# SCIENCE REPORT – WATER PROJECT

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# Science Report

## Water project

The 14th of March, during the water resources' week, we made a field trip to Molberkktjern, in the north of Moss. The experience began at nine in the morning and finished, more or less, at three in the afternoon. It was a cloudy day where the temperatures were low and almost all the area was snowy, but we went prepared for it with winter and snow clothes.

The aim of this fieldwork was to experience the different roles that the workers of Rambøll have in this Railway project. Showing us their serious and meticulous work, helps us to see the importance of a sustainable development of a valuable resource as the water. Also, this fieldwork gave us the opportunity to live and differentiate the stages that Rambøll's work carry through in this area.

Background information

**About the project. "Railway".**

The company known as Bane NOR have started this year the building of a new railway with the collaboration of Rambøll and SWECO. This two-way railway is going to go through the city of Moss, from Sandbukta to Sastad. It is going to have 10 km of distance, two tunnels and one new station in Moss. It is a hard project that it is estimated to be finished in 2024.

**What is Rambøll and what is their role in the large railway project?**

The collaboration of Rambøll in this project is crucial when we talk about a sustainable construction. The role of this company is to promote and obtain sustainable solutions to the project they support. In this case their work is going to be focused on a green area where the water has an important role when we talk about sustainable development. The job that Rambøll has is to monitor the water quality in the area routinely every week. This control of the water is necessary for knowing if the building of this railway can suppose a pollution problem for the area.

**About the area of Molbekktjern.**
Molbekktjern is a lake in the middle of a green area located in the north of Moss. It is a forest area where there are some rivers that are connected with the lake and with the Outer Oslofjord sea. There are also a lot of paths for hiking through the woods and the rest of the vegetation.

The area is, on one side, next to the sea and, on the other side, next to a main road. But the railway project has caused the necessity of building new roads through the green area to enable the arrival of equipment and transport needed for the monitoring work. The company thinks that this change of the landscape is required for a actual sustainable development of the railway project.

**About water. What is water and what important properties does water have?**
As we all know the water is the most important element for the life being on earth, and without it we wouldn't be here. The water's molecule is composed by oxygen and hydrogen, so it has different properties that make it the origin of every ecosystem with biodiversity on the planet.

These properties are:

-Universal solvent (ej. salt into water)

-Cohesion and adhesion (they permit the transport of nutrions and wast in an organism)

-High surface tension (the surface water molecules are more strongly attached than the ones above)

-High heat capacity (the chemical hydrogen bondingslet water absorbe a heat whitout changing its chemical state)

-Changes in density (solid, liquid and gas)

**Water cycle.**

All these properties make possible that the hydraulic cycle is carried out. This cycle is based on the change in the density of water where other factors also affect.

The process begins in the oceans where the heat of the sun changes the density of the liquid water and evaporates it into gas. This gas water arrives to the sky and with the condensation process it becomes itself into clouds. The cold temperatures cause the precipitation of the water in liquid or even solid density. This water that falls from the clouds can precipitate the seas again or the land area.

There are different places where the water arrives when it falls to the land. At the height areas like the mountains, the water normally arrives as snow (solid) because the low temperatures. Also, it can be precipitated in all the different ecosystems in land providing nutrients for the life being in the area. The water that stays on the surface descends from the mountains, rivers and lakes until it returns to the sea (the beginning of the cycle).

**<u>Methods used in the fieldwork</u>**

The following data is the parameters we got testing the samples in the fieldwork:

**DATA GROUP 1:**

1. PH – 6.7
2. SALINITY -
3. TEMPERATURE – 0.6
4. NUMBER OF PARTICLES – 49.1
5. CONNECTIVITY – 0
6. CONDUCTIVITY – 68.2

**DATA GROUP 2:**

1. PH - 6.9
2. SALINITY- 0.0
3. TEMPERATURE – 0.3
4. NUMBER OF PARTICLES – 71.6
5. CONNECTIVITY - 0
6. CONDUCTIVITY – 100.6

**DATA GROUP 3:**

1. PH – 6.3
2. SALINITY- 0
3. TEMPERATURE – 1
4. NUMBER OF PARTICLES – 55.4
5. CONNECTIVITY –
6. CONDUCTIVITY - 77.5

We went to a lake close to the place where the train rail is being built. That place is one of the key spots where the water could be influenced by the building process. Ramboll, the company who is being responsible of monitoring the water, has chosen three spots where they take the samples from: the first one is placed up-stream the lake, that is, all the water is going to the lake. The second one is placed down-stream the lake, and the last one is placed in the lake itself.

When we were in the field, we used an electrical machine which is measuring the pH, conductivity, temperature and the number of particles in the water. We used a recipient which was filled up with water from the three different spots we mentioned before. Afterwards, we used the machine to measure the different factors which can give us information about the level of pollution in the water. On the other hand, we took a special sample to measure how many heavy metals are contained in the water. For that, we mixed mercury with water from the lake. That sample went to the laboratory to be tested.

The samples have been taken in the field for one year, every fifteen days. It's important that they're taken regularly to make sure that the conclusions are correct.

The building of the train will affect the environment around. The aim of Ramboll, hired by the building company, is to make sure that all the ecological parameters are at the normal level. After a field study in the area, they concluded that water could be the factor with more risk to be altered. That's the reason because they're taking water samples all around the area. When they finish with the sampling work, their results will be crucial to deciding the next move of the building process.

**Environmental pollution.**

**Our visit to the laboratory.**

They divided us into two groups to explain to us with more ease and agility the functioning of the laboratory and what they were doing in it.

They began by explaining that the water sample had to pass through different stations before being analyzed. They insisted on importing time, speed and productivity when performing the analyses. In such a way that the chain that follows the sample to be analyzed is assembled in such a way that it arrives as quickly and efficiently as possible at its destination.

First, the sample arrives through a conveyor belt to the reading and sorting area. This tape has 3 levels, each level of the tape is intended for one type of sample (samples that must be analyzed within 24 hours, normal samples, special samples). Each sample must carry with it a document with information about the sample and where it is indicated that analysis is wanted to be carried out or that it is intended to look for in that sample. This facilitates and speeds up the distribution of the samples.

Then the samples go on to the next station where they separate the general sample into smaller ones with the sizes and shapes necessary to make the different analyses required. The rest of the sample is frozen and stored for 6 months in case the client requests another analysis or the repetition of one. At the same time, each of these partitions of the general sample carries an identifying sticker, with the number of the sample that was formed with the date (day, month, year) and then the sample number (1, 2, 3, 4, ...). In this way, the sample has a unique number that identifies it throughout the laboratory in the same way.
Once the sample has been divided and identified, they are taken to the different places where each of the analyses is performed. There are different areas depending on the type of analysis required, some of the analyses are done manually and others by robots. We were also informed that more and more work is being robotized because it is faster and more efficient.
Finally, they explained to us the system they were following in order to always try to improve and correct the mistakes they made. This system consisted of a screen with the time it has taken to perform the analysis and if they take longer than expected it appears in red. In this way you can easily detect where the problem is and put the necessary means to solve it.

**Interview with the project manager from Rambøll (Mr. Tom Jahren)**

- *[Interviewer]* How can the report and the investigation that you are doing in the water influence in the construction of the train railway?
- *[Mr. Tom Jahren]* We contribute to making sure that the project owners don't influence nature in a bad way, that means we understand that of course you have to do this, you have to feel in that creek because you need to build the roads to tunnels but we can help to avoid getting the water in the worst state that it was before the construction of the tunnel. So, we are making sure that the project owners stick to the water framework direct differences that we keep our waters in a good state.
- *[Interviewer]* So, if the pollution levels are so high, you can say to the company stop or you have to do that in another way.
- *[Mr. Tom Jahren]* Yes, you must change the way you work or something.
- *[Interviewer]* And we are interested as well in why did you choose the water to check, I mean, not other factors like air, the trees or the ground, or whatever?
- *[Mr. Tom Jahren]* As I've told you early today before starting the monitoring of the waters we had studied, and we know, or we knew they were going to fill in this river and the water is the first thing that gets influenced. We know about the biodiversity here and we know that there is not has that much effect on the biodiversity, but it can influence the water. So, we look at the water first and of course then we have framework directive that we work after and we have the guideline values for how much particles and contaminants we can have in the water.
- *[Interviewer]* So, you also check the vegetation and the ground.
- *[Mr. Tom Jahren]* Yes, we haven't checked in detail here, we haven't done this study, so we must get knowledge about what kind of nature types we got here.
- *[Interviewer]* Is it mandatory to make this kind of studies in all the constructions in Norway?

- *[Mr. Tom Jahren]* Yes, when you get digging in the sea or influencing rivers and so on, there is always strict legislation on that, so the authorities have to come into the project and give permits. And with the permits, of course, it comes mandatory programs and so on.
- *[Interviewer]* And are you being hired by the kommuna?
- *[Mr. Tom Jahren]* No, we are hired by the project owners here.
- *[Interviewer]* And do you keep investigating it when the process of the building the thing is finished?
- *[Mr. Tom Jahren]* Yes, we are going to continue to investigate after the project is finished. Just to control that everything is working okay and that we are in a good state in the waters.

**Video project**

Here it is the link to one of our blogs of the course "Outdoor Education and experimental Learning". We uploaded a documental-video about our experience in the water project, concretely in the fieldwork next to Moss.

**https://wordpress.usn.no/228243/projects/water-project/ (password: outed)**