

Resilient catchments



Restoring the hydrological cycle on local level in catchments with forestry and agriculture.

Over time the realization of how climate change will impact food production in Norway has come to the landowners. They see an increase of flooding during spring, drought during summer and flooding again in fall. Catchments are no longer capable of handling the amount of water that falls and has less storage capacity for periods of little to no precipitation. Water has been ditched out, buried in the ground through pipes and areas taken for other purposes. How do we get back to resilient catchments that can handle the new climate?

With the new Water Resilience Strategy for the EU, it became evident that many of the measures we are promoting and implementing in the Halden river basin sub-district are in line with the strategy but lack a more systematic approach. Reports have been made to look at how to reduce flooding in especially exposed catchments but have problems getting implemented strategically. The areas in question where the measures should be implemented are private landowners, farmers and forest owners. Measures like this is not mandatory but has to be implemented on a volunteer basis. The forest owner often does not see

the problem downstream, and does not see the need for retention measures such as small dams and peat land restoration. The farmer gets the problem but focuses on getting the water through the area as quickly as possible. Other land further down then can't handle the amount of water that comes and therefore changes from cereal to grass because of occasional flooding. Towns, villages and roads near the lakes and larger waterbodies then look to technical and grey solutions to reduce damages.

The hydrological cycle has been shortened, where the speed from precipitation to see has increased, and take nutrients, pollutants and particles with it. Unless the stakeholders start looking upwards in the catchment and begin the effort to increase resilience within the catchment, there is little hope for the water quality.

We are working in large regional areas with single measures solely based on the interest or willingness of landowners. The measures are effective and good locally, but to reduce the larger problem with flooding we need to upscale the sheer amount of measures and more strategically place them where they have the most effect.



Up in the forest

The forested area in the highest parts of the catchment is often pointed to to ensure water retention in periods of heavy rainfall, but also retention in the sense of releasing water in a slow and steady flow to reduce the risk of drought in periods of little or no rainfall. In a report for a specific catchment in the sub-district the peatland areas which was ditched in post WWII to ensure timber production, has been pointed to as the areas with the highest potential for retention, with some areas where timber production never became successful is also the areas with the least interest conflict and loss of possible income for the landowner.

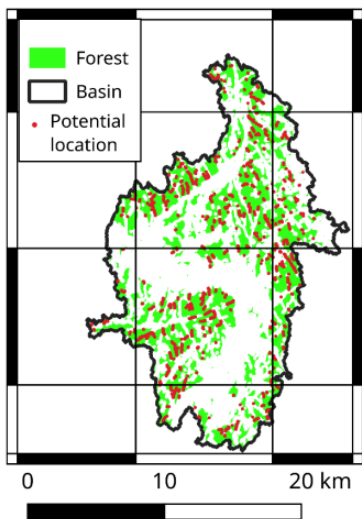
Another measure that has become more popular especially among farmers that own the connected land where forest and agriculture meet, is small debris dams or retention ponds, where a dam structure is put in place with a permanent outlet into the drainage. In periods of heavy rainfall the dam is able to store water while releasing it at a steady flow, reducing erosion risk along the drainage and surface water flowing over the agricultural land. This measure has quite evident local effect, but in a larger catchment to have significant effect on flooding, you will need many dams.

Other measures is usually focused on the forest logging methods, following PEFC-standard especially on riparian zones and the maintenance of

forest ditches.

The main barrier to these measures might be that the same land-owners doesn't necessarily see the benefits from measures on their own land, but is asked to do measures to have effect downstream. Finding the added benefits and proper motivation is key.

Map of debris dams



Industrialized peatland with flood retention potential

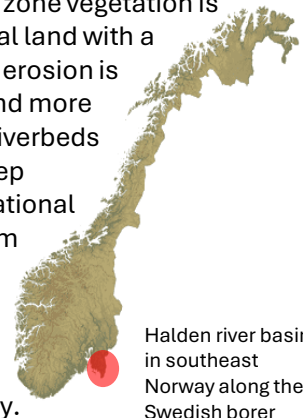
Down by the stream

Further downstream we hit the agricultural land. The area is mostly cereal production, and despite having policy to prevent most tilling of soil during the fall, it is still practiced by some legally. With heavy rainfall we see issues with flooding, bank erosion, surface erosion and damages to drainage and hydrotechnical structures. Within the agricultural land there has been a focus on sedimentation chambers that include small wetland filters. Large scale wetland and floodplain restoration is very rare, due to a national average of just below 3% agricultural arable land.

As a result of a questionnaire to farmers on water quality measures, they responded that sedimentation ponds were the least interesting measure to implement, due to high maintenance and cost of establishing them and usually on arable land.

Restoration of riparian zone vegetation is another measure by agricultural land with a lot of focus recent years. Bank erosion is increasing due to water flow and more farmers are now eager to line riverbeds and banks with stones and keep vegetation out, although the national promotion of planning long term and the use of nature based solutions.

Also, the promotion of soil health measures might increase water retention locally.



Halden river basin in southeast Norway along the Swedish border

Possible partnerships

We are looking for sibling regions that work on a catchment based approach on building water retention and reducing floods, erosion and surface run-offs, to compare measures, efforts in implementation, policy and with communication and dissemination.

Despite the national low average of agricultural land, the region represented have a higher average between 8-12%, with then an average of forested area between 65-70%. Farming in the area is mostly cereal (wheat, barley, rye and oats) and some, but little animal husbandry, due to policy of regional focus towards cereal production.

The aim for the Halden river basin sub-district is to improve water quality, through the reduction of erosion and loss of nutrients to water, but are using the benefits of reduced loss of food production and the increased soil health as factors to help implementations.

