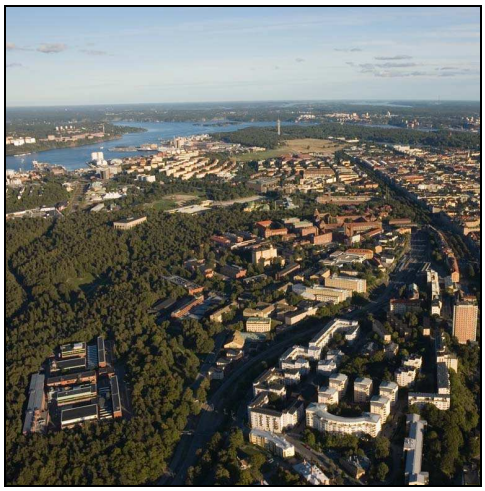
Loudden – A controversial harbour for petroleum products in Stockholm



(Photo: Ronald Wennersten)

Case study report within the Coastman project

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Abstract

Stockholm has for long time been an important city for trade in northern Europe and the Baltic Sea Region (BSR). The scenario for the future is that this role will not be less important but the prediction is rather that the harbours in Stockholm will play an even more important role in the future. Loudden is one of several harbours in Stockholm County and the biggest oil terminal of the region. It is situated in the eastern part of the central Stockholm. After several years of infected debates between several stakeholders as politicians, oil companies, municipalities and NGOs, the city of Stockholm finally took a decision in 1999 not to prolong the contracts with the oil companies after 2011. Important motives for the decision to close Loudden were to get rid of the transportation of petroleum products by trucks travelling through the city and the transportation of petroleum products in the archipelago. Another important motive is also the city's strategy to build and expand the city inwards, which means to use as much of existing land as possible and in the same time use existing infrastructure for building residential areas and offices.
There are several stakeholders involved in the case. For example harbour company own by the city, oil companies renting the oil harbour from the city, neighbours to the industrial area, planners at city planning office, tourists, NGOs, political parties, etc. It's important to recognise that the interactions between stakeholders have consequences for the decisions that are made.

Keywords:

- Stockholm, Loudden, oil terminal, stakeholders, decision-making processes, conflict resolution, coastal zone, sustainable development, risks.

1. Introduction

Stockholm, sometimes called 'The Venice of the North', is built on 14 islands around one of Europe's largest and best-preserved mediaeval city centres. Stockholm was founded in the middle of the twelfth century at the point where Lake Mälaren, Sweden's third largest lake, meets the Baltic Sea. During the seventeenth century, Stockholm evolved into an important city of trade and shipping due to its strategic location. The Stockholm Archipelago is the biggest archipelago in Sweden, and one of the biggest archipelagos in the Baltic Sea. It consists of approximately 24,000 islands and islets.

2. Background

2.1 Description of Stockholm's Harbour and Loudden Dock

Stockholm is built on the waterfront, which means that the harbour has always played an important role for the city. Until the 1950s, Stockholm harbour was the biggest import harbour in Sweden. The city flourished and traded with all parts of the world. After the Second World War the trade with the Baltic States ceased, while ferries to Finland increased in numbers.

Today Stockholm harbour is the biggest harbour on the Swedish east coast and plays an important role in the provision of goods to the city and Mälardalen region and also for passenger ferries and cruising ships. The harbour is divided into several docks, the most important being Stadsgården, Frihamnen, Värtahamnen, Loudden and Masthamnen. Other docks of importance in the Stockholm area are the outports of Kapellskär (90 km north of Stockholm) and Nynäshamn (60 km south of Stockholm). In addition to Loudden, petroleum products are handled in the Södertälje harbour (40 km south of Stockholm) and the Berg oil terminal in Nacka. (Malmsten, B., 2005).

The increased demand for oil caused by industrialisation resulted in the construction of the oil port at Loudden in 1926. Loudden is the biggest oil terminal in the region, with an area of 250,000 m^2. It is situated in east-central Stockholm, close to the Stockholm National City Park (Fig. 1). It comprises more than 100 storage tanks plus six underground storage cisterns with a capacity of 130,000 m^3 for holding petrol, diesel, heating oil and other substances such as lubricants and naphtha. Furthermore, underground tanks situated in the south-eastern area of the Loudden docks are available but currently not in use. Loudden is thus an important component of the regional supply of petroleum products to central parts of the Stockholm Region and for shipping traffic.
(Malmsten, B., 2005), (Transek, 2005).

Fig. 1. The Loudden oil terminal in central Stockholm (Ronald Wennersten)

The organisational structure of the parent company Stockholm Harbours (Stockholms Hamnar) is presented in Figure 2. Stockholm Harbours is a subsidiary company and fully controlled by Stockholm city. The land is owned by the City of Stockholm.

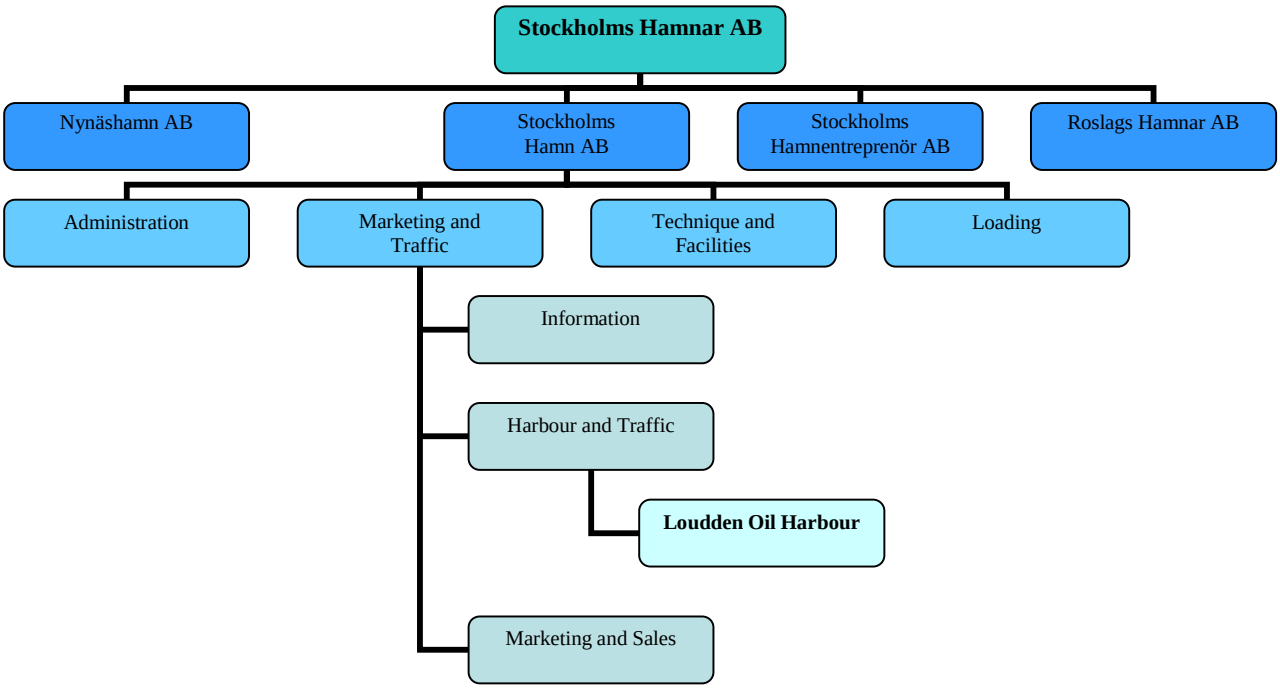

Fig. 2: Organisational diagram of Stockholms Hamnar AB. (Ronald Wennersten)

The docks in central Stockholm, Kapellskär (north of Stockholm) and Nynäshamn (south of Stockholm) are important links in the regional supply chain, as well as for the sea traffic over the Baltic Sea.

There are nine oil companies active at Loudden, two decontamination companies and one bunkering company situated in the area, including:

- Preem Petroleum AB
- Norsk Hydro Olje AB
- Univar AB
- Petrolia AB
- OK-Q8 AB
- AB Svenska Shell
- Reci Industri AB

Except for areas rented by the operating companies, Stockholms Hamn AB maintains common facilities such as piers, traffic routes and the gateway. Stockholms Hamn AB is responsible for safety and environmental reports on the harbour area.

Petroleum products such as diesel, gasoline and heating oil come in by ship from refineries in Finland, Norway, Sweden or Denmark through the archipelago, are unloaded and then stored in the Loudden cisterns and underground tanks. These 1.2 million tons of petroleum products and 170,000 tons of coal are mainly distributed by road traffic in the Stockholm Region.
The Swedish Maritime Administration (Sjöfartsverket) has stipulated that the capacity and measures of oil tankers bound for Loudden should not exceed 20,000 tons, 11 m draught and 200 m visibility in daylight. Safety factors reduce these values for night-time or bad weather conditions. All ships handled at Loudden in 2002 were equipped with double hulls. This is not due to legal requirements, but to the introduction of financial bonuses for ships with higher safety and environmental standards. Sheet pile walls have been built along the coastline of the harbour to prevent uncontrolled oil discharges from contaminating the land. Oil traps and sand filters have been installed to clean the rainwater run-off.

After several years of intensive debate between stakeholders such as politicians, oil companies, municipalities and NGOs, the city of Stockholm finally took a unilateral decision in 1999 not to prolong the contracts with the oil companies at Loudden after 2011. There was political consensus regarding this decision but no alternative site for the oil terminal has yet been identified. A solution for the region will affect not only the city of Stockholm, but also several other municipalities in the region. It is of course of central importance that a sustainable alternative solution to Loudden is presented and accepted by the stakeholders before Loudden is closed in 2011.

2.2 The case study around Loudden Docks

This case study was chosen because of its complexity regarding the decision-making process and stakeholder interest. The case study was mainly carried out in collaboration between the Royal Institute of Technology (KTH) in Stockholm and the City of Stockholm. Figure 3 shows Loudden Docks along the waterfront, almost embedded in National City Park which stretches through a large part of Stockholm. The area where Loudden Docks is situated is very close to the city centre and the Royal Institute of Technology (KTH). This location makes Loudden ideal for many purposes, such as a distribution node for petroleum products to the city but also potentially as residential area, recreation area etc.

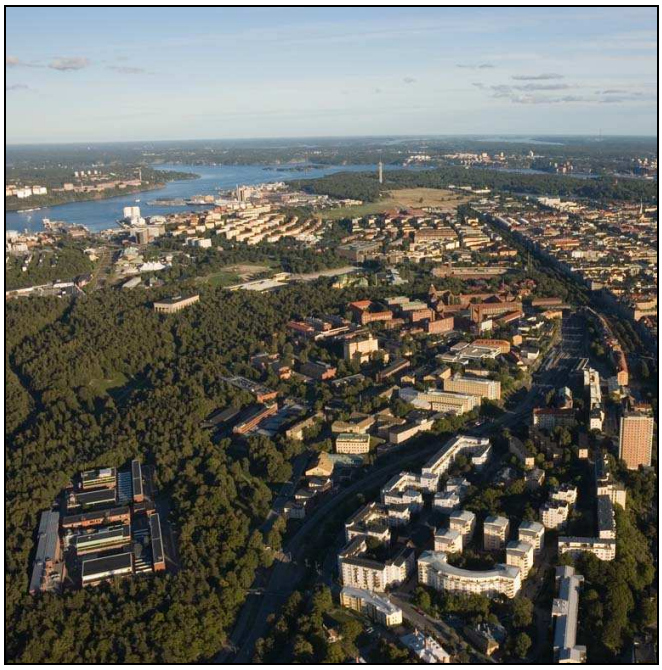

Fig. 3: Location of Loudden Docks on the Stockholm waterfront. (Photo: Ronald Wennersten)

The objectives of the case study were to:

- Study the decision-making process.
- Determine the knowledge, information and data that should form the basis for a decision.
- Reveal the interests and conflicts surrounding the process
- Investigate the role a university can play in the mediation process.
- Identify conflict resolution methods that could be used in the process.

It is important to understand that the decisions taken in the administrative and political processes of a city are not only the result of information and data. Even if the situation concerning information is effective and all stakeholders have access to the same knowledge and information, different stakeholders will have various opinions and will favour different decisions. The important thing is that the stakeholders have trust in each other. The degree to which one party trusts another is a measure of belief in the benevolence and competence of the other party. A failure in trust can be forgiven more easily if it is interpreted as a failure of competence rather than a lack of benevolence. Knowledge,

information and data should form the basis for a decision but the decision can only be taken in a process where the stakeholders' values are revealed. We only know of one such effective process, and that is the democratic process. The problem in practice with the democratic process is the real or experienced differences in power between the stakeholders.

Experience from many cases where conflicts or potential conflicts have been handled in different ways show that it is always important to start early in a conflict resolution process. The money and time spent on handling problems before they turn into intractable conflicts provide a very high rate of return on investment. It is not always possible to reach consensus, but the important thing is that different opinions can be made visible and it is always much easier to establish a trustful communication process early. It is also advantageous if a third party can play an important role in the communication process. This third party should have an independent role in the process. From investigations of public confidence in different institutions, we know that universities are always perceived with a high degree of confidence, while politicians and industry are poorly rated. Universities should therefore strive to establish value-free platforms for discussions and develop scientifically-based evaluation tools.

One of the objectives in the present case study was thus to see how a university (KTH) could play the role of mediator in resolving conflicts such as that surrounding Loudden. This was achieved through the use of different methods, examples of which are:

- Creating an information base through a literature study: Reports, books and newspapers were used to collect information needed in the case study.

- Workshops and hearings: Workshops and one hearing were used to create platforms for discussion between different alternatives for Loudden and also around the decision-making process.

- Indicators were developed describing different aspects of sustainable development for different alternative locations of the docks.

- Risk assessment: The aim here was to develop methods to assess risks so that the results could be communicated to all stakeholders in the process. The methods had to be based on knowledge from research in risk communication.

- Questionnaire: A questionnaire survey was carried out in order to obtain information on how different stakeholders experienced the decision-making process and what changes they would have liked to make to it.

2.3 Administrative, political and legal framework

It is not possible to fully understand the decision-making process around Loudden Docks without understanding the administrative, political and legal framework in Sweden. The location of docks in Stockholm is part of an integrated coastal zone management (ICZM) process for the region. However, there is no overall national legislation or special agency or institution responsible for planning, implementation and evaluation of ICZM in Sweden. The main legal framework is the Swedish Environmental Code and the Planning and Building Act, which apply to both terrestrial and marine areas. The inland and off-shore extent of the coastal zone is not explicitly defined in the Code but the areas were comprehensively shown on maps connected with the Bill in which the regulations were proposed. According to the Bill, the more detailed definition of the various coastal zones is a task for municipal comprehensive (physical) planning. The extension off-shore is suggested to be 1- 3 nautical miles from the baseline. A major part of the coastal zone has been identified as an area of national interest. Many of the provisions in the Environmental Code must be used when applying the Planning and Building Act. The special management provisions in the Environmental Code include regulations on sitting new industrial installations, tourism and recreational functions and restrictions on summer cottage developments.

The central government ministries most relevant to coastal zone planning and management are the Ministry of the Environment and to some extent the Ministry of Agriculture, where issues concerning fisheries are handled. The National Boards and Agencies in Sweden also have great responsibilities regarding environmental issues and planning, since they produce guidelines and since some of them give permits to larger projects within their sector.

Most important are:

- The Swedish Environmental Protection Agency (EPA)
- The National Board of Fisheries
- The National Board of Shipping and Administration
- The Swedish Board of Housing, Building and Planning
- The Planning Coast Guard

The municipalities in Sweden are responsible for physical planning at both the comprehensive and detailed level, although the County Administration Board can intervene if decisions by the municipalities threaten national interests.
The Swedish government and some regional organisations support sustainable development in coastal regions. The Regional Environment and Management programmes are examples of the ambition to integrate ecological, economic and social aspects in regional development.

The immediate power of planning in Sweden lies with the local municipalities. There is a long and strong tradition in Sweden of local self-government, and the municipalities are strong compared to the situation in many other countries. However the government and its regional agency the County Administration Board have to monitor all planning and have the power to object in certain cases – mainly when national interests, health and security and inter-municipal interests are violated.

In contrast to the case in many other countries, the Government departments in Sweden are relatively small. The Ministry of Environment – responsible for the environment, planning and building – consists of 125 members of staff.

To support the government administration, there are a number of central authorities or boards, each responsible for a sector of the community. To support the Ministry of Environment there are six different major central authorities employing approximately 1500 people. The Government can give the authorities instructions concerning their policies and activities, but according to the Swedish constitution the Government is not allowed to steer their decisions in individual cases. In this respect the authorities are independent of the Government. This is typical for the Swedish constitution, which dates back to the 17th century.

The Swedish National Board of Housing, Building and Planning, with 165 employees, is one of these major central authorities.

On the regional level, Sweden is subdivided into 21 counties headed by county administrations linked to central authorities. The County Administration Board is a state agency operating under general directives issued by Parliament and the Government. The board is completely independent to take decisions within its own framework. In some cases the County Administration acts as a court. The head of the county is a Governor, appointed by the Government for a period of six years. The Governor is chairman of a board of 14 people, to which the members are indirectly elected.

Parallel to the County Administrative Board, which is a government agency, there are on the regional level County Councils. These are elected by the people in general elections every four years. Their main purpose is to be responsible for healthcare. In Stockholm, the County Council is also responsible for regional planning and for public transport. The Regional Planning Office, which is an agency under the County Council with its own political board appointed by the Council, works with the regional planning issues. The company *Storstockholms Lokaltrafik* is owned by the County Council and operates the public transport network within the county.

The smallest political body is the municipality. Sweden has 288 municipalities, with populations varying in size from 3000 to 750 000. The median size of a Swedish municipality is approx. 16 000 inhabitants and the median area approx. 700 km^2. Stockholm City is the biggest municipality of all, with 750 000 inhabitants.

The supreme decision-making body in a municipality is the Municipal Council, in the case of Stockholm the City Council. It is directly elected every four years and has in the case of Stockholm 101 seats. The Council appoints a number of delegations with about 15 local politicians, some of whom also have a seat on the Council. The most important delegation is the *Executive Board*. Another important and compulsory board is the *City Planning Committee*. In Stockholm other important boards are the *Real Estate and Traffic Committee* and the *Environment and Health Committee*. These committees have offices at their service, most interesting here are *The City Planning Administration, The Traffic and Street Cleaning Administration , Stockholm City Development Administration* and *the Environmental Administration*.

Stockholm City owns the *Stockholm Harbour Company*, which operates the docks in Stockholm, Kapellskär (in the north-eastern part of the county) and Nynäshamn (in the southern part of the county). Loudden is located within the Stockholm Harbour area.

3. Description of the conflict and the decision-making process

The conflicts around the Stockholm docks are multidimensional and can be divided into three main areas:

- Protection of the environment and public health.
- Social aspects such as availability of residential apartments, job opportunities.
- Economic aspects mainly for municipalities and companies.

Examples of concrete conflicts within these areas are:

- The future need for docks: This will be dependent on the development of the City of Stockholm, as well as the future demand for fuels.

- Economic interest from other stakeholders: The companies that are active at Loudden have expressed their interest in staying at Loudden and even expanding some activities there. Other municipalities in the region have expressed their interest in taking over capacity from Loudden, mainly for reasons of economic development in their area.

- The future need for apartments and offices in central Stockholm: Part of the policy is to expand Stockholm inwards the area where the Loudden Docks is situated. It would be very attractive for the city of Stockholm to build residential areas and offices.

- The protection of the Stockholm Eco Park, defended by several NGOs.

In 1999, Stockholm municipality decided that the Loudden oil terminal should be closed down in 2011. One motivation for the decision was to get rid of the transportation of petroleum products by trucks travelling through the city and the transportation of petroleum products in the archipelago. Before the City Council took the decision, there had been discussions around this issue for many years. Initially, the discussion focused on the supply of aviation fuel from Loudden to the Stockholm airports at Arlanda and Bromma. During the 1980s discussions were held about a pipeline as an alternative means of transportation of the fuel. In 1994 the City of Stockholm decided to guarantee the funding for such a pipeline. One of the conditions for such a guarantee was that the company responsible for the pipeline would have long-term contracts with the companies delivering aviation fuel to Arlanda. However the oil companies did not want to commit themselves to such a long-term agreement and this ended the discussions around the pipeline. This is a basic problem connected to right of disposition, where the city is often responsible for planning infrastructure but it does not have any control over the companies delivering products, e.g. petroleum products and energy. (Lidquist, A., 2005), (Malmsten, B., 2005).

The decision to close the Loudden Docks gradually developed up to 1998, when an accident occurred close to Loudden. The safety aspects can often radically change public opinion when an accident occurs. This happened when a truck containing 14 tonnes of propane was involved in an accident close to Loudden, in the central part of Stockholm in 1999. This accident did not lead to any severe consequences, but it could easily have caused a catastrophe. It had a great impact on the discussions about the risks associated with transport and led to a ban on the transport of propane from the harbour. One of the parties in the City Council, the Stockholm Party, used the accident for one of the matters close to its heart, namely to get rid of heavy transport from Loudden through the city and through the archipelago. The Stockholm Party formed an alliance with the non-Socialist parties to run the city, and

the City Council of Stockholm took the decision to close the Loudden Docks. When it came to signing new contracts with the oil companies, there was a new strategy. The previous contracts ran for 20 years in order to give the petroleum companies possibilities for long-term investment, but from now on the contracts were only for one year. In 2002 there was a new election when the power went over to the socialist parties and the environmental party. The new City Council opted to sign contracts with the oil companies up to 2008, with the possibility for prolongation to 2011. (Lidquist, A., 2005).

The decision to close the Loudden Docks after 2011 has not been changed and there is now a process running for finding a new solution for the regional supply of petroleum products. During autumn 2006, the handling of aviation fuel was moved to the harbour in Gävle, a town 175 km north of Stockholm. Fuel is taken to the docks in Gävle and carried by railway to depots at Brista power station from where it is pumped through a pipeline to a depot at Arlanda airport.

Another important motive for closing the Loudden Docks was Stockholm City's comprehensive strategy to transform industrial land to build new housing. The Stockholm City Planning Committee is planning to build a new residential area on the property where Loudden is located. In its comments on the decision of the City to close the Loudden Docks, the County Administrative Board has written:

The docks are of strategic importance for the region as the only full service docks and are in this role of national interest. How the docks' activities will develop in the long run is unclear. There is however much that indicates that the area will continue to be docks with surrounding activities in the foreseeable future. The area has an attractive situation in the city and can, when the docking activities decrease, be converted to a city development area. The possible phase-out of the docks must however be seen as a long term development"

Today the County Administrative Board of Stockholm is searching for an alternative solution for the petroleum docks in the Stockholm region. However, there are many questions that need to be addressed and many interests to be handled before a solution can possibly be accepted by all the stakeholders.

Some of these are:

- The strategic supply of petroleum products for the region.
  How will the demand for the products develop in the next 10-20 years? Stockholm City has established the goal to be fossil fuel free by 2050. (Environmental and Real Estate Division, Stockholm City Council, 2007) Do we need docks for petroleum products in the long run? How will a gradual switch to bio fuels affect the situation?

- Interregional competition between the municipalities for employment opportunities, infrastructure development and economic growth. Docks would mean employment opportunities and economic growth for a municipality, but would also require adjustments of the infrastructure to support transport to and from the docks. What development is necessary and who will pay?

- Which aspects in sustainable development of the regions are most important?
  Environmental impacts, risks, social aspects, culture aspects?

- Who will bear the costs for phasing out the docks, decontamination etc?

- Who is responsible for finding an acceptable solution for the oil companies?
  Their interest is that a change will not raise their costs.

- What should the land at Loudden be used for if the docks are closed? What consequences will a new residential area have for other activities in the area such as ferries etc? The area is also close to the National City Park.

- Who should take the final decision and what impact should the different stakeholders have on the final decision?

Many stakeholders are affected by the decisions but the actual decisions are always linked to the actual power to decide. In the planning process it is important to have an early exchange of thoughts around different solutions among the stakeholders. This can be classified as upstream conflict resolution. Before the decision was taken to close the Loudden Docks by Stockholm City Council, there had been a long period of discussion among the stakeholders. However these discussions had been diffuse and unstructured in many ways and the decision was finally taken with the Stockholm municipal interests in focus. The main problem connected with the decision was that no alternative for location of the docks had been decided. The decision was taken by Stockholm City Council as one of the stakeholders, but the one holding the decision-making power. However, the alternative locations will affect the other stakeholders, such as the petroleum companies and the other municipalities in the region. Thus the decision was not taken as a balanced decision among the different conflict aspects and regional interests. The main problem with this kind of decision is that it tends to create intractable downstream conflicts, as in the case of Loudden.

For this reason it is important to look for conflict resolution methods that can be used to reveal information and values among the stakeholders as early as possible in the planning process. It is of course also important to identify at an early stage the stakeholders who will be affected by later decisions and plans.

4. Relevant stakeholders and relevant conflict resolution methods

4.1 Stakeholders involved in Loudden Docks relocation process

In Table I, the stakeholders identified in the conflict are categorised into interest groups, individuals, organisations and authorities.

Table I. Name and nature of stakeholders involved in the Loudden Docks relocation issue. *(Ronald Wennersten)*

Name of the stakeholder group	Interest groups	Com-panies	Organi-sations	Indivi-duals	Autho-rities
Stockholms Hamn AB		X			
Oil companies	X	X			
Neighbours to industrial area				X	
Tourists			X	X	
Citizens	X			X	
Consumers	X		X		X
Swedish Government					X
Political Parties			X		

Stockholm's Hamn AB can be considered one of the most active groups in this conflict. This might be due to the fact that on the one hand the chairman of this company is actively driving the question of shutting down the oil terminal at Loudden and on the other hand the civil servants, managers and workers in the company do not want to move the facility. Many internal investigations about possible alternatives, risks and environmental impacts have been conducted and are presented in this paper. Stockholm's Hamn AB is part of the stakeholder group.

The **oil companies** (generic term for all companies operating at Loudden) are acting in a more defensive way. A few investigations have been carried out by e.g. OK/Q8 regarding the risk assessment of transportation of petroleum products. Due to increased occurrence of oil spill accidents in the Baltic Sea, the public awareness about the problem is omnipresent and the companies have to work on their environmental image.

On the other side there are the attempts of Preem Petroleum AB to increase the volume of petroleum products allowed to be handled at the Loudden oil terminal (from today's 229,000 up to 818,000 tonnes per year). This case is currently being discussed at the Environmental Court in Stockholm. Because of these arguments, the oil companies form one group of stakeholders in the target group.

Of course **neighbours** to industrial areas in general would preferably not live close to such a site, especially in the centre of the city. The City Council of Stockholm is aware of this problem and is therefore declaring parts of the city to be environmentally protected areas, e.g. the National City Park in the direct neighbourhood of the Loudden oil terminal.

Neighbours are complaining about noise, smell and air pollution by traffic and would like the oil terminal to be moved to another place. People living along the access roads are also disturbed by trucks passing by and polluting the environment with noise and exhaust fumes and the residents are afraid of being seriously injured in the event of an accident occurring (explosion, fire etc.).

In addition, the level of sensitivity has been increasing in recent decades: people know about the health effects of 'dirty industries' and want to avoid harmful substances. On the other hand practically everybody is dependent on petroleum products: for example driving cars or using public transportation, using heating systems and electricity, as well as travelling by boat or plane.

Coming to the question of whether or not neighbours should be a part of the target group, the decision is based upon the assumption that political parties and organisations, such as the Organisation for Environment and Social Development, are generally represent the points of view of social groups such as neighbours and citizens, especially since no civil action groups have been established.

Tourists coming to the City of Stockholm by ship from other countries around the Baltic Sea land in the direct neighbourhood of the Loudden oil terminal. Other tourists will probably not come into contact with this area since no sightseeing attractions other than the National City park and the Kaknäs Tornet, giving the view from above, are in the close surroundings of Loudden.
It is not very likely that the impression of Stockholm and Sweden would dramatically change from a tourist's point of view, if Loudden were to be moved in the future, but the City would definitely be able to create a new tourist magnet by building a new quarter with shops and museums.

The interests of **citizens** and neighbours in a democratic state are presumed to be represented by political parties or organisations, as long as no action groups are formed.

Within the group **consumers,** members of other groups are partly included, such as citizens using cars or public transport, neighbours using oil for their heating systems and also other industrial companies that are using these petroleum products in further production steps. These consumers are interested in this discussion because it might have an influence on the market prices for petroleum products in the event of the oil terminal being moved to a more distant location.

The **Swedish Government** is the stakeholder that aims to look at the national economic, environmental and social aspects of this conflict. This perspective allows and requires a thorough evaluation of the conflict. Even if there are lifelike different points of view towards this problem in different political parties, the government as an institution has certain regulations and guidelines. Because of this, the government is part of the target group as a representative of citizens and neighbours.

4.2 What type of information is needed in such a complex decision?

As has been described, the decision-making process around Loudden is very complex, involving many stakeholders and conflicting interests. To facilitate an effective decision-making process, there is a need for a comprehensive background material based on a holistic view and if possible a common vision or visions. The vision should be an integrated part of a vision for sustainable development of the Stockholm region. This is also a central goal for the planning process in the City of Stockholm, to focus on sustainable development. Vision Stockholm 2030 states: (City Planning and Traffic Division, Stockholm City Council, 2007).

"The City of Stockholm is working on a holistic and long-term vision in the project 'Vision Stockholm 2030'. The vision shall serve as inspiration and uniting force in the long-term development carried out in the City of Stockholm and other actors in the region. The work is founded on a broad cooperation and agreement around strategic questions for the Stockholm region."

In developing this vision the city strives to engage all stakeholders in the city in an active process of discussion. Sustainable development can be formulated in a general way, such as that in the Brundtland report from 1987:

"development which meets the needs of the present without compromising the ability of future generations to meet their own needs."

When it comes to practice, this general statement has to be broken down into more concrete objectives and goals. A vision has to develop some targets and goals and also indicators that will show how progress is achieved. Indicators can be formulated top-down as in the case of the Swedish Environmental Goals, which are broken down into different sector goals e.g. for energy and building sectors. (Swedish Environmental Protection Agency, 2007).
However, sustainable development is a complex issue involving choices and values about what is more important or less important. These choices can only be made in a democratic process involving broad public participation. In this sense it is also important to formulate visions to develop indicators in a bottom-up process.

In creating the vision of a sustainable Stockholm region, there are several key components central for the development of the region in relation to the case study. Examples of these are:

- National transport political goals.
  The Swedish government decided in 1998 around a general goal for transport policies in Sweden. The overall goal was formulated as 'To ensure a national economically effective and sustainable transport support for citizens and business in the whole country'.

- Scenario(s) for the development of the energy needs in Stockholm County.
  In a recently published report, a prognosis for the future consumption of petroleum products in the Stockholm region was described. Stockholm County has the fastest increase in population in Sweden. The prognosis shows that the consumption of petrol and diesel in the Stockholm area will increase for the next 20 years. The consumption of diesel is expected to increase the most. (Transek, 2005)

- Scenario(s) for how these needs are going to be met.
  A change from fossil fuels to alternative fuels does not mean that docks will be redundant, since for example most of the ethanol used in Sweden is imported from Brazil. However the alternative fuels have a lower energy value and greater storage volumes are needed. A change to alternative fuels would thus require larger storage space and larger transportation capacity.

- Transport and depots – the planning of infrastructure for the coming 20-30 years.
  Stockholm is a large region, with 40% of the petroleum products being consumed in the central part and the remainder divided between the north and south of the region. Several investigations propose that docks located north and south of the Stockholm region should replace Loudden, to avoid heavy oil transportation through Stockholm city centre. Several of the suggested harbour locations are situated far from Stockholm and calculations show that transport distances will increase by 25% if Loudden is closed. (Transek, 2006).

- Regional and municipal general plans.
  In the Stockholm region there is a regional plan called RUFS which describes the region's strengths and weaknesses. The plan is a strategic instrument to integrate continuing growth with long-term sustainable development. All communities in Sweden must have a comprehensive plan that describes how land and water resources should be used in the community.

In addition to these key components, the background material should include:

1. **Environmental consequences**
   - Emissions to air

   At the docks, the petroleum products give rise to volatile hydrocarbon emissions when the petroleum products are pumped to the cisterns from the ships. When oil is transported by ships and trucks, the transport facilities generate emissions to air and the oil give rise to emissions during unloading. The emissions from the ships contain sulphur oxide, nitrogen oxides, carbon dioxide and particles. The consequences can be acidification, eutrophication, trophospheric ozone, greenhouse effects and depletion of the ozone layer.

   - Emissions to water

   Oil spillages can occur at different places in a dock area, for example at access ramps for trucks and railways, quays, pumps and tank locks. Contaminated water can also be released from the underground storage cisterns. The consequences of oil spills can be poisoned drinking water, contaminated nature and eutrophication.

   - Waste

   Waste in an oil terminal mainly consists of sludge from the oil sludge separation, cleaning residues from tanks, oil polluted matter from the ground, waste from the oil tanker engine house, flushing water and ballast water.

   - Protected areas

   It is important that sensitive areas and objects close to docks, depots, channels, roads and railways are mapped to determine how sensitive these areas are during standard operation and transportation and what the consequences would be if an accident occurred.

- Erosion

Erosion at coastlines, beaches and sea beds can be natural or generated by traffic. Erosion generated by ships depends on the speed, size and shape of the ship, the gradient of the beaches, the width and depth of the channel and the quality of the sea bed.

- Noise

Activities in harbours and depots can create noise that disturbs residential and recreation areas in the local environment. Noise from sea traffic is mainly generated when the ships are passing through the channel, lying in the quay and when the oil is being loaded and unloaded at the docks.

- Vibrations

Intensive transport by heavy traffic, e.g trucks and railway, creates vibrations in the land and poses a high risk to buildings and nature.

2. Risk aspects

The risks in docks are mostly associated with handling of the oil products. The products are classified as highly inflammable or less inflammable. The products can catch fire if leaks and evaporation occur.

Some docks and depots are located in industrial areas where other businesses can intensify the consequences if an accident happens in the oil terminal.

3. Transport

- Road transport

Most accidents involving transportation of dangerous goods in Sweden affect nature and water resources, and the consequences are serious but fatalities are unusual. To make transportation safer, it is important to map dangerous road sections; bridges, tunnels, sections with very intense traffic and sections recommended for dangerous goods transportation.

- Railway transport

Railway accidents occur in different ways, for example level crossing accidents, sabotage and derailment. The standard of railways for dangerous goods transportation is important, for example number of level crossings and tunnels, how accidents affects roads and other railway lines nearby and whether different products should be transported in the same train.

- Sea transport

Discharge from oil tankers during normal operation consists of contaminated ballast water, cleaning water from the tanks, oil residues and water from the engine room and the keel. Grounding and collisions can lead to accidents with larger disasters. In the Baltic Sea, grounding is the most common accident and collision the next most common. Oil deliveries are limited by the quality of the harbour channels, quay berth access and road and railway capacity. The Swedish maritime administration is responsible for drawing up regulations regarding the types of ships permitted to traffic Swedish channels, depending on the width, depth and visibility in the channels.

- Transport costs

The price varies between different means of transportation for petroleum products. For example the price is 0.05 SEK /ton km for transportation with oil tanker and 0.10 SEK/ton km for transportation by rail in both directions.

4. **The present standard and capacities of the harbours in the region**
   When Loudden is closed, the Loudden national interest must be abolished and the environmental permits at the alternative docks must be consulted. The Swedish maritime administration decides which harbours and channels should be classified as national interest. The environmental permits regulate how much oil products each harbour is allowed to manage.

5. **Costs of reconstruction and decontamination of Loudden when the docks close**
   - Land and large investments are required to construct a new depot. In investigations concerting Loudden, calculations show that a new depot (500,000 m^3/year) would cost approx 300 mil. SEK and an inland depot (500,000 m^3/year) would cost approx 300 mil. SEK. (Transek, 2006).

   - Activities in the Loudden Docks have been going on for 80 years and the ground in the area is contaminated. Decontamination of the area can only begin when all activities that can cause contamination have ceased. The business companies in the Loudden Docks area are responsible for the decontamination. One of the specific problems with remediation of the area is that there are several bedrock storage systems. Remediation of these could require a long time.

As can be seen from this short summary, there is a need for an extensive background material in order to describe the complex issue around the Loudden case. Such a background material has to be in such a form that it can be communicated to the stakeholders in the decision-making process.

The decision-making process for this kind of regional problem is unclear. There is no regional forum for such processes and the decision taken by the City of Stockholm is a unilateral standpoint although many regional stakeholders are affected.

4.3 What methods can be used to facilitate the decision-making process and create platforms for discussions?

One of the central objectives in this project was to investigate how different methods can be used to create platforms for mediation between the stakeholders in the conflict. The outcome of the process is highly dependent on the willingness and commitment of the stakeholders to find a reasonable and practical solution. The parties have been involved in the processes and conservative in their opinions for a long time, and it could be necessary to involve a mediator in order to create a basis for a fruitful working environment. It is necessary that the stakeholders agree on such conflict assessment beforehand.

In this case study, different methods for conflict resolution were applied. The most important methods used were:

- Hearings, seminars and workshops
- Questionnaire survey
- Risk assessment
- Indicators for sustainable development

4.3.1 Hearings, seminars and workshops

Hearings are often used as part of a juridical process but can also be used as part of conflict resolution strategy where different stakeholders have the possibility to ask a committee questions. In this case, a hearing was held with the politicians in the municipal district committees and an energy company planning for a large storage facility of natural gas close to the Loudden area. The hearing was directed by KTH, which took the role of a neutral third party, and the focus in the hearing was safety issues. In order to get permission to construct the storage facility, the company had to include a written safety report in the permission application which was in a standard form. However these safety reports are very difficult to understand and evaluate for laymen and had been criticised by a local NGO.

The hearing was held with around 15 participants without the obligation for any party to undertake any commitments. The aim was to create a more neutral platform for unbiased discussions in the presence of neutral experts from the university. The results of the hearing were very positive and a step forward in the communication process and in understanding the stakeholders' arguments. An interesting result was that the role of the university as a third party was very appreciated by the participants in the hearing.

In order to collect information for the case study, two workshops were held. During these workshops different stakeholders had the possibility to give their opinions on the questions around a new harbour structure and also to comment on other stakeholders' opinions. The workshops were held by KTH, acting as the convener and also as the moderator creating a neutral ground for the discussions. In order to further develop the contacts with the stakeholders in the case study, a student has been working on her Master's thesis in parallel, on the theme 'Sustainable harbour infrastructures for the Stockholm region'. This work has created more regular contacts with the stakeholders during the case study.

4.3.2 Questionnaires

Questionnaires are a type of statistical survey handed out to a specific group of persons to gather information. Questionnaires have advantages over some types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys and often have standardised answers that make it simple to compile the data.

In order to better understand how the different stakeholders viewed the decision-making process, in this case study a web-based questionnaire was sent out in 2006. The questionnaire was aimed at administrative (executive) officials within different stakeholder groups such as the County Administration, County Council, different municipalities, docks, oil companies and NGOs. The questionnaire was answered by around 70 officials (of approx. 200) mainly from county administration boards and municipalities. The results created an important discussion among the stakeholders around the need for a regional body handling these kinds of planning processes. One interesting result was that information from newspapers seemed to be one of the most important information sources for the officials. Another interesting result from the questionnaire was how the officials prioritised different aspects when planning a new structure for the docks area. The results showed that the officials gave transport opportunities to and from the docks together with environmental concerns as the highest priority, while employment was ranked lowest.

The results from the questionnaire also showed that it is mainly stakeholders from Stockholm that are taking part in the docks planning process and that these stakeholders think that the process affects a bigger region and that more stakeholders outside Stockholm should be active in the process.

Today there is no regional political organ that works together for finding a new solution for the docks. Of those stakeholders that responded to the questionnaire, 33% believed that a regional organ should take the final decision about how the oil deliveries for Stockholm region should be organised in the future when Loudden is closed.

The stakeholders want to replace Loudden with several docks located south and north of Stockholm to avoid long-distance oil deliveries by trucks through the city. In the planning process for the new docks structure, the most important factors to consider are the transport possibilities by sea, road and railway, environmental impacts, risks and regional development.

In the future, the stakeholders believe that the function of the oil terminal will change and other fuels will be delivered to the docks, for example biofuels. On the other hand, however, the majority of the stakeholders believe that the Stockholm region oil supply will always be an important question.

In 2006 a seminar was arranged by KTH and the results from the questionnaire were presented. Some topics in the questionnaire were discussed in more detail during the seminar, for example who should make the decisions about the future docks solution for oil supply in the region? Will we be using fossil fuel in Stockholm in 2050? At the seminar the stakeholders agreed that a special regional organ is needed in the docks planning process to deal with issues concerning land use, infrastructure and energy consumption.

4.3.3 Risk assessment

One of the main issues in our case was the possibility of a major accident e.g. during transport by trucks on the roads in the central part of Stockholm or oil spills in the archipelago. For many of the activities, there are existing risk assessments developed by the companies, but the general experience is that the results are difficult to communicate. Some stakeholders are very suspicious that the results are manipulated in order to favour the planned activities. In the case study, we developed more robust methods for estimating risks and the general conclusions are:

- Describe real Worst Case Scenarios, not more probable but less catastrophic scenarios. Realise that calculations of probabilities are very unreliable. Try to evaluate your ability to handle Worst Case Scenarios.
- Do not underestimate the consequences in content and discussions. If one party focuses on probabilities, other interest groups will focus on consequences.

4.3.4 Indicators

The DPSIR (Driving force; Pressure; State; Impact; Response) framework is not a set of indicators but rather an approach often referred to in the context of sustainable development indicators. The concept underlying the DPSIR framework is cyclical: human activity exerts Pressures on the environment resulting in changes in its State; such changes will have an Impact on human and ecosystem health, which in turn may elicit a Response for corrective action and changing habits. In this case study, the DPSIR model was used to develop indicators for use in the discussions around the sustainability of different alternatives for dock relocation. From the set of indicators developed, a subset can be chosen in an evaluation process where the most relevant indicators for the docks structure are chosen. In earlier investigations for sustainable docks structure, the focus was more on the national economy and less on environmental consequences. (Bosch, P. Gabrielsen, P., 2003;. European Swedish Environmental Protection Agency, 1999).

In the planning for a new docks structure, a number of issues have to be addressed, for example emissions, demand for oil products, political decisions etc. With the DPSIR model, both qualitative and quantitative indicators can be developed and the connections between them can also be visualised in order to decide which actions have to be taken in order to establish a more sustainable docks infrastructure.

5. Conclusions

From the discussions above it can clearly be seen that the decision-making process around the Loudden Docks is complex, involving many stakeholders and conflicts of interest. The final decision will demand a comprehensive and extensive basis starting from a long-term vision, long-term planning horizon and in-depth consequence analysis.

The answers from the stakeholders to the questionnaire clearly show that there is a need for a regional body that can take such strategic decisions, instead of decisions from single municipalities that affect the other actors and interest groups. The university can play an important role as mediator in creating a neutral forum where the stakeholders can reveal and discuss conflicting interests. In such a process the university can use different methods to collect information and also to turn this information into a form that is understandable to the stakeholders. It is important to know that in the end, such decisions are political and should be taken in a democratic process.

However a necessary requirement for a democratic process is that the stakeholders have access to a broad description of different alternatives and the consequences of whatever the alternative/s chosen.

6. References

Bosch, P. Gabrielsen, P., 2003: Environmental indicators: Typology and use in reporting. European Environment Agency, 2003. *(English)*

City Planning and Traffic Division, Stockholm City Council, 2007: Vision Stockholm 2030 – Underlag för dialog om framtidens Stockholm -PM 2007-03-06. Stockholm City Council, 2007. (Swedish)

Environmental and Real Estate Division, Stockholm City Council, 2007: The Stockholm's Action Programme on Climate Change. Available at: http://www.stockholm.se/Extern/Templates/Page.aspx?id=172599 (last viewed on 01.08.2007). (English)

Lidquist, A., 2005: Vilken soppa! En studie av processen bakom det politiska beslutet om av avvecklingen av Loudden och frågan om den framtida oljeförsörjningen i regionen. Department of Social and Economic Geography, Stockholm University, 2005. (Swedish)

Malmsten, B., 2005: Förslag till hamnstrategi för Stockholm: Att hamna rätt. County Administrative Board of Stockholm, 2005. (Swedish)

Swedish Environmental Protection Agency, 1999: System med indikatorer för nationell uppföljning av miljökvalitetsmålen Rapport 5006. Swedish Environmental Protection Agency, Stockholm, 1999. (Swedish).

Swedish Environmental Protection Agency, 2007: Swedish Environmental Goals. Available at: http://www.miljomal.nu/english/english.php (last viewed on 15.06.07) (English)

Transek, 2005: Stockholmsregionens framtida oljeförsörjning: Etapp I - Inventering av nuvarande användning av oljeprodukter samt kartläggning av befintliga anläggningar och distributionssystem. Stockholm, December 2005. (Swedish)

Transek, 2005: Stockholmsregionens framtida oljeförsörjning: Etapp I - Inventering av nuvarande användning av oljeprodukter samt kartläggning av befintliga anläggningar och distributionssystem. Stockholm, December 2005. (Swedish)

Transek, 2006: Stockholmsregionens framtida oljeförsörjning Etapp III – Slutrapport. Stockholm, December 2006. (Swedish)