Electronic Supplementary Material (ESI) for Environmental Science: Processes & Impacts.

ELECTRONIC SUPPLEMENTARY INFORMATION

for

Limited nitrogen retention in an urban river receiving raw sewage and wastewater treatment plant effluent

Jingshui Huang [1,2], Hailong Yin [1,*], Seifeddine Jomaa [2], Michael Rode [2], Qi Zhou [1]

[1] College of Environmental Science and Engineering, Tongji University, Shanghai 200092, China.

[2] Department of Aquatic Ecosystem Analysis and Management, Helmholtz Centre for Environmental Research – UFZ, Brückstraße 3a, 39114 Magdeburg, Germany.

[*] Author to whom all correspondence should be addressed: yinhailong@tongji.edu.cn;

Supplementary Information consists of 8 figures and 1 table.

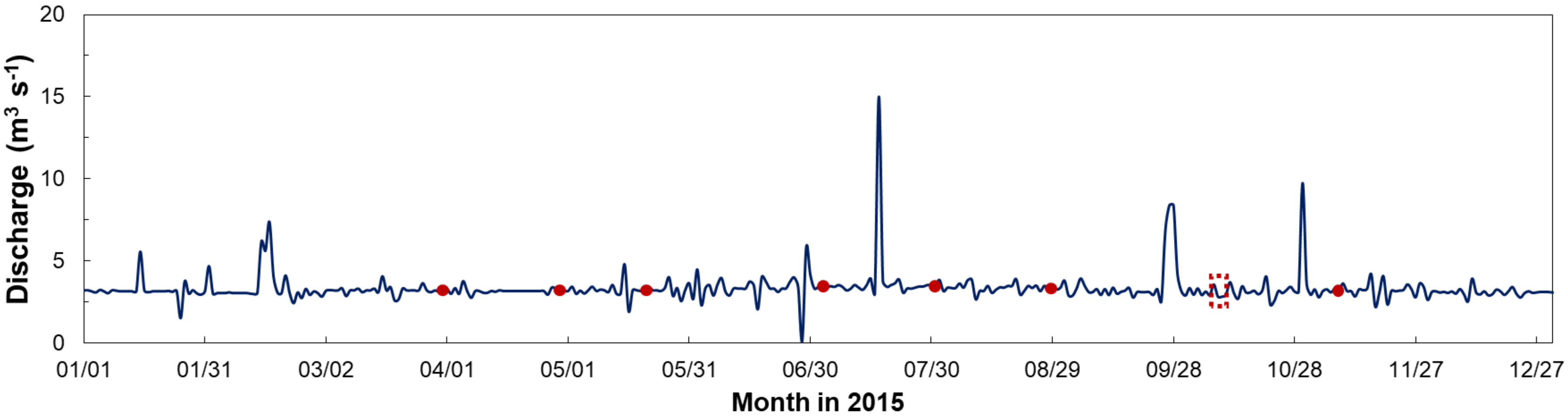


Fig. S1 Discharge hydrograph at Site 14 in the Nanfei River for the year 2015. The red dots represent the routine sampling dates. The red dashed square represents the intensive Lagrange survey under low-flow condition.

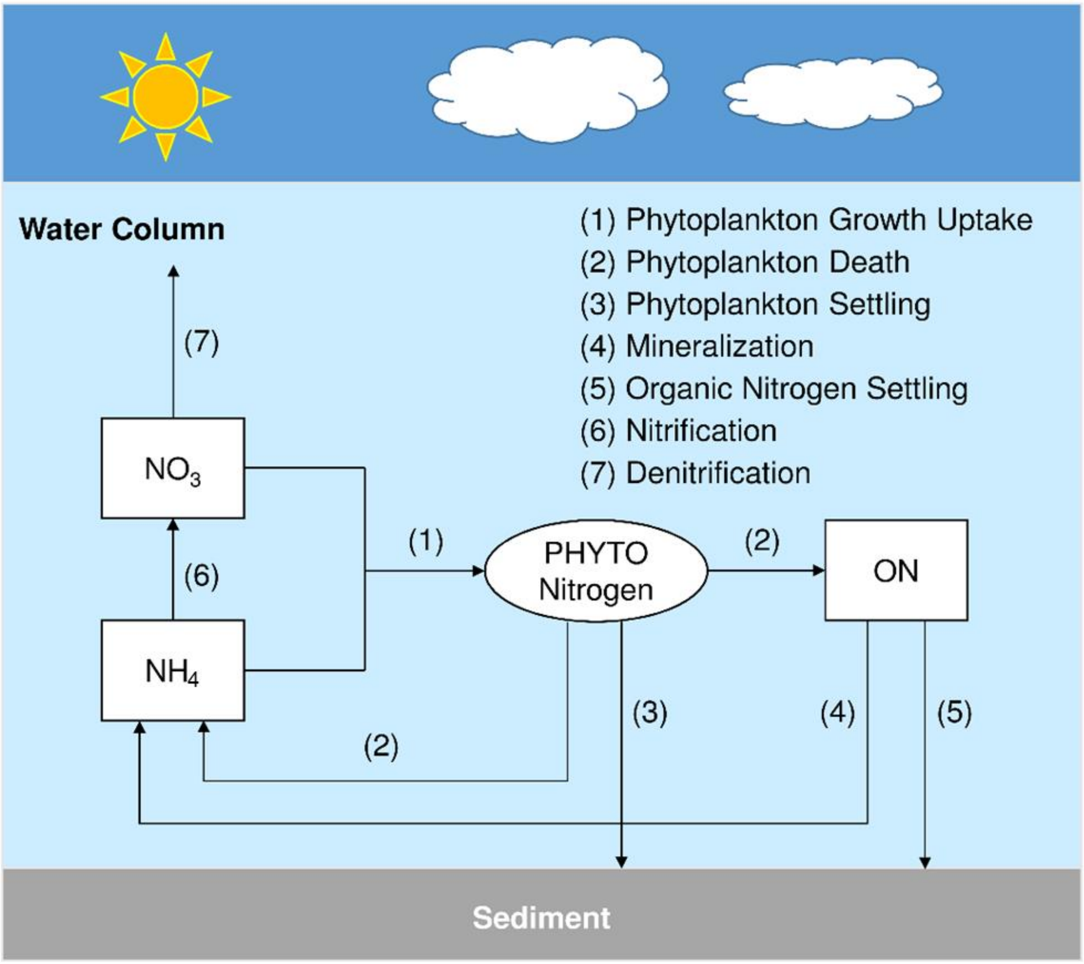


Fig. S2 Schematic description of the N cycling in the WASP EUTRO Module.

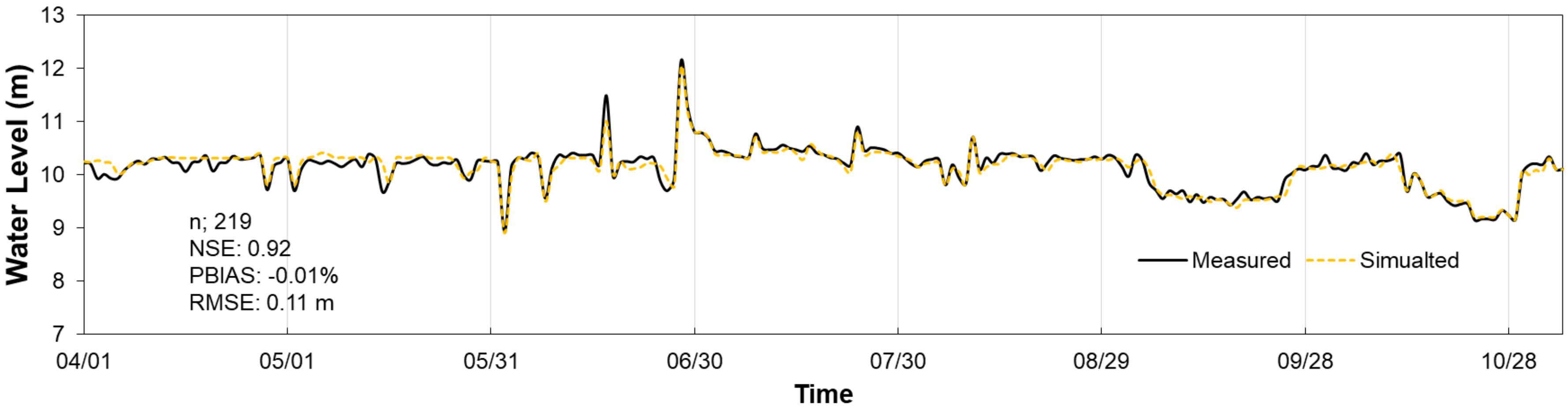


Fig. S3 Results of hydrodynamic model validation: comparison of simulated and measured values of water level at Site 14 during 1st April - 5th November 2015; the number of measurements was 219.

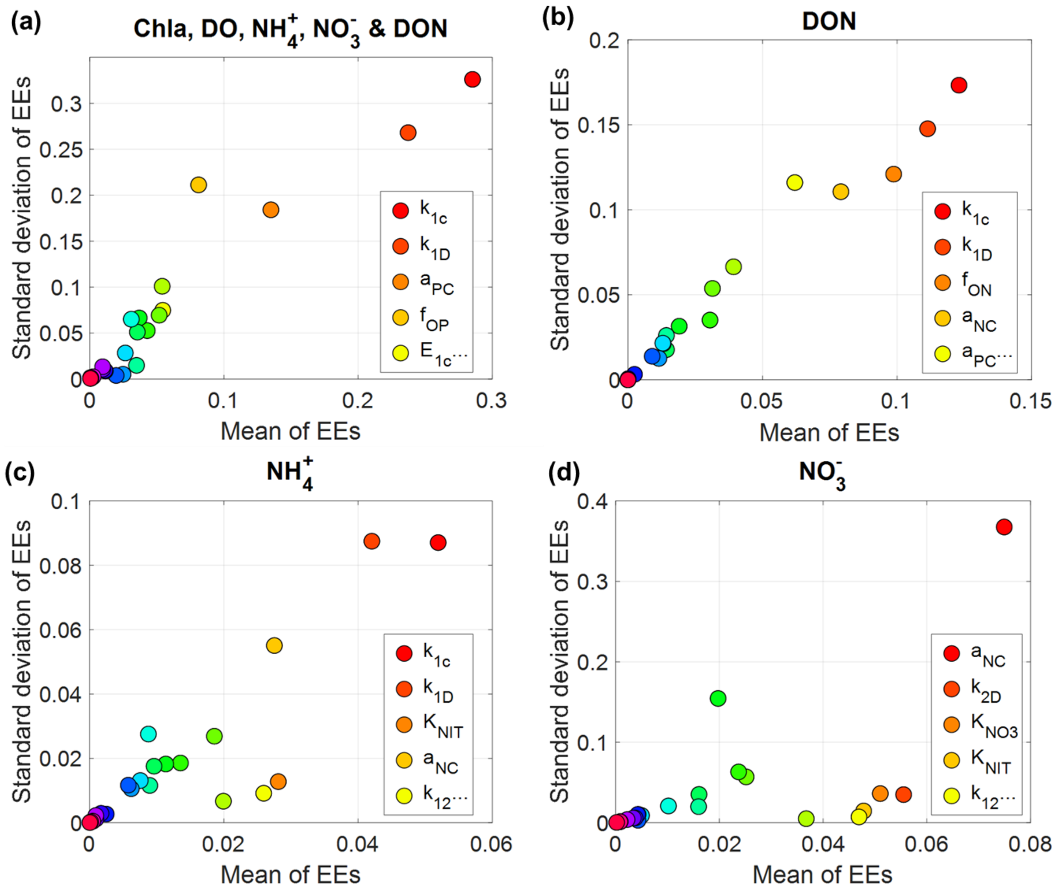


Fig. S4 Parameter sensitivity ranking by Elementary Effects (EE) method with different objective functions defined respectively by (a) the sum of NSE coefficients of NH3, NO3, DON, Chl-a and DO, the NSE of (b) DON, (c) NH3, and (d) NO3. The more to the right a point along the horizontal axis, the more influential the parameters. The higher up a point along the vertical axis, the larger its degree of interactions with other parameters. Useful for screening and ranking.[1] The 5 most sensitive parameters for each objective function are shown in its legend.

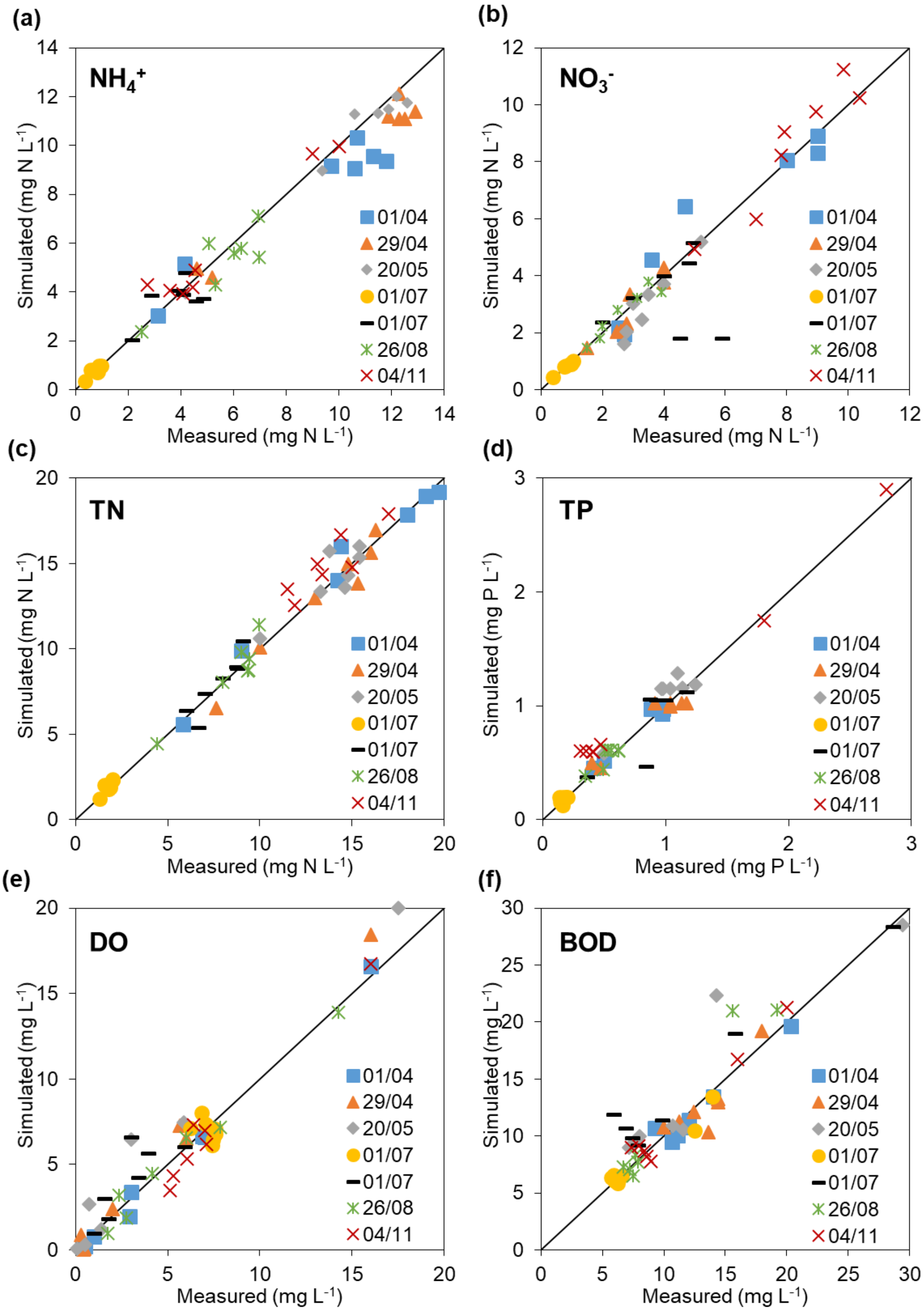
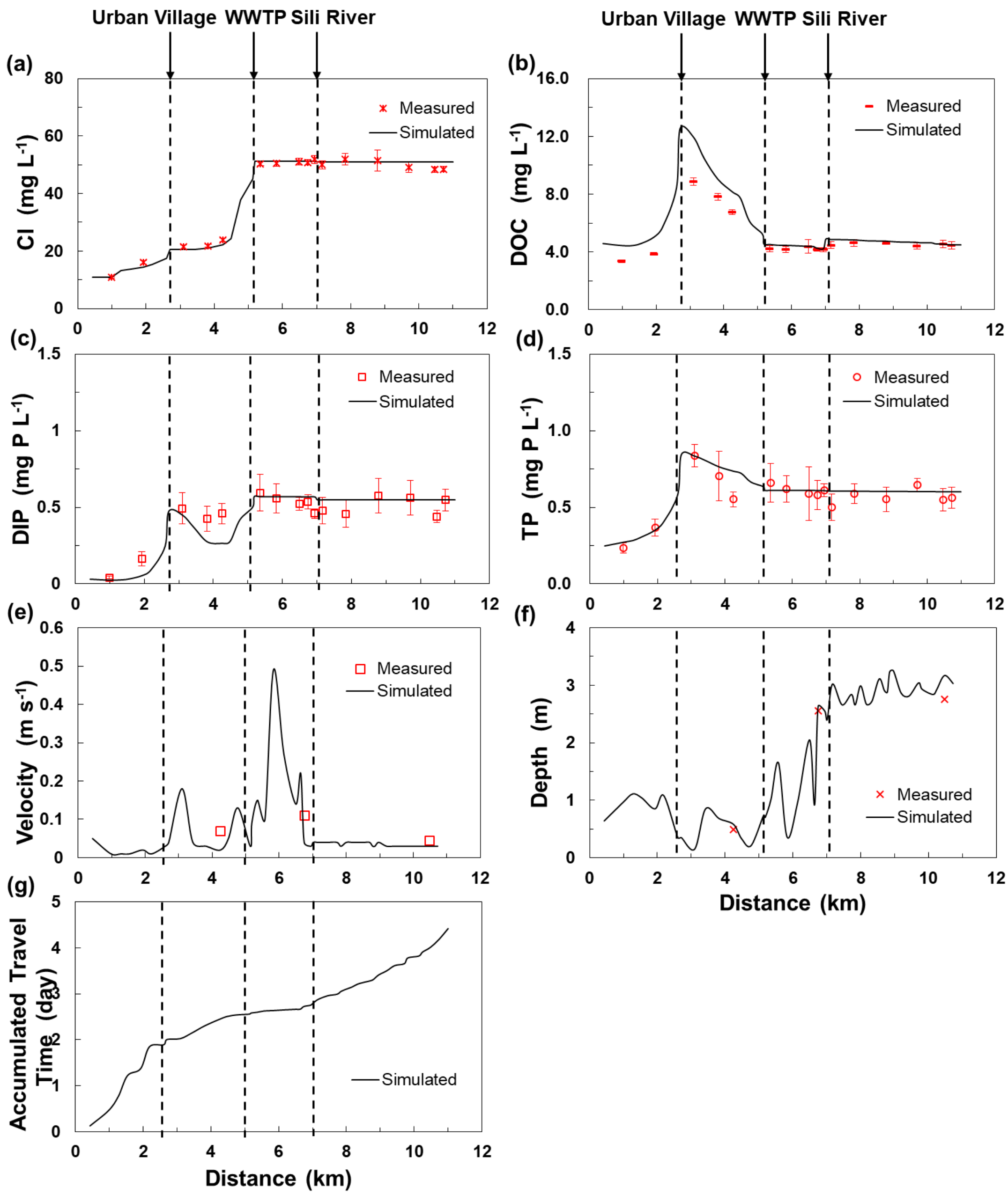


Fig. S5 Results of hydrodynamic model validation: comparison of simulated and measured values of water level at Site 14 during 1st April - 5th November 2015; the number of measurements was 219.



33

34 **Fig. S6** Longitudinal measured and simulated (a) Cl (b) DOC (c) DIP (d) TP (e) velocity

35 (f) depth and simulated (f) accumulated travel time during low-flow conditions in the

36 Nanfei River.

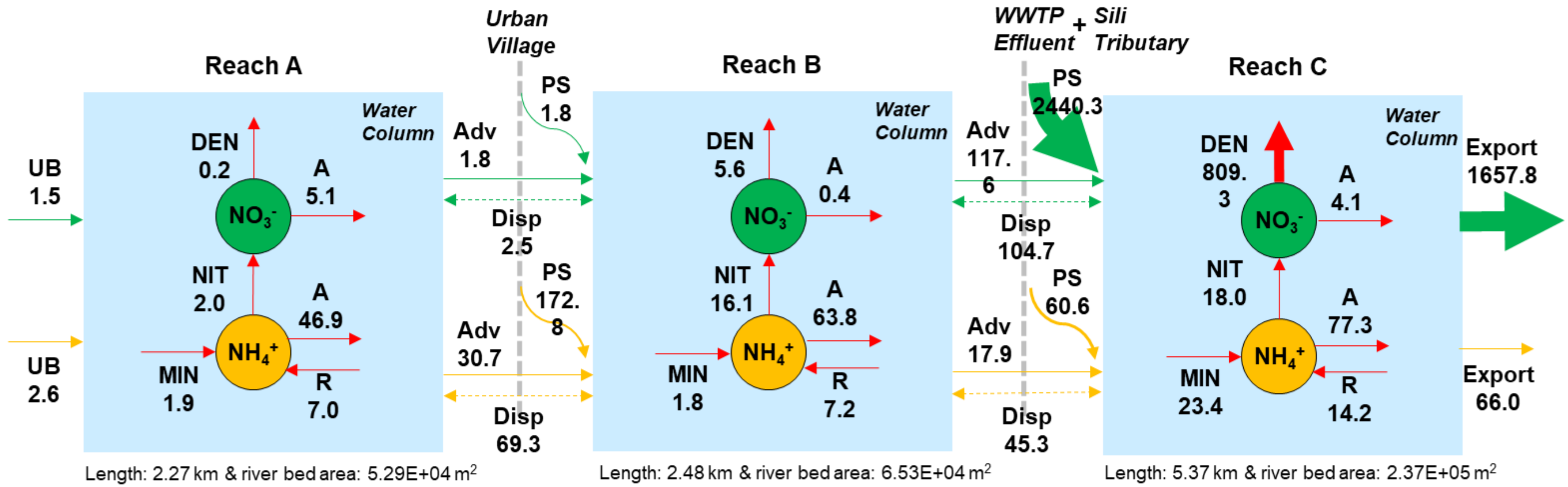


Fig. S7 DIN mass balance fluxes (kg N d^{-1}) including boundaries, advections, dispersions, loadings, reactions and exports in Reaches A, B and C; UB, Adv and Disp are short for upper boundary, advective and dispersive transport, respectively. The thickness of the arrows indicates the amounts of the fluxes.

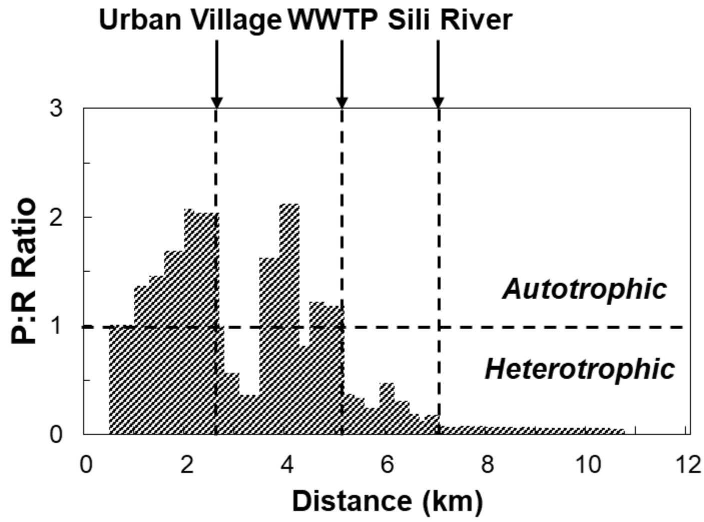


Fig. S8 Longitudinal primary production to respiration ratio and metabolism condition.[2]

Table S1. DIN cycling, inputs & exports fluxes (kg N d^{-1}) in the three representative reaches and whole reach.

	Reach A		Reach B		Reach C		Whole Reach	
Flux	NH_4^+	NO_3^-	NH_4^+	NO_3^-	NH_4^+	NO_3^-	NH_4^+	NO_3^-
Inputs								
Upper Boundary	1.5	2.6	30.7	1.8	17.9	117.6	1.5	2.6
Urban village			172.8	3.5			172.8	3.5
WWTP					19.5	1757.4	19.5	1757.4
Sili River					41.0	682.9	41.0	682.9
Dispersion	69.3	2.5	-114.6	102.2	45.3	-104.7		
Σ Inputs	70.8	5.1	88.9	107.4	123.7	2453.2	234.8	2446.3
Processes								
Mineralization	1.9		1.8		23.4		27.0	
Nitrification	-2.0	2.0	-16.1	16.1	-18.0	18.0	-36.1	36.1
Phytoplankton death	7.0		7.2		14.2		28.4	
Assimilatory uptake	-46.9	-5.1	-63.8	-0.4	-77.3	-4.1	-188.0	-9.6
Denitrification		-0.2		-5.6		-809.3		-815.1
Σ Processes	-40.1	-3.3	-71.0	10.2	-57.7	-795.4	-168.7	-788.6
Export	30.7	1.8	17.9	117.6	66.0	1657.8	66.0	1657.8

References

1. F. Pianosi, K. Beven, J. Freer, J. W. Hall, J. Rougier, D. B. Stephenson and T. Wagener, Sensitivity analysis of environmental models: A systematic review with practical workflow, *Environmental Modelling & Software*, 2016, **79**, 214-232.
2. J. Huang, H. Yin, S. Chapra and Q. Zhou, Modelling Dissolved Oxygen Depression in an Urban River in China, *Water*, 2017, **9**, 520.