The Rebuilding of Slussen and Securing the Right to Drinking Water for over Two Million People

Marija JURIC and Jennifer ULLGREN, Sweden

Key words: Sweden, drinking water, Slussen, Mälaren, transportation, rebuilding

SUMMARY

The population of the Swedish capital Stockholm is growing very fast every day. Slussen, as a district of Stockholm, is an important traffic junction where hundreds of thousands of people are passing through daily. To be able to meet the need regarding transportation of the future residents of Stockholm, Slussen is today undergoing major rebuilding. As a first step of the rebuilding, the whole traffic junction has been demolished and is now being reconstructed from the ground up.

In this process of reconstruction, the drinking water for two million people will also be secured. The water supply in Stockholm comes from the lake Mälaren. The water from Mälaren and the Baltic Sea meets in Slussen. After the rebuilding of Slussen the capacity to drain water from Mälaren will be five times higher than in the past. The new Slussen will after the rebuilding be able to withhold rising sea levels up to two meters. By these measures the flooding and contamination risk of the drinking water will decrease.

The rebuilding process of Slussen is complex and includes collaboration between several actors, such as the Municipality of Stockholm, Lantmäteriet (the Swedish mapping, cadastral and land registration authority), the County Administrative Board, property valuation experts, architects and others.

This paper will present Lantmäteriet's role during the rebuilding process of Slussen.

The Rebuilding of Slussen and Securing the Right to Drinking Water for over Two Million People

Marija JURIC and Jennifer ULLGREN, Sweden

1. BACKGROUND

Slussen as a district of Stockholm is, and has always been, an important traffic junction where hundreds of thousands of people pass through on a daily basis. The bridge over Slussen connects all traffic between the southern and northern parts of Stockholm. Buses, trains and metro lines are connected in Slussen and enables the inhabitants of Stockholm to travel efficiently between the northern, southern, western and eastern parts. In other words – Slussen ties together the different parts of Stockholm.

Slussen is not only an important traffic junction, it has also played an important role for securing the drinking water for two million people. Over two million people are living around the lake Mälaren, the area known as Mälardalen, surrounding Stockholm. The whole water supply in Stockholm and Mälardalen comes from lake Mälaren. Slussen regulates Mälaren's waterflow and protects the lake from saltwater contamination from the Baltic Sea.

1.2 A brief history of Slussen

During the 13th century, the lake Mälaren was completely separated from the Baltic Sea. The land rise continued and it gradually became more problematic for vessels to get through the channel. Due to this a lock was built in Lilleström that was 6 meters wide and 1.5 meters deep (south of the current Lock). This new lock was called Queen Kristina's lock. Dutch builders were responsible for the construction which was built during years 1637–1642. The lock made it possible for ships to travel more efficiently between Mälaren and the Baltic Sea which eliminated the risks of pulling the boats through the streams.

In the 18th century, the lock was considered too small and inventor Christopher Polhem was honored to build a new one. The new lock was built between 1744 and 1755. In the 19th century, when Polhelm's lock was believed to have served its purpose, a new construction assignment went to Nils Ericson, known as "The father of the Swedish railway". Eric's lock was 45 meters long, 9.5 meters wide and 3.6 meters deep and was built between 1845 and 1850 in the Kvarnströmmen, just north of Polhem's lock.


Polhelm’s lock illustrated to the left: Röda Slussen 1780. Artist: Holm, Anders. Stockholm City Museum
Nils Ericson lock illustrated to the right: Blå Slussen 1764-1820. Artist: Cumelin, Johan Petter Stockholm City Museum

When the tram network later came, the lock’s bridges could not carry the weight of the wagons. Passengers were still allowed to walk across the lock, from one side stop to another. Gradually, both water and land traffic increased. Nils Ericson's construction has turned into a blockage. At almost every bridge opening, cars had to wait in line for hours.

The solution became the current Slussen, designed by the architects Tage William-Olsson and Holger Blom in collaboration with the city planning office engineer Gösta Lundborg.
At the water level, the Karl Johan slussen was built, a lock that was 75 meters long, ten meters wide and 3.5 meters deep. On top of the lock, a clover leafshaped traffic carousel was created that connected the various access roads in a vivid way. King Gustaf V opened the facility in 1935. The city’s skyline has remained largely unchanged since then. Now, when Slussen had served Stockholm’s citizens for approximately 80 years, it has decayed and were slowly sinking into the lake.

The importance of sea traffic, between Mälaren and the Baltic Sea, decreased during the 20th century in the same time as the need for traffic on land increased. The need for vessels to pass through Slussen decreased due to another lock that have been built south of Stockholm, where also bigger ships could pass throug.

Since the transportation on land increased, at the end of the 20th century, the cloverleaf lock became worn down and the foundation was defective. The concreate of lock begun to moulder since it couldn’t withstand the salt water from the Baltic Sea. The cloverleaf lock was so worn down that the whole facility needed to be demolished and the facility in Slussen is now being rebuilt from the foundation.

Opening in October 1935. Photo: Unknown. Stockholm City Museum

2. THE REBUILDING PROCESSES

The rebuilding of Slussen started in year 2016 and it is supposed to be finished by 2025. Since Slussen is an important traffic junction it cannot be completely closed off to traffic during the rebuilding process. At the same time as the rebuilding process is going on, Slussen must be able to drain big masses of water from Mälaren.

The aim of the rebuilding is to turn Slussen into the one of Stockholm's most attractive meeting points with cultural events, entertainment venues, parks, restaurants and cafes.

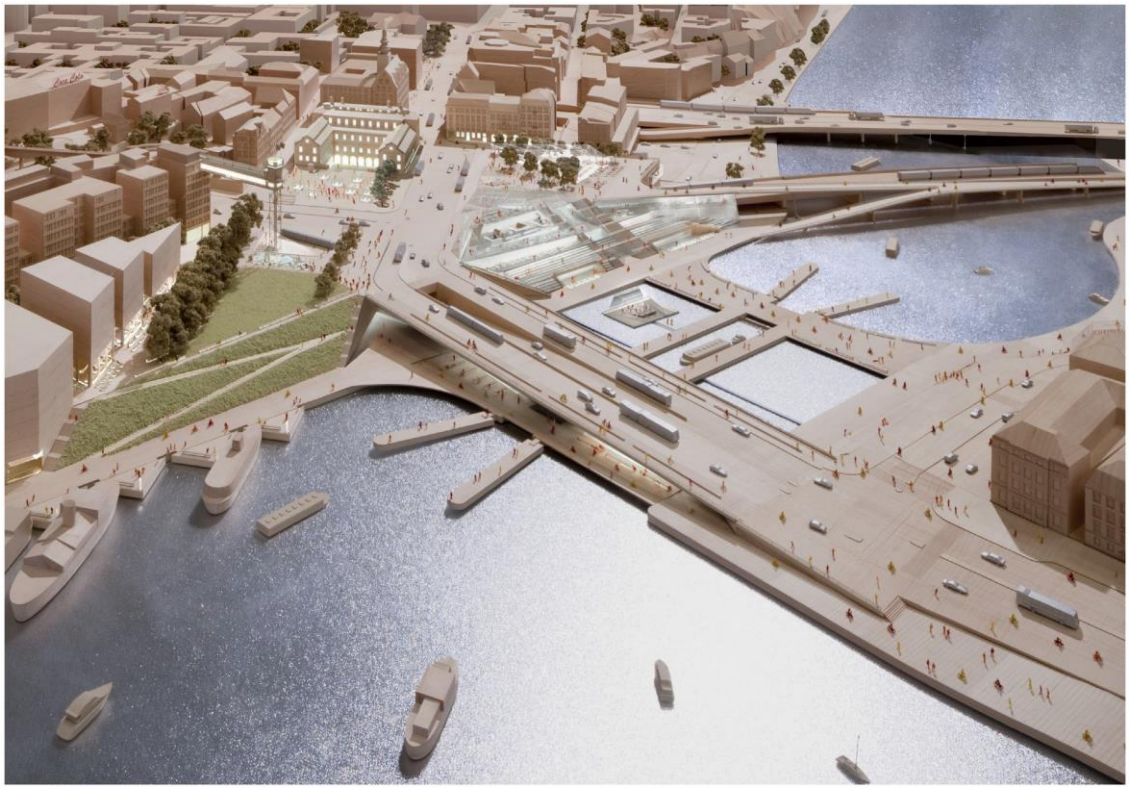
2.1 Changes in traffic

Stockholm’s population is increasing rapidly, therefore the accessibility of road and public transportation, walking and bicycling lanes need to improve and meet the demands of the increasing population. The rebuilding of Slussen is one way to meet these increasing demands.

Before the rebuilding, the facility had two bridges with twelve lanes. After the rebuilding process there will only be one bridge with eight lanes since the car traffic had decreased due to alternative travelling options. The new bridge will be 140 meters long, 45 meterwide and

weight 3 500 tons. The facility will become a meeting point where pedestrian and cyclist will have the ability to pass through in open spaces overlooking the water.

Another bridge will also be built for pedestrians and cyclist only between Old Town and Södermalm. A new tunnel for traffic enables a new boardwalk by the water and new office buildings. A bus depot is built into the mountain to facilitate an easier transit to other public transport for inhabitants living in the south-east part of Stockholm. The centre between the metro, bus depo and train-station will become a trading place easily accessible not only for all commuters but also for pedestrians, cyclist and inhabitants in the area.



https://www.tikab.com/wp-content/uploads/2017/08/Total-BIM-How-Stockholm-s-1bn-urban-transformation-project-is-going-100-digital.pdf

2.1 The securing of drinking water

Mälaren's water level has been regulated through channels and locks in Stockholm and in the city Södertälje, south of Stockholm. It hasn't been possible to drain large masses of water from Mälaren and the risk of flooding has therefore been too high. A flooding in Mälardalen today could lead to the drinking water getting partially or fully wiped out due to contamination. A flooding could also negatively affect buildings and infrastructure such as supplying systems for heat, water and communication.

To prevent the high risk of flooding, the rebuilding increases the possibilities to drain larger quantities of water from Mälaren. After the rebuilding the capacity to drain water from Mälaren will be five times higher than in the past. Therefore, the risk of flooding and contamination of the drinking water will decrease. The capacity to drain water will be 1 400 cubic square meter per second compared to todays 300 cubic square meters per second.

A though technical challenge is the shafting of the new channels eight meters below the surface. The rubble from the shafting will at some extent be used to reconstruct the seabed. The new lock groove will be 24 meter wide and 70 meter long and therefore minimize the risk of flooding. The rising sea levels increases the risk of salt water contamination from the Baltic Sea. Therefore, the new Slussen is being rebuilt to be able to withhold rising sea levels up to two meters.

3. LANTMÄTERIETS ROLE IN THE REBUILDING PROCESS

The rebuilding process of Slussen is complex and includes collaboration between several actors, such as the municipality of Stockholm, the Swedish mapping, cadastral and land registration authority, the County Administrative Board, property valuation experts, architects and others.

Lantmäteriet has helped with the process through subdivisions, by creating traditional 2D properties and through reallotment of 3D spaces. The purpose of the cadastral procedures is to build a property for a bus terminal to accommodate public transport between central Stockholm and the surrounding area. Since the bus-depo is located in the mountain, easements to and from the properties has been created to secure entranceways and fire exits in case of emergency.

Lantmäteriet has also helped through utility easement procedures, in order to protect the rights to securing a drainage tunnel associated with a protection zone.

4. CONCLUDING REMARKS

Slussen has been rebuilt several times throughout the history of Sweden due to changing needs of transportation and increasing population.

The ongoing rebuilding of Slussen was a requirement and a collaboration between different actors has enabled the work. When the new facility is finished it will not only ensure the increased need of transportation but it will also play an important role in the securing of clean drinking water for over two million people.

Overall, the rebuild Slussen with it’s traffic solution and it’s new lock will be an improvement even from an environmental perspective, which is very important from a climate point of wiev.

REFERENCES

City of Stockholm. *New Slussen, new places to meet, more spaces for pedestrians, cyclist and puclic transport, safe drinking water.* Stockholm: Edita Bobergs. 2017.

City of Stockholm: *Slussen anpassas till dagens behov*. 2017. https://vaxer.stockholm/projekt/slussen/slussen-daligt-skick/ (Accessed 2020-01-30)

City of Stockholm: *Slussen, projektfakta - hålltider*. 2018. https://vaxer.stockholm/projekt/slussen/ (Accessed 2020-01-30)

City of Stockholm, Stockholmskällan*: Stockholms platser, Slussen*. 2017. https://stockholmskallan.stockholm.se/teman/stockholmsplatser/slussen/ (Accessed 2020-01-30)

City of Stockholm: Översvämningsriskerna i Mälaren. 2017. https://vaxer.stockholm/projekt/slussen/slussen-klimatanpassas/ (Accessed 2020-01-30)

BIOGRAPHICAL NOTES

Ms. Marija Juric has been working as a cadastral surveyor for Lantmäteriet, the Swedish mapping, cadastral and land registration authority, since 2007, after graduating with a bachelor's degree in surveying from University West in Trollhättan, Sweden. She works with all types of cadastral procedures but mostly with forming utility easements. Since 2012 she is a delegate to FIG Commission 7.

Ms. Jennifer Ullgren has been working as a cadastral surveyor for Lantmäteriet since 2019, after doing service as a law clerk at the district court of Sundsvall and after graduating with a Master of Law from Stockholm University 2017. She mostly works with property formation procedures but also with utility easement.

CONTACTS

Marija Juric
Lantmäteriet, the Swedish mapping, cadastral and land registration authority
Lantmäteriet, fastighetsbildning
801 82 Gävle
SWEDEN Tel. + 46 8 709 57 68
Email: marija.juric@lm.se
Web site: www.lantmateriet.se

Jennifer Ullgren
Lantmäteriet, the Swedish mapping, cadastral and land registration authority
Lantmäteriet, fastighetsbildning
801 82 Gävle
SWEDEN Tel. + 46 8 709 56 14
Email: jennifer.ullgren@lm.se
Web site: www.lantmateriet.se