparing with before data and lacking a Business as usual to compare with, the data have been compared to a similar interview at the ARCHIMEDES measure 51 Cycle Motorway. The result here is that 90 % of respondents state that they feel safe when travelling on the cycle commuter route. This number show a significant difference compared to the ~45% that feel safe cycling on the shared space.

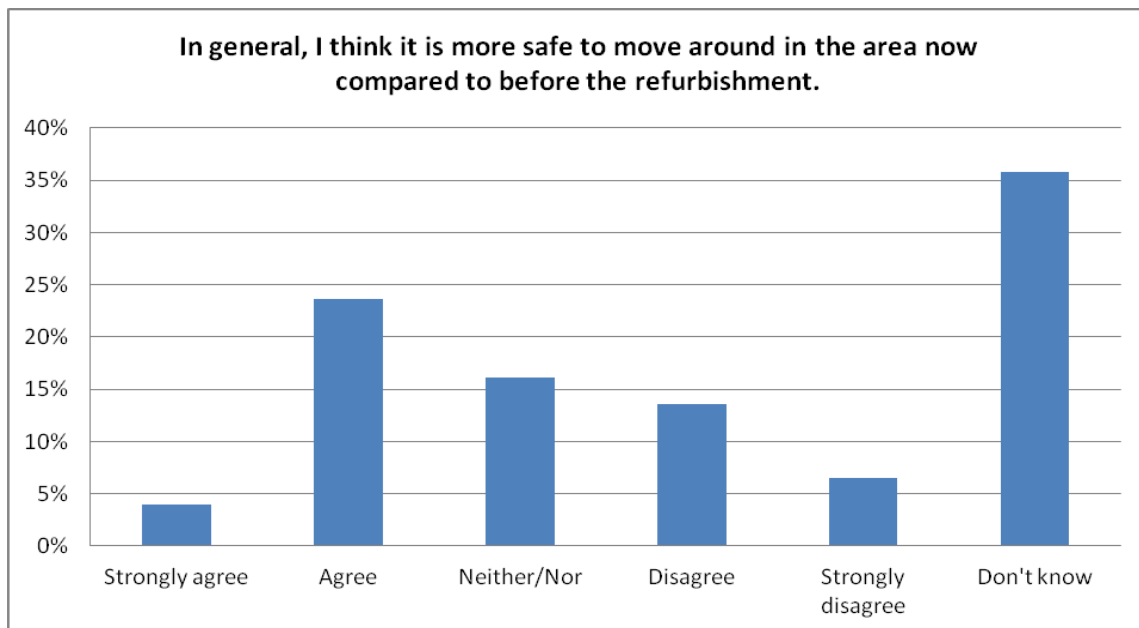


Figure 24: Most respondents have not taken a stand towards the question whether the safety has been improved compared to the before situation.

As Figure 25 shows, the most important issues, regarding to the respondents, are related to safety (90 %). The feeling of safety is always expected to be regarded as important, but the extreme high score on importance is probably also a second indicator of the low score on the feeling of safety (Figure 22).

68 % of the respondents state that the decoration of the area is important or very important, and 76 % state that the lightning is important or very important. The least important initiative according to the respondents is the two storeys of biking rack which is further supported by additional negative comments.

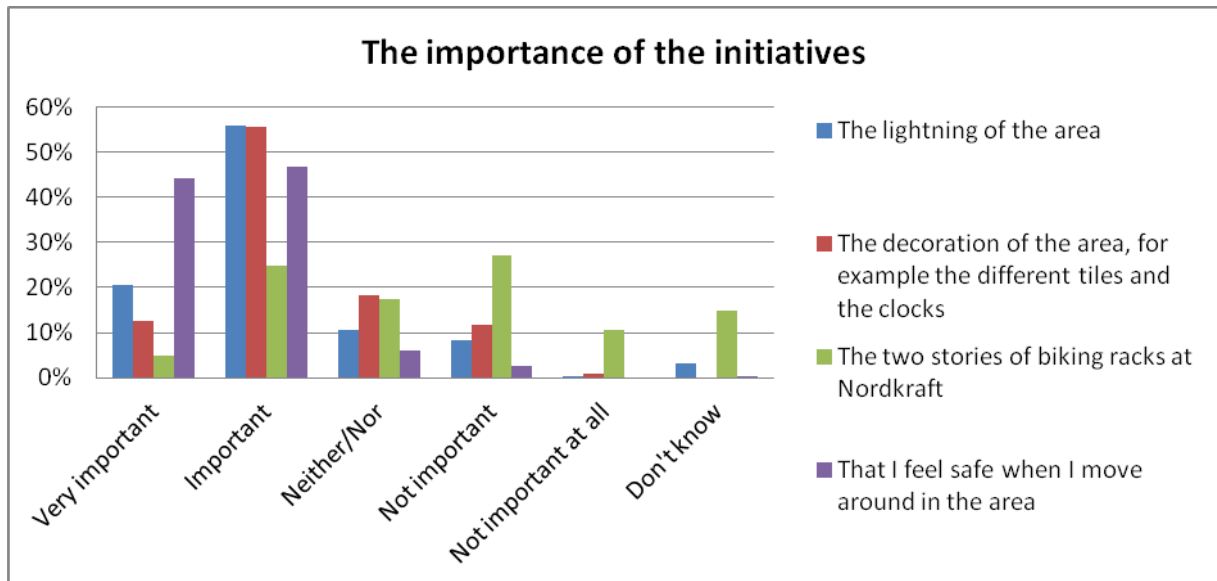


Figure 25: The respondents reply that safety is the most important initiative. However, both the lightning and the decorations are perceived as important initiatives. The two storeys of biking racks are rated as not important.

In general, most respondents (82 %) are satisfied or very satisfied with the area while only 7 % replied that they were unsatisfied or very unsatisfied with the area in general. No interviewees answered 'Don't know' to this question.

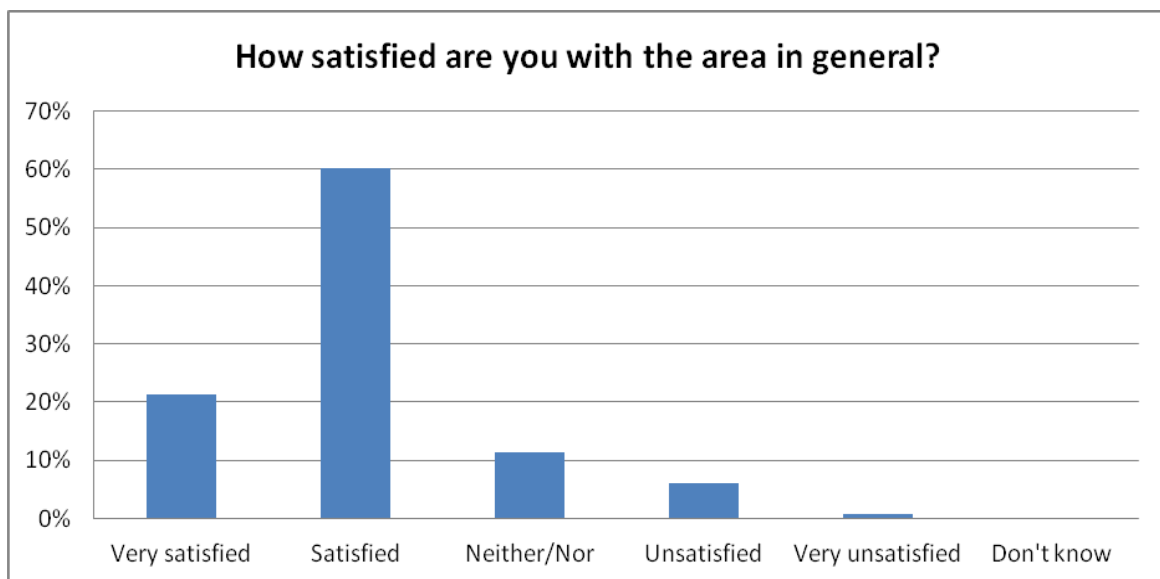


Figure 26: In general, the respondents are satisfied with the area.

**Table C2.2.1: Summary of evaluation results in terms of society**

Indicator	Before (date)	B-a-U (date)	After (2012)	Difference: After – Before	Difference: After – B- a-U
Acceptance level  Perception of safety	N/A	N/A	82% are satisfied or very satisfied with the area.  The lighting and the decorations are successful initiatives as around 75 % of the respondents agree or strongly agree that they it.  80% believe it is safe for pedestrians to travel in the area, while 44% regard it as rather unsafe for cyclists.  The most important issues, regarding to the respondents, are related to safety (90 %). However, 68 % of the respondents state that the decoration of the area is important or very important.		

### **C3 Achievement of quantifiable targets and objectives**

No.	Target	Rating
1	To provide a safe environment for soft modes in the city.	★★ <sup>1</sup>
<p><b>NA = Not Assessed    O = Not Achieved    ★ = Substantially achieved (at least 50%)</b>  <b>★★ = Achieved in full            ★★★ = Exceeded</b></p>		

### **C4 Upscaling of results**

The solution is as described in section B4 a solution, which is tailored to this specific street. Therefore, it will neither be relevant nor realistic to implement the measure other places in the city.

The concept of Shared Space is used in other place in the City with similar evaluation results, implying that the number of accidents is reduced due to increased attention among the road users. The increased attention can result in that the road users despite of the reduced number of accidents perceive the area as less safe. With the positive results in terms of traffic safety in mind the use of Shared Space will also be considered when designing areas in the future.

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<sup>1</sup> The respondents think it is safe for pedestrians to travel in the area (80 %), however in terms of perceived safety for cyclists this is lower. In terms of accident level the time period is too short to make any clear conclusions.

## **C5 Appraisal of evaluation approach**

The following aspects are important learnings during the design and completion of the evaluation of this measure:

- The evaluation survey through stop interviews on the street proved to be a valuable way of getting direct information on how the users perceive the cycle route. However, this way of doing evaluation through interviews is a time consuming process, requiring a number of, for instance, students assistant hired. The use of smart phone evaluation could be the future.
- In order to be able to make sound conclusions in terms of reduction of accidents in the area a longer time period (minimum 5 years) after the construction is necessary. However, this is not related to the evaluation method, but the overall evaluation context.
- An repetition of after countings of the traffic and cyclists have secured that the results are more accurate results compared to a situation where only one countings was made.

## **C6 Summary of evaluation results**

The number of vehicles at the street has increased with nearly 13%. This – or even a larger growth was expected due to the increased activity in the area.

The average speed level in the area has decreased by 3,1 km/h and the 85% quantile has also decreased by 5,8 km/h. The decrease in speed levels indicates that the redevelopment has had the intended positive effect on the speed levels.

The number of cyclists counted in May 2010 before the reconstruction of the street on a normal weekday was 3400 cyclists. After the reconstruction in September 2011 the number of cyclist was 3050 cyclists, and the number of cyclists in September 2012 was 2350 cyclist pr. day. This shows a decrease in the number of cyclists. The redevelopment of the area had as a consequence that dedicated cycle lanes were removed and cycling were integrated in the shared space traffic, including the growing numbers pedestrians in the area. These changes have in fact caused that the cyclist feel less safe than before. As a consequence some of the cyclists now prefer alternative routes.

In the survey most of the respondents are young cyclists and frequent users of the area. In general, most respondents (82 %) are satisfied or very satisfied with the area. Especially the lighting and the decorations are successful initiatives as around 75 % of the respondents agree or strongly agree that they like these initiatives.

The number of accident registered in a year after the construction work was finished is lower than expected, both outsides the rebuild area, and none accidents with pedestrians or cyclists is registered. However, the period after is only one year which means that there are statistically uncertainties related to this relative short time, and even though the results indicates a positive effect on the safety, no firm conclusions on the effect can be given.

The respondents think it is safe for pedestrians to travel in the area (80 %) while they regard it as rather unsafe for cyclists (44 %). It is remarkable that a high share of the respondents (48 %) state that the shared space is not functioning very well.

The most important issues, regarding to the respondents, are related to safety (90 %). However, 68 % of the respondents state that the decoration of the area is important or very important, and 76 % state that the lightning is important or very important.

## **C7 Future activities relating to the measure**

Minor adjustments of the areas link to the cycle path west of the area is planned to increase the traffic safety for the cyclists.

## D Process Evaluation Findings

### D.0 Focused measure

X	0	No focussed measure
	1	Most important reason
	2	Second most important reason
	3	Third most important reason

### D.1 Deviations from the original plan

**The construction work was delayed due to an unusual strong winter:** The work was finished in June 2011 instead of March 2011 as stated in the DoW. Construction work was started by mid August 2010 and was expected to be finished by the end of November 2010. From the start of the construction some technical challenges were experienced and due to these challenges the implementation process was rescheduled with a total project finished by the end of December – still well before the DoW milestone in March 2011. Due to an unusual early and strong winter that started with snow in the middle of November the construction work was put on hold until the end of March 2011. Even though the continuation of the construction work was attempted more times during the winter, it was not possible to continue to work until the end of March.

The construction work was restarted in March and finalised by the middle of June 2011. It is not possible to foresee this kind of planning problems and even though there was slack time in the time schedule for the construction work, this was not enough. It is though difficult to do anything different.

### D2 Barriers and drivers

The project is part of the greater vision of the renewal of the waterfront and therefore part of the overall plan of the waterfront. This means that a lot of other activities and redevelopments as describe take place in the areas. This overall development is a driver for the measure since it is part of an overall plan.

In the following the barriers and drivers are summarised.

#### D.2.1 Barriers

##### Preparation phase

- **Delays in other projects in the area (Planning):** This measure was as described part of the large renewal of the waterfront. Therefore, it depended on the actual development of the different areas on the waterfront. A possible barrier was thus delays in the other project that could have influenced the planning of this measure. However, no crucial delays affecting the measure occurred.

##### Implementation phase

- **The construction work was delayed due to an unusual strong winter (Planning) –** Due to an unusual early and strong winter that started with snow in the middle of November the construction work was put on hold until the end of March 2011. Even

Measure title: **Provision for soft modes in Aalborg**

City: **Aalborg**

Project: **Archimedes**

Measure number: **42**

though the continuation of the construction work was attempted more times during the winter, it was not possible to continue the work until the end of March.

#### **Operation phase**

- No barriers experienced.

### **D.2.2 Drivers**

#### **Preparation phase**

- **Part of the overall plan of the waterfront (spatial)** - The overall development in the area supports the use of the area for cyclists and pedestrians.
- **Development in the area is part of the overall plan (political/strategic)** – The area is redeveloped as part of the overall strategic of redeveloping the old harbour front, which secured political support for the measure.

#### **Implementation phase**

- **Continuous communication with the contractor regarding the planning and weather conditions (organisational)** – Even though the continuation of the construction work was attempted more times during the winter it was not possible to keep up the work. The dialogue though secured that the situation continuously was evaluated and the work started as soon as possible.

#### **Operation phase**

- No drivers experienced.

### **D.2.3 Activities**

#### **Preparation phase**

- **Dialogue with the police (organisational)** – In order to secure that some of the desired alternative solutions were approved a dialogue with the police was started early in the planning phase.

#### **Implementation phase**

- **Rescheduling the time planning due to the delays (planning)** – As mentioned the work was delayed due to an unusual strong winter. It is not possible to foresee this kind of planning problems and even though there was slack time in the time schedule for the construction work, this was not enough. It is not perceived possible to do anything else than rescheduling the time plan in cases like this. If the work was continued during the winter it would have compromised the quality.

#### **Operation phase**

- No activities undertaken.

## **D.3 Participation**

### **D.3.1. Measure Partners**

- **City of Aalborg** – Responsible for the planning and implementation of the measure.

### **D.3.2 Stakeholders**

- **The North Jutland Police** – Responsible for the approval of the traffic initiatives in the redevelopment of the area.
- **Contractor** – Responsible for the road construction work.
- **Landscape Architects** – Responsible for the design of the area.

## **D.4 Recommendations**

Regarding the delay due to the winter weather it is not possible to foresee this kind of planning problems and even though there was slack time in the time schedule for the construction work, this was not enough. It is though difficult to do anything different in the process.

The specific initiatives and the function of the stretch is unique and not possible to compare to other areas in the city or other areas in other cities. However, some general recommendations can still be made.

The lessons learned are summarised in recommendations in the following two sub-sections:

### **D.4.1 Recommendations: measure replication**

- **Recommendation 1:** Close cooperation with the police during the planning work secures the support for alternative initiatives.

### **D.4.2 Recommendations: process**

- **Recommendation 1:** Close contact with the contractor secures the best time plan despite of challenges like weather conditions or technical challenges.