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## Abstract

### **A field study in Kenya of insolation parameters to make water drinkable in the household water treatment unit SOLVATTEN**

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SOLVATTEN is a household water cleaning device that cleans water with solar energy using filtration, pasteurization and UV sterilization. A field study of the necessary amount of solar insolation that is required to make water drinkable has been carried out in Kenya using a new type of indicator developed by Solvatten AB. This new indicator will complement the old one, which only registers the temperature, with new features to store information about temperature and insolation. The indicators have been calibrated for energy and temperature and a Matlab program has been developed to analyze the information registered by the indicators. The program handles the time shifting that occurs since the indicator only saves the data at some point during a quarter of an hour. It also handles temperature correction and does a suitable curve fitting using polyfit and spline.

The experiments have been divided into two parts, one where the relationship between UV and total solar insolation has been studied and one where we have taken water samples and studied the limiting factors of temperature, UV and total insolation for drinkable water.

Previous studies have showed that the water in SOLVATTEN gets clean at 55 °C. To reach this temperature the required UV245-400 and UV190-570 insolation is 83.0 Wh/m<sup>2</sup> and 307 Wh/m<sup>2</sup> according to our tests. The required total insolation is 2680 Wh/m<sup>2</sup>.

From our measurement it can be seen that it is possible for water to be clean at 53 °C. During our artificial tests where we pre-heated the water and thus decreased the total insolation, we never got below 8.2 Wh/indicator which correspond to 1940 Wh/m<sup>2</sup> of total insolation at 55 °C. The limit for clean water shown from earlier tests by Solvatten AB is 8 Wh/indicator. Even when the temperature was lower than 55 °C and we got clean water, the insolation was never below this value. This means that it is the temperature that is the limiting factor; however the synergy effect with the insolation is essential for the cleaning process.

When it is cloudy the amount of UV that SOLVATTEN receives will be lower compared to the total insolation. With more clouds the temperature will drop and rise many times, while the insolation continues to increase. This means that more clouds will give more total insolation.

The shortest time it took to reach 55 °C was 1 hours and 45 minutes at an optimal angle to the sun.

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