

Computer model of the Flommen Lagoon system – measures to improve water quality by investigating the water exchange

The Flommen Lagoon system can be found in southern Sweden, in the province of Scania, on the south western edge of the Falsterbo peninsula. It is the only lagoon in Sweden. Unlike most lagoons that consist of a singular water body, the Flommen Lagoon system is a complex network of water bodies interconnected with narrow channels. As a waystation for migrating birds and home to several species of toads, Flommen hosts a valuable ecosystem.

Coastal lagoons can be found in the transitional zone between sea and land, constituting water bodies that are connected to the sea by one or several inlets. These inlets allow for water exchange between the lagoon and the sea. The ecosystems found in lagoons are often unique and delicate, functioning as a habitat for many animal species. The health and vitality of these ecosystems very much depend on the water quality of the lagoon.

There have been concerns about the water quality in the Flommen Lagoon system due to insufficient water exchange between the lagoon and sea. The current sole existing inlet, Slusan, is crucial for the water quality in the lagoon. Should it be blocked by sediment, then water exchange between the sea and the lagoon will cease, adversely impacting the water quality.

The objectives of this thesis was to determine the current water exchange in the Flommen Lagoon system and to investigate different measures that could enhance water exchange with the sea and thus improve water quality in the lagoon.

Several conclusions regarding the water quality in the lagoon were accomplished by a mix of computer software and field measurements. These were used to create a working computer model of the lagoon and its behaviour. A combination of calculations and field measurements were then used to verify the reliability of the model.

One of the key findings is that the construction of a new inlet to supplement Slusan would aid in improving the water quality of the lagoon. However, this solution would come with one drawback. Increased maintenance costs can be expected to keep both inlets open. Another possible solution investigated would be to close Slusan and rely solely on the new inlet to provide water exchange for the lagoon. The results seem to indicate that this leads to a significant reduction of lagoon water quality over time.

Vast differences between water quality in different parts of the lagoon can be seen. Water quality seems to be correlated with proximity to the inlet. The part of the lagoon closest to the inlet enjoyed significantly better water quality than the parts deeper inside the lagoon.