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Potential synergy between solar energy and biodiversity

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Like other countries The Netherlands are facing several societal challenges. As space is very scarce in the Netherlands it is vital to find chances for synergy in solutions to the challenges. It is investigated whether an upgrade of natural values in a large Dutch freshwater lake could go together with installing solar panels on water and thus generate sustainable energy. Our first exploration shows that this kind of synergy has potential for both biodiversity and renewable energy. The presentation will show the design, requirements, uncertainties, chances and risks.

The area of interest is Lake IJssel, a freshwater lake covering an area of 1,100 km^2 with an average depth of 5.5 m. Lake IJssel was constructed by the completion of a dam in 1932, transforming the former brackish water of the Zuiderzee into a lake. The water levels are precisely controlled, and the lake provides several ecosystem services. The present ecosystem is imbalanced with low productivity and low biodiversity.

To strengthen the delta nature in the Dutch waters a national Program for nature restoration has been launched. Goal for Lake IJssel is creating more natural transitions: from wet to dry and from fresh to salt. This is done by creating the missing habitats necessary for a healthy ecosystem like shallows with submerged vegetation and wetlands with a natural fluctuation of water levels. At the same time, the region surrounding Lake IJssel is trying to find opportunities for generation of renewable energy. Solar panels on the open water of the lake is one of the options. We have developed a design consisting of a cluster of artificial island modules.

The entire design consists of seven modules of which four modules provide space for solar panels. Each solar module consists of a constructed ring dike with an open connection to the lake providing a water surface where wave action is greatly reduced so thatsolar panels can be installed safely. In this exploration, we opted for a panel coverage percentage of 50% of the surface. If we decrease the water depth by one or two meters under the solar panels with local sediment, the light can penetrate to the lake floor. This creates a favorable environment for aquatic plants. Under the panels, a relatively open, structure-rich vegetation of mainly pondweeds is expected, which is interesting for growing young fish in the summer due to a combination of food supply and shelter. In winter, when the vegetation has disappeared, these waters are expected to be attractive for the wintering of (larger) fish. In addition, the mounting structures of the panels also contribute, providing a substrate for mussels and other invertebrates.

The idea has not yet been tested in practice. The possibility of multiple use of space for ecology and energy is so far based on the judgement of the best available experts and experiences. A pilot study and monitoring are required to gain more insights in the ecological impacts of solar panels in this ecosystem.