

35th IASP World Conference
on Science Parks and Areas of Innovation 2018
Isfahan, Iran

**#SustainableSciencePark Mjärdevi - How Science Park Mjärdevi will
be a sustainable community**

*Parallel session 3:
The productive city (factory city)*

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Hosted by:



ISFAHAN
SCIENCE & TECHNOLOGY TOWN
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#SustainableSciencePark Mjärdevi

Climate change is real. With the Sustainable Science Park Initiative, we take action to reduce our climate impact and adjust to a low CO₂ future. The initiative is part of the municipality of Linköping's ambitious goal of reaching carbon dioxide neutrality by the year 2025. One-third of CO₂ emissions come from traffic. To achieve CO₂ neutrality, we need the involvement of the local business community. Therefore, the municipality of Linköping funded the development of a Sustainable mobility plan for Science Park Mjärdevi. An action plan was created in collaboration between property owners, companies, and other stakeholders within the park. This plan is now being realized -step by step

How?

- Highlight good initiatives and present Sustainable and smart alternatives
- Events and meet-ups to inspire and to build knowledge
- Try-outs to change travel habits (i.e., public transports, e-bikes)
- Eco-friendly commuting challenges
- Establish a bicycle repair store
- Better bike stands and infrastructure
- Sustainable mobility as a service

Sustainable mobility plan

A CERO analysis has served as the basis for the design of the target scenario and action plan for the next two year period, with interim targets of 15% CO₂ reduction 2017-2019.

CERO is a transparent and easy to manage framework developed to assist companies, municipalities and other organizations in reaching climate travel targets inconsistency with economic payoff and employee acceptance. CERO is developed in Markus Robèrt's doctoral thesis¹ and the model is also published and peer-reviewed in four international scientific journals.² The model is now implemented in more than 80 organizations.

The target scenario and action plan with the actions prioritized were developed in a workshop managed by consultants responsible for the CERO analysis, with the aim of creating consensus among actors in the form of companies and property owners in Science Park Mjärdevi, Linköping municipality, and the regional public transportation company Östgötatrafiken. Based on the target scenario, a specific action plan has been developed with responsible actors for each action. Each actor will estimate time and resources for the future implementation.

¹ <http://www.cero.nu/en/>

² <https://www.kth.se/profile/mrobert/publications>

Follow-up is scheduled in 2019. At this time, a full analysis will be conducted again, with follow-up of travel patterns, emissions and other factors measured in the base measurement, as well as an update of the target scenario and action plan for the next two-year period until 2021.

In total, employees in Mjärdevi travel approximately 46 million km to and from work per year (7300 km/employee) which corresponds to approximately 1,147 laps around the world. In total, more than 5 600 tonnes of CO₂ emissions are generated commuting to and from Mjärdevi for a year and trips by car account for 91% of the emissions from commuter trips. On average, employees spend 17 125 SEK (1665 EUR) on trips to and from work in one year and releases 895 kg CO₂ / year.

Because of the amount of emission from cars, it becomes extra important to work with employees commuting habits, and it is, therefore, positive that 55% of employees express their support for the Sustainable mobility plan and that the employer is working to increase the proportion of sustainable travel. A total of 43% of employees are bicycling or walking to work, which is among the highest measured value in CERO analyzes so far. Nevertheless, there is potential to get even more people bicycling and/or walking to work. Today, 34% of those who commute by car five days a week have less than 10 kilometers to work. An in-depth dialogue with property owners regarding bicycle parking / changing rooms would likely affect the bicycle area positive.

Another potential development is to get more people commuting by public transportation, 46% of those who commute five days a week by car would change the way they commute if the public transport could be improved. Public transport is experienced as unavailable from several places. The regional public transportation company will, therefore, make an availability analysis of public transportation system to and from the Science Park.

Background

The Linköping municipality's climate target is that the entire municipality (the geography) should be carbon neutral in 2025. A prerequisite for achieving the goal is involvement and participation from citizens and the local community and business sector. The transport sector's carbon dioxide emissions are a very big challenge for goal fulfillment. The municipal council has, as part of increased cooperation with the business sector decided to allocate funds for the development of a Sustainable mobility plan for a geographically-defined business area- Science Park Mjärdevi.

The development of a Sustainable mobility plan for the area is a pilot project for engage the business community in the climate adaptation and gain knowledge about which actions are most effective to reduce CO₂ emissions from service and commute journeys.

In the ongoing work to develop a detailed, comprehensive plan for Mjärdevi and the nearby area, there is also a dialogue around extended service and additional residential buildings in the area that will naturally result in increased traffic work. Through targeted long-term efforts for those currently active in the area are the intentions with the Sustainable mobility plan that one of the Science Park profiles should be Sustainability.

About Science park Mjärdevi

Science Park Mjärdevi is essentially a knowledge and innovation environment with 7000 employees divided into 400 companies in telecommunications, system development, electronics and more. Many companies have their foundation in innovations at Linköping University. It is home to leading

technology companies like Sectra, IFS, and Autoliv, as well as groundbreaking start-ups like Amra, XM Reality and Senion. Science Park Mjärdevi is mainly planned for large-scale buildings because the activities initially intended for the area required large building volumes. This means that the properties are divided into larger units and the road network consists of a few main streets. Many of the locales provide primary access to large parking areas and are nearby the road. Datalinjen and Teknikringen are the main streets of Science Park Mjärdevi, where these meet is what is today the center of Mjärdevi. Here you will find the 13 floor building Mjärdevi Center, which is a landmark in the area. In the area, there is a real estate network consisting of ten property owners who have continuous meetings with the management of Science Park Mjärdevi.

A detailed plan for Mjärdevi and the nearby area

Science Park Mjärdevi is in an expansive stage. Both people and companies grow and the demand for a liveable cities/area is increasing. Today, compared to when the area was established in 1984, other characteristics in the environments are desired. Linköping municipality wants with this plan create the conditions for a metropolitan environment with residences, services, meeting places and better public transportation.

The plan was out for consultation during spring 2017 at the same time as the process for the development of Sustainable travel plan was ongoing. Through it, wide participation from Science Park Mjärdevi including Business and Property owners in the area are given good prerequisites and tools to develop the place. Working with sustainability is also an increasingly important issue for attracting future employees, customers and investors.

The purpose of a Sustainable travel plan in Science Park Mjärdevi

Providing companies in the area of a "receipt" of the effect of the actions implemented is a key part of the strategic CERO work with recurring follow-ups. This motivates the management as well as employees to make climate-efficient decisions. Much will also happen "for free" due to the energy transformation society faces.

Examples of this include:

- The increasing proportion of renewable fuels and energy efficient cars as a direct consequence of technology development, energy price developments and other factors such as the expected increasing carbon taxation in society.
- The potentially increasing transfer from car and airplanes to public transport, train and virtual communications that are seen in many cities today.
- Future targets for public transport for renewable fuels that directly affect the climate. Here the municipality can pursue development through dialogue with traffic managers and regional decision makers.

In the light of the survey and the target formulation, the analysis supports actions that govern from today's situation to the goal set. An important part of this analysis is to identify what companies manage for their own power (e.g., what measures are profitable today). But also, what would be required further from traffic principals, authorities and decision makers (collective bargaining

taxes, fuel taxes, etc.) to reach further even on a long-term basis. The CERO analysis can thus improve dialogue between companies, municipalities, regions and region-responsible public actors.

Include staff travel in CSR work. To try to improve the terms and efficiency of staff commuting and missions is a way to improve health and work environment. This aspect is important to point out from a health-related CSR perspective (Corporate Social Responsibility).

The community benefit

Environmentally-friendly travel policies covering both commuting and service travel are so far unusual within organizations in Sweden. However, in several countries within the EU this is an increasingly common measure in traffic planning. In a societal perspective, this seems to be a smoother energy change, increased accessibility, less climate impact, better environment, reduced costs, fewer accidents and healthier employees at the workplace.³

To plan for more energy efficient travel and find modern solutions for how they can be replaced with information and communication technology implies increased profitability for individuals, organizations, companies, and society when energy prices will increase in the future.

Large, staff-intensive workplaces, are expected to play a key role in the energy change though their travel policy affects a large group of people. At the same time, they can have a large impact on decision-makers (public transport, county councils, municipalities, authorities, etc.) to improve the sustainable traffic infrastructure.

To post a strategic Action plan for future energy and climate goals can, in turn, give organizations good conditions to take advantage of the situation by taking the lead, before in an international perspective and constituting good examples of how travel and energy management can be optimized when demand for solutions will be acute globally.

The initiative in Science Park Mjärdevi has been preceded by some good examples of organizations. Companies and business areas have been initiated in sustainable travel planning for their employees

The launch of the Sustainable travel plan

A presentation about the Sustainable travel plan Mjärdevi was introduced for the Real Estate Owners Network in October 2016. They showed great interest and commitment to the task and gave Linköping municipality a 'ready to proceed' with the project. Step 2 was calling for an information meeting with the largest companies in the Science park. This meeting was held in December of the same year and the attending 14 companies also showed support of the project.

A travel survey was distributed thru the property owners in the area on to the companies which in their turn spread the survey to their employees. The link to the questionnaire was also available on

³ Evaluating qualitative management research: Towards a contingent criteriology, Robèrt and Jonsson, 2006;

websites and spread through social media. A campaign was conducted with large signs at entrances, floor decals, messages on digital displays in the properties as well as a collection of responses in person during lunchtime at the most popular lunch restaurants. Special contacts were taken with the 15 largest companies in the area with the aim of engaging and gaining a high response rate.

In January 2017, a digital survey was distributed with questions regarding employees' travel habits. The response received from 1,361 people, which resulted in a response rate of 22%. The basic material has been "washed" and unreasonable answers have been removed. For reasons of the resource, no response analysis has been made. However, this had ensured that the respondents in the survey represent a representative sample of the employees in Mjärdevi.

In connection with the CERO travel survey, the 15 largest companies in Science Park Mjärdevi were offered the opportunity to get a company-specific CERO analyzes for the purpose of creating a clear internal action plan including development of enterprise-specific target scenarios and action plans, as well as a withdrawal of service data for carrying out cost-benefit analyzes. Three companies have done this so far and the possibility remains.

Commuting

61% of employees commute by car to work. Science Park Mjärdevi has a high proportion of people who bike to work, a total of 39%. 14% use public transport, 5% travel by car as a passenger and 4% walk. Note that the percentage of employees does not aggregate to 100% because different types of transport are used during a whole week.

In total, approximately 30 years are consumed when employees travel to and from work in one year. This travel time corresponds to a socio-economic value of approximately SEK 31 million / year. The employees estimated the average cost of travel to and from work is SEK 1,078 / month.

Those who travel by car as a driver or as a passenger have about 20 minutes travel time each direction both the summer and winter periods. The travel time for the cyclists is just under 20 minutes and for public transportation commuters about 30 min. Pedestrians have less than 30 minutes.

Over half of the employees are positive about the employer's aim to reduce emissions from traffic.

Active mobility

Physically active travel time is important from a public health perspective. 2465 employees in Mjärdevi bikes a total of about 15 million minutes a year, which corresponds to an average of 130 minutes per week per cyclist (26 minutes a day during a working week).

This figure is a key figure for follow-up of travel behavior in Mjärdevi. Daily physical activity has a clear bearing on public health according to medical research. The strive is to make as many as possible to walk or bike on average at least 30 minutes a day to minimize the risk of endemic diseases.

In addition to the relatively high proportion of cyclists, 269 employees arrive by walking to Mjärdevi, with an average walking time of 31 minutes a day.

To the number of physically active commuters who fill the quota of at least 30 minutes of physical activity per day includes the majority of public transport users (865 employees), because the commuting by public transport comprises at least four walks (home-location, stop-work, return trip)

Main reasons for the choice of transport

The main reasons for those commuting by car five days a week to work are the time they gain 51%, followed by 22% comfort and 8% access to travel.

For those who travel by bike, health is most important with 35%, followed by 21% comfort and 15% environmental reasons.

For those who walk, the main reason is also health reasons with 45%, followed by the comfort with 33% and the time gain by 11%.

For those who use public transport the main reason is economics with 32%, followed by 30% convenience, access to travel by 23% and environmental reasons by 9%.

For those using long-distance trains, access to transport is the most important.

For those traveling by express bus, it is the main reason that it is comfortable with 45%, followed by economic reasons by 39% and access to vehicles and environmental reasons with 8%.

Of those who responded and commented on why certain means of transport are chosen; the answers can be divided into the following main groups:

- Many live close to their workplace which makes walking or taking the bike to work the easiest way to get there. Fresh air and exercise is a plus.
- Children are to be picked up and left at preschool/school.
- Dogs that have to be rested or left at dog care centers.
- Public transport is too slow compared to the travel time by car.
- Activities / missions on the way home is a reason why the car is used
- No safe bicycle parking at the workplace

Car commuters as a target group

Car commuters stand for 92% of CO₂ emissions. The focus is therefore on mapping drivers' travel behavior and finding opportunities and sustainable alternatives. Of Mjärdevi employees 61% use the car to work any day of the week during the summer period and 62% during winter.

For those who drive five days, 10% have less than 5 kilometers to their workplace. Here it is important to remember that the group five days a week is about 60% of those who use the car.

Figures from a travel survey conducted for the entire Linköping municipality in 2014 point out that the working distances are relatively short in Linköping;

- 62% of residents in Linköping municipality have less than 5 km to work
- 81% of residents in the city have less than 5 km to work
- 59% of employees in Mjärdevi have less than 5 km (regardless of means of transport)

It's probably worth trying to attract just those groups of employees that have less than 10 kilometers, and especially those who have less than five kilometers to the workplace, to switch to alternative ways of travel such as public transport, to bicycle or walking, especially during the snowless part of the year. Here are incentives such as better health and fitness, economics, environmental reasons, etc. which can also provide spin-off effects to the employer regarding higher work efficiency and fewer days of sickness.

What could make car commuters change the car to other means of transport?

For those who use the car to their workplace, improved public transport is the measure that should get most people to change the way of travel. 46% of those working five days a week using the car has answered this. Those traveling to work five days a week are about 60% of drivers. Drivers also answer that they may think of a change of way of travel if there was a chance to calculate travel time as working time, 4% of them should take the bicycle if there were better infrastructure for biking.

The use of the car has been motivated by:

- Children should be left and collected at the nursery/school
- Dogs must be rested
- There is no public transport

Changing the means of transport would be considered if:

- Faster public transport and train station in Mjärdevi that the express buses stop in Mjärdevi
- Better maintained and illuminated walking/bicycle paths
- Subsidized electric bicycle
- Less need to travel during worktime
- More accessible public transport

Business trips

It is clear that local business trips by car do not generate a high traffic load in the area about commuting travel.

Most commonly used business trip mode of transport trains. Flights also stand for a large quota, which is the most emission-intensive vehicle choice. Measures to reducing air travel should, therefore, be part of the company's internal climate work.

The survey included questions about where you traveled and what route you traveled to in business trip. 61% travel outside Sweden, 20% travel outside Sweden within Europe, 8% travel outside Europe. Locally within the municipality and regionally within the county travel 6% each. 30% of employees have not made a business trip in recent years.

E-meetings

Instant messaging, Voice over IP (VoIP) and Video conferencing are a very economical and emission-friendly alternative to IRL-meetings and therefore one important policy issue in most organizations. To replace, as much as possible, physical trips with non-residents meetings mean cost savings. The survey asks the question if the most recently completed appointment could be replaced by an on-line meeting. 8% of those who performed one trip for an appointment in the last year answered yes, which corresponds to 345 employees.

In the travel survey, we also have the basis for summarizing the number of hours traveling time. Off all employees who stated that they could have relinquished the last trip for an e-meeting. In total, these landings are 2 798 hours. Based on national statistics on average wage costs for civil servants, we see that this potential work-time efficiency would amount to 875 743 SEK (85 153 EUR) for this latest travel opportunity that employees consider could have been replaced.

Impact assessment of measures

To make the emission target more palpable and to identify the measures that have the greatest effect it is relevant to transform the emission target into concrete changes. To calculate the relationship between the number of drivers or the number of trips that need to be replaced, for the climate target to be achieved, a transformation model is used.⁴

The result is a "Gross Lists" on alternative climate improvements of Mjärdevis commuting trips. Here are alternative measures with estimated effects on both emissions and economics. Each reduction options listed below are counted with the goal of achieving an effect of 1% less CO₂-Emissions from journeys in Mjärdevi. To achieve climate goals in the short and long term, Mjärdevi can choose to use combinations of the following reduction options.

- *Replace car with public transport (bus card, etc.).*
On average, 63 drivers (2% of drivers) choose to travel by public transport to work the effect will be 1% less CO₂ emissions.

⁴ Robért, 2007, Mobility Management and Climate Change Policies

- *Targeted measures against long-distance commuting employees.*
If the eight drivers with the longest route, change the car to a non-emission-generating alternatives, 1 % reduction of CO2 emissions is achieved. Alternatively, you can review special agreements for this group.
- *Encourage employees to choose vehicles with environmental considerations.*
If an average of 125 drivers (3% of drivers) change their vehicles to environmentally friendly cars, this will result in 1% reduced CO2 emissions.
- *Encourage flexible working methods.*
CO2 emissions will decrease by 1% from Science Park Mjärdevi's travels if 42 drivers (about 1% of the drivers) work on remote per day. It would correspond to that 1/5 of the employees on average works on remote one day a month.
- *Offer courses in fuel-efficient driving (e.g. eco-driving).*
If about 422 drivers (about 11% of drivers) will drive fuel-efficiently, CO2 emissions would probably decrease by 1%. We have assumed this is decreasing fuel consumption by about 10% (according to data from a drivers school).
- *Encourage cycling, walking or carpooling to work.*
If on average, the 235 drivers with a maximum 7 km road to work (6% of drivers) turn over to cycling, walking or carpooling for one day a week it reduces CO2 emissions from travel by 1%.

Target scenario for Science Park Mjärdevi

The target scenario was developed in an interactive process with representatives from companies, real estate owners, and other relevant actors. In a process-oriented workshop based on all reduction options above (for more information about workshop methodology and IT-based process management tool applied, visit <http://www.cero.nu/en/workshops/>). The following companies, property owners, and actors were involved in the development of goals and objectives in the action plan: Ericsson, Advania, Cambio, Combitech, SICK IVP, Autoliv, Actia, Sunda hus, Combitech, Sunfleet, Klöver, Castellum, Sankt Kors, Östgötatrafiken and Linköping Kommun.

To achieve the potential effects reported in the CERO analysis, an action plan is a required set up to change travel in practice. There are different ways to influence travel within Mjärdevi, where well-chosen actions together create the greatest effect.

Central to getting started one powerful change process is to create understanding and broad anchoring in a project group, where everybody together has good insight into both target images and results and methodology in the CERO analysis. With this as a basis, an action plan can be drawn up with responsibility for prioritizing measures to reach the set goal. Workshops have been conducted in Mjärdevi with this CERO analysis as the basis for decision making, the design of target scenario and priority action plan for the next two year period, with the interim target of 15% CO2 reduction 2017-2019. Based on the target scenario, there is a specific action plan Developed with responsible actors for implementing actions, as well as established timetable for completion of the respective action. Each actor must estimate time and resources at the next stage for implementation to estimate a budget for the implementation of the action plan until the next follow-up date which is scheduled for January 2019. At this time, a full analysis implemented again, with follow-up of travel patterns, emissions and other factors measured in base measurement, as well as an update of target scenario and action plan for the next two-year period up to in 2021.

The workshop moments are based on the goal-oriented approach "backcasting" that characterizes methodology in CERO, where a "smorgasbord" of co2-smart alternatives is presented. At the first workshop, the group adopted a target of 15% CO2 reduction to the next measurement, in 2019. On this basis, goals were set below the following target scenario for employees' commuting trips, broken down to some different efficiency enhancements, each of which can be followed up over time. The action plan is designed via a digital planning tool developed for the purpose.

At the second workshop, the stakeholders started to co-design the action plan by choosing what measures are considered most effective and which combinations of actions that best fit together. The action plan also includes appointing the responsible part for each action. Actions, time and responsibility for each measure are listed in the digital Planning tool. Here are some measures listed:

Actions for the property owners in Science Park Mjärdevi:

- *Bicycle Sales, Bicycle Service*
Get bicycle dealers to establish themselves in the area and give the possibility to bicycle service facilities, either through a co-financed public bicycle service station in the area or inside the respective property
- *Bicycle parking*
A review of existing bicycle parking in the area and improvements in theft proof and protected bicycle parking near the workplace's entrances.
- *Shower and dressing room*
Improvements in the shower and changing facilities at workplaces incl. The possibility of clothes storage in lockable cabinets.
- *Electric vehicles charging infrastructure*
Review and improvement of the charging infrastructure for electric cars in the area.
- *Parking facilities as a control*
Mark and allocate places for environmental vehicles / charging locations closest to the entrances.
- *Parking review control using registration, timing or fees*

Actions companies Mjärdevi:

- *The economic incentive for commuting by bus*
Provide economic incentives for increased public travel through, for example, subsidized, pre-taxed public transport card and introduction and marketing of regional public transportation company's annual ticket.
- *Business trips by public transportation*
Introduce travel cards for public transport trips during worktime. The cards may be personal to those who travel a lot in the service, as well as bookable and available via reception or similar to those who rarely travel.
- *Information / Policies for e- meetings*
Which type of trips should be directed to free-of-charge meetings (domestic flights, meetings where the trip is longer than the meeting, etc.)? These rules can be clearly stated in the organization's travel policy.
- *Undo technical obstacle*
Reinforce and develop information, education and work for travel-free meetings- and conference forms. Review of existing technical equipment. Make sure employees think these are satisfactory and develop web manuals for the use of video conferencing and web conferences.
- *Bikepool and service*
Offer a benefit for buying a bike. As a complement to this, the employer also can offer a yearly free of charge or discounted bicycle service. Ensure access to bikes for business trips, both regular bikes, and electric bicycles, as well as encouragement to use these for short trips.
- *Control against a selection of environmental cars*

Support employees to choose environmental cars through:

- Sharp writing in policies around company cars. An agreement with a car dealer
- Parking regulations that prize environmental cars in the area
- Differentiated mileage premiums for environmental cars
- Develop the number of p-seats for loading vehicles.

- *Bicycle friendly workplace*

Work on meeting criteria that make it easy for employees to choose the bike, both to /from work and on duty. For example; bicycle-related information on intranet and number of people in a leading position at the workplace who bicycle to work, etc.

Actions Science Park Mjärdevi:

- *Hackathon* and *Creathon*
Stimulate internet of Things solutions that can be tested and developed within the Sustainable Travel Plan Mjärdevi. Two recurring categories in one of the hacks are Energy & Sustainability and Civil Environment & Transportations.
- *Mapping of needs*
Investigate interest and opportunity to create an alternative resource between different Science Parks in Sweden.
- *Marketing and Information meeting*
Conducted on a regular basis with the purpose of providing knowledge and give the inspiration to continue working with the activities.

Actions Linköping municipality:

- *Active mobility*
Offer a concept/information / campaigns/lectures that stimulate walking, bicycling or public transport to and from work
- *Bicycle test and showroom*
Provide opportunities for employees in the area to see and test different types of commuter bikes incl. Accessories such as electricity, cargo bikes, and bicycle trailers etc.
- *Carpool*
Stimulate the development of a carpool in the area through information, campaigns and offers aimed at both companies and individuals.
- *Bicycle Infrastructure and Bike pool*
Review and improvement of infrastructure and directions for bicycling in connection with Mjärdevi. Investigation on the introduction of a rental bicycle system in Linköping is ongoing. Use the knowledge in the area to develop the ideas about the system.
- *Try out periods*
Annual recurring opportunities for car commuters where they are encouraged to commute with e-bicycle for two weeks. A contract for bicycling at least three days/week is written. Free bicycles provided.
- *Monitoring via Information* about the possibility of bicycling to and from work on for example the intranet (bicycle maps, cycling times between different districts, competitions), Intensified information for changes in bicycle road network in the municipality.

- *Car parking Investigation*
Develop the discussion around the future parking solution.
- *Electrical Vehicle showroom*
Collect local car dealers for a mini fair in the Science Park. The employees got the possibility to test drive and get more knowledge about electric and environmental hybrid cars.
- *Carpooling*
Provide knowledge and smart tools to make more people think collaborative, environmentally friendly for common travelers, as an alternative.
- *Bicycle Friendly Workplace*
In consultation with the companies, develop a concept and criteria for the bike-friendly Workplace.

Actions public transportation company:

- *Try-out periods*
A recurrent activity where drivers are encouraged to try public transport to work for two weeks free of charge. Follow-up thru web surveys.
- *Improved offer*
Through a collaborative process, an in-depth analysis will be conducted with the aim of improving accessibility for public transport connected to where employees live.
- Intensified information/campaign on changes in public transport

More information:

<https://mjardevi.se/sustainable/>

<https://mjardevi.ideahunt.io/>

<https://www.facebook.com/groups/SustainableSciencePark/?ref=bookmarks>