

### Heat Transfer Calculations

We will use heat transfer analysis to evaluate the heat transfer and temperature distribution in a solar water heater system. This process involves applying the principles of thermodynamics; heat transfer; fluid mechanics; etc. to calculate the thermal efficiency; heat loss; heat gain; etc. of the system. To determine the size of our solar water heater system, we will make assumptions of input parameters to determine the absorber area of the system. Some specific input parameters for our solar water heater system:

The type of solar collector we will use: Evacuated-tube solar collector.  
The capacity of our storage tank (in litres) = 20l

The daily hot water consumption (in litres) = 15l (assuming an individual that will use 15l per day).

The water inlet temperature (in  $^{\circ}C$ ) = 14.1 $^{\circ}C$  (annual minimum water temperature according to World Sea Temperature (2023)).

The water outlet temperature (in  $^{\circ}C$ ) = 48.9 $^{\circ}C$  (temperature to prevent scalding (United States Consumer Product Safety Commission, 2023)).

The solar radiation intensity (in  $W/m_2$ )