S1 Aerial imagery of the Shafdan WWTP

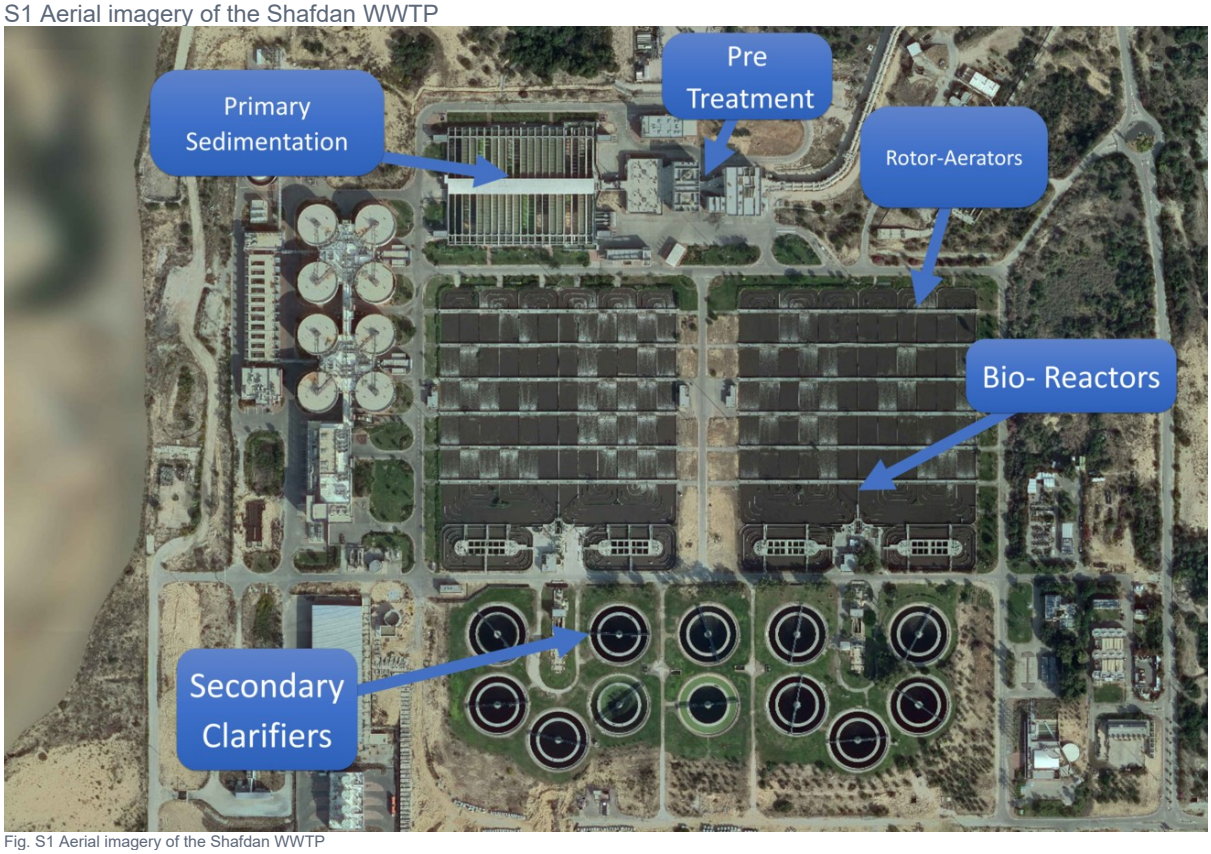

Fig. S1 Aerial imagery of the Shafdan WWTP

S2 Example of an LSTM Prediction

Assuming a simple time-series:

$$0.1,\ 0.2,\ 0.3,\ 0.4,\ 0.5,\ 0.6,\ 0.7,\ 0.8$$

This time-series could be applied with the sliding window method as described above, where prediction horizon is 1, window size is 3, and the amount of steps between each instance is 1:

X	Y
[0.1,0.2,0.3]	0.4
[0.2,0.3,0.4]	0.5
[0.3,0.4,0.5]	0.6
[0.4,0.5,0.6]	0.7
[0.5,0.6,0.7]	0.8

A simple LSTM model with 1 neuron is trained by feeding the first 4 instances (rows) above into the model. Weights after the training are as follows:

$W_i = -0.46$ $B_i = -0.46$
$W_f = 1.07$ $B_f = 1.07$
$W_c = 0.55$ $B_c = 0.55$
$W_o = 1.24$ $B_o = 1.24$

This weights are part of the LSTM equations as described above. After the model is trained, it is ready for making a prediction on last instance as: $X_0 = 0.5$, $X_1 = 0.6$ and $X_2 = 0.7$. As can be seen in Fig. S2, an unfolded LSTM neurons that receives the last instance as the input. Three iterations of calculating the equations are done where H_{-1} and C_{-1} are set to zero. Final prediction will be outputted as $H_2 = 0.79$ (which is very close to the actual value 0.8)

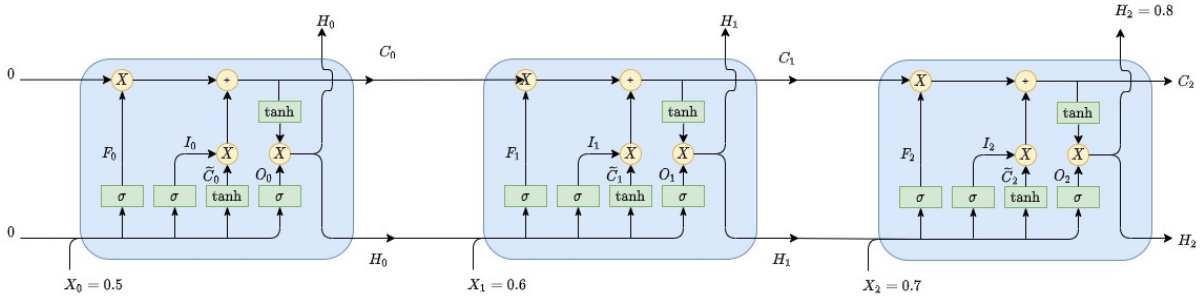

Fig. S2 Example of a prediction done on an LSTM model

S3 Imagery of microorganism's diversity

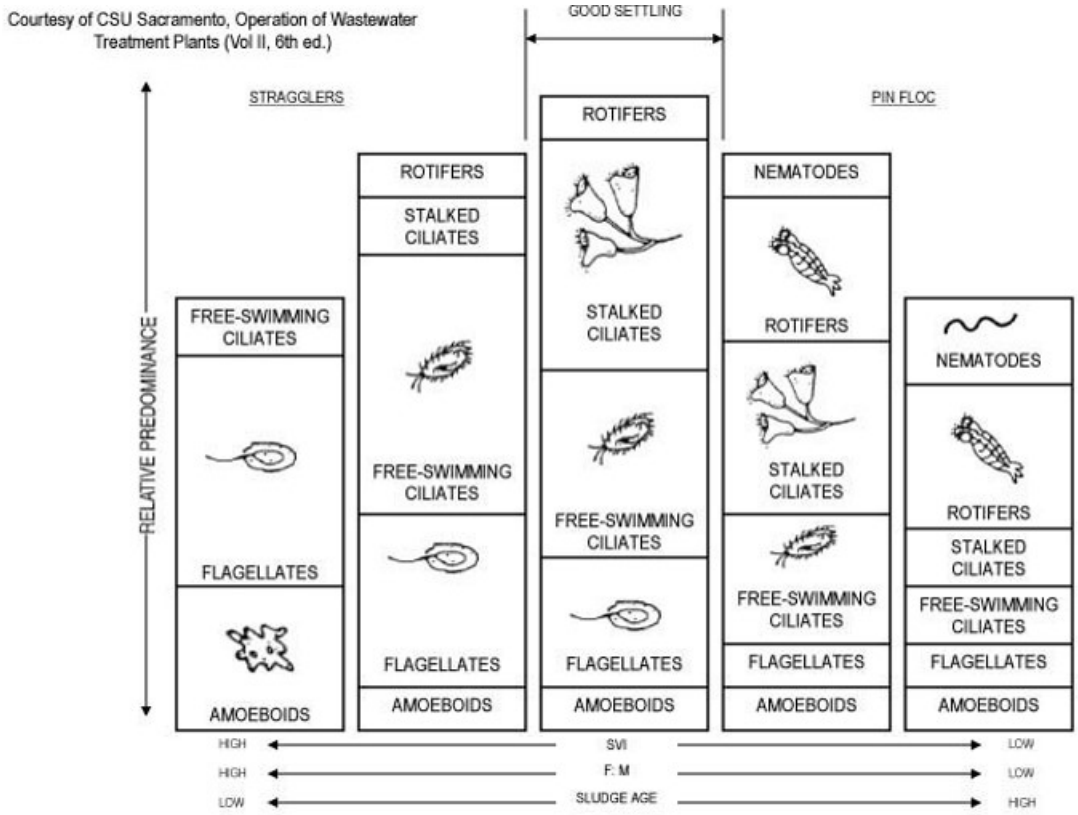

Fig. S3 AS microorganism's diversity observed at various Sludge age and F/M conditions [Federation, Water Environment Federation. Operation of Municipal Wastewater Treatment Plants, WEF Manual of Practice No. 11, Sixth Edition, 2007. Print.]

S4 MLSS microscopic images

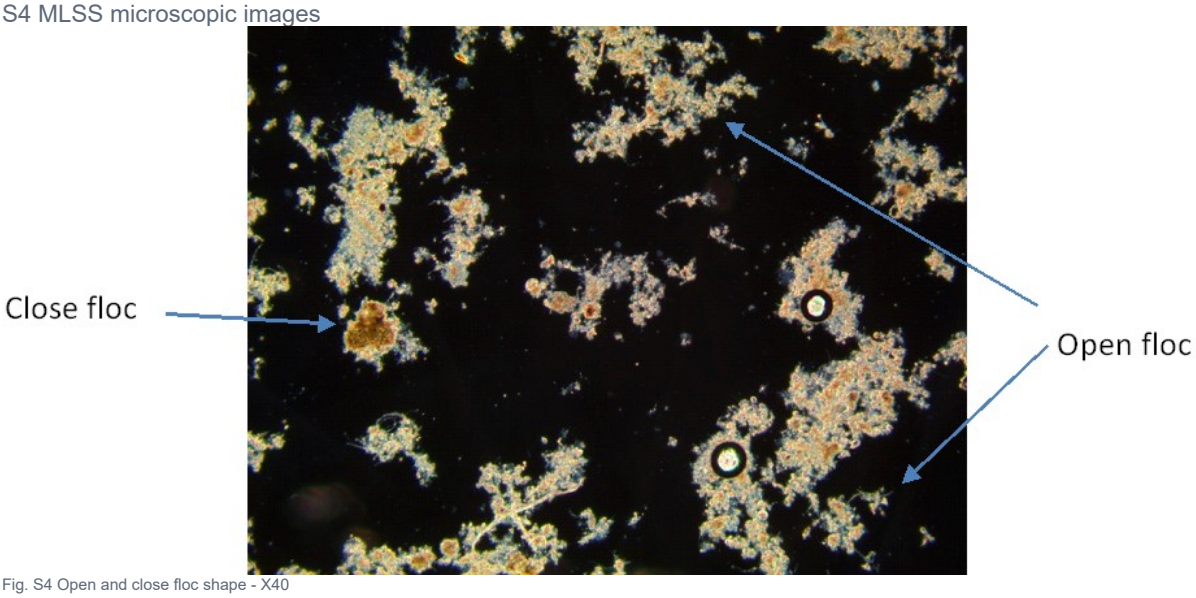

Fig. S4 Open and close floc shape - X40

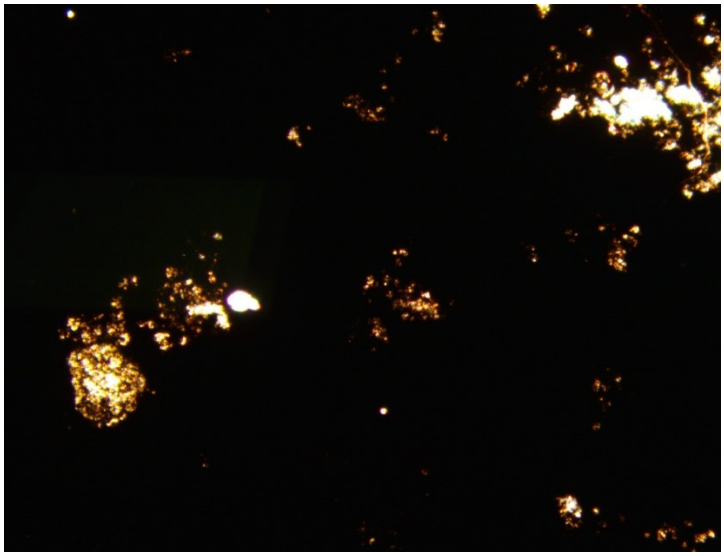

Fig. S5 MLSS sample after indian ink addition - X40

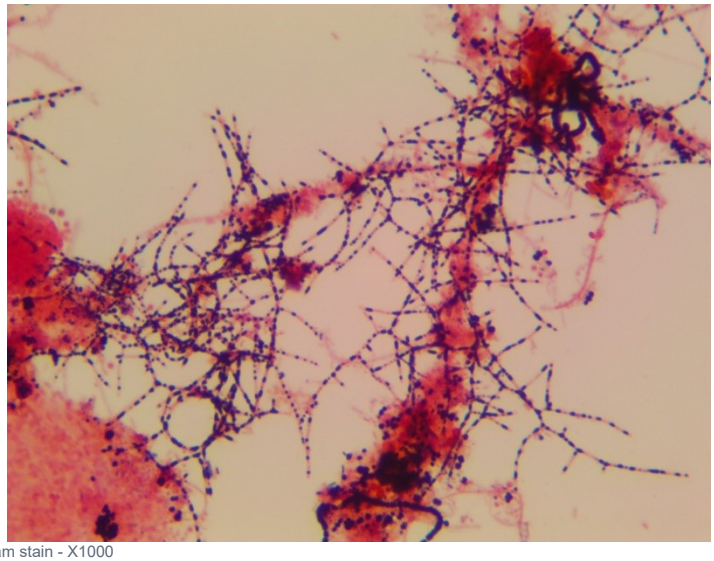

Fig. S6 Nocardia filament after gram stain - X1000