



Supplementary Materials

Table S1. Description of sampling sites in the study region (Yangju, South Korea)

Sampling Site	Population served (Number)	Water consumption (m ³ /day)	Designated sewage (m ³ /day)	Service area (km ²)	Sewer networks			Land use	GIS
					Diameter (mm)	Length (m)	Year buried		
NY-1	433	198	236	0.706	300	5,838	2006	Residential	37°46'59.5"N, 127°01'49.7"E
NY-2	808	370	440	1.076	300	8,628	2006	Urban commercial (City Hall, Restaurant, etc.)	37°47'00.8"N, 127°02'40.9"E
NY-3	1,236	567	641	0.575	300	2,080	2006	Residential/Commercial/Industrial	37°48'04.8"N, 127°02'55.4"E
NY-4	1,783	818	925	0.354	300	5,154	2006	Urban commercial (Restaurant, etc.)	37°47'55.6"N, 127°02'48.7"E
NY-5	3,019	1,385	1,566	0.929	400	7,646	2006	Residential/Commercial/Industrial	37°47'52.0"N, 127°02'54.3"E
NY-15	-	121	152	-	300	-	2006	Near military base camp	37°47'53.6"N, 127°02'46.5"E
NY-8	20,156	9,246	7,577	1.255	600	9,103	2009	Urban residential/Commercial	37°47'26.6"N, 127°04'24.3"E
NY-9	22,561	10,348	8,481	1.650	600	14,698	2006	Urban residential/Commercial	37°46'38.9"N, 127°03'06.9"E
NY-11	385	177	144	0.414	300	2,687	2006	Residential	37°46'24.7"N, 127°02'50.5"E
NY-6	3,062	1,405	1,588	9.965	400	9,468	2006	Residential/Commercial/Industrial	37°47'16.1"N, 127°02'58.1"E
NY-7	3,870	1,775	2,028	2.041	400	18,574	2006	Residential/Commercial/Industrial	37°46'51.0"N, 127°02'55.8"E
NY-10	26,431	12,123	10,509	3.691	700	34,141	2006	Residential/Commercial/Industrial	37°46'15.5"N, 127°02'54.3"E
NY-12	26,816	12,300	10,653	4.105	700	37,626	2006	Residential/Commercial/Industrial	37°46'15.5"N, 127°02'45.6"E
NY-13	589	270	282	0.260	300	4,972	2006	Rural residential	37°46'14.1"N, 127°02'16.9"E
NY-14	1,309	601	626	0.709	300	9,451	2006	Rural residential	37°46'08.0"N, 127°02'41.0"E

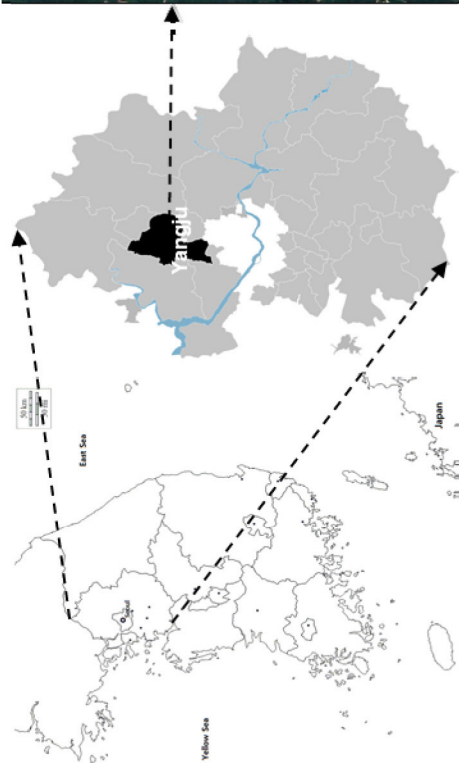


Fig. S1. Maps of the study region with sampling sites marked, and a simplified diagram of sewer networks.

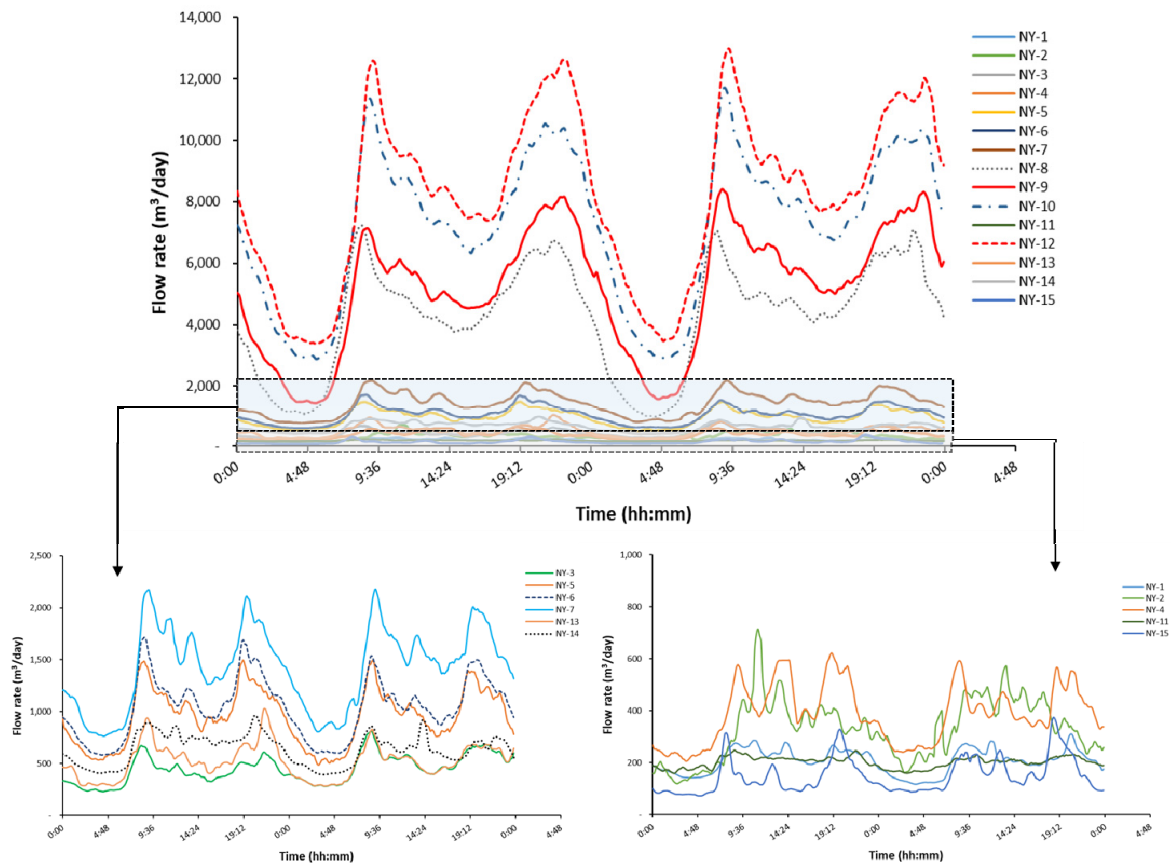


Fig S2. Diurnal variations in flow rate at each sampling site (high flow rates, NY-8, -9, -10, and -12; moderate flow rates, NY-3, -5, -6, -7, -13, and -14; low flow rates, NY-1, -2, -11, and -15).

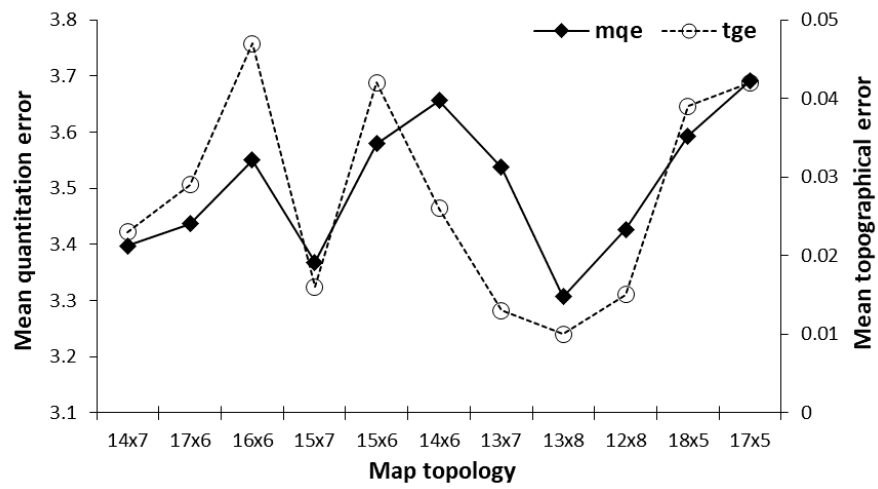


Fig. S3. The quality of map based on mean quantitation error and mean topographical error.

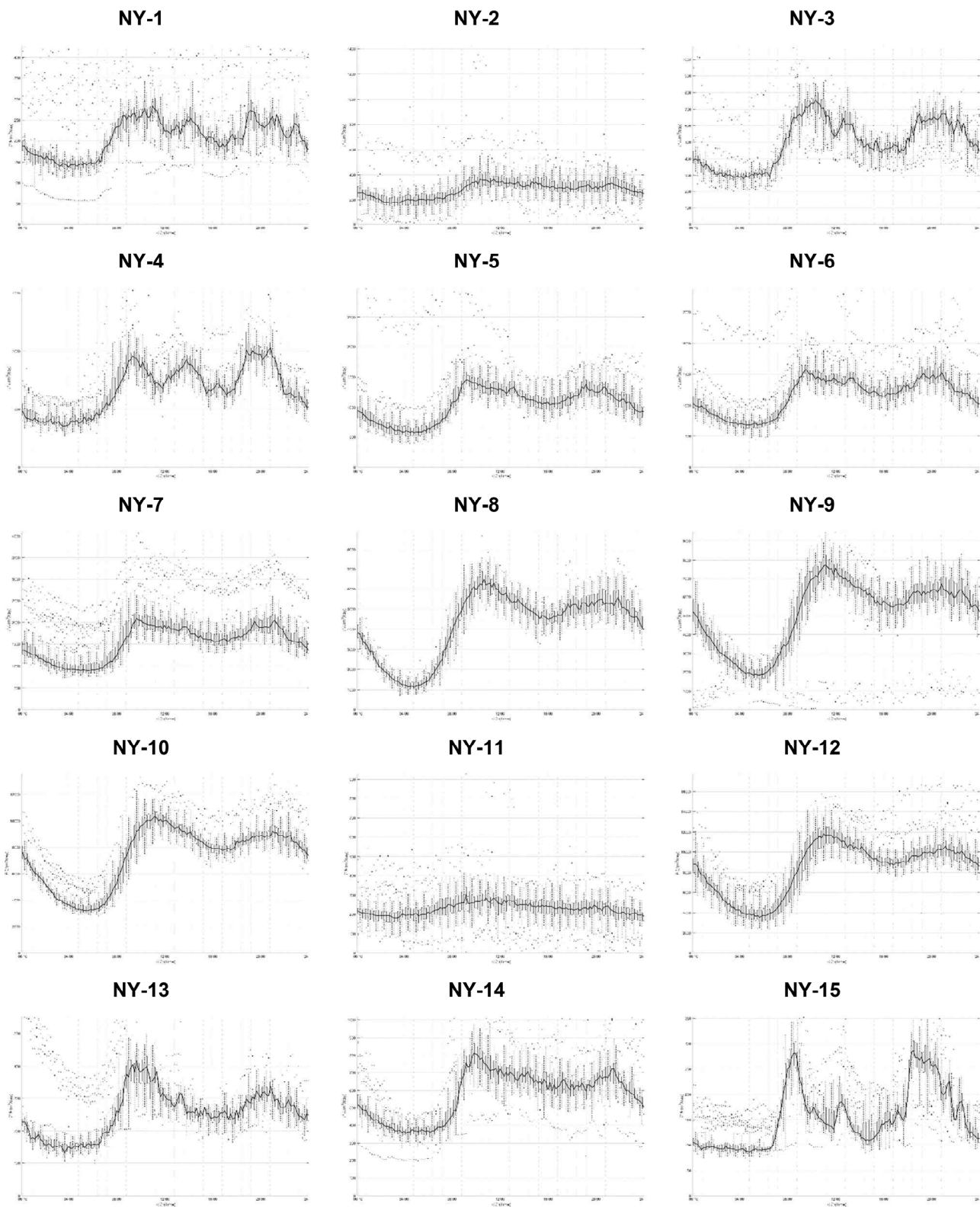


Fig. S4. Average daily flowrates of each monitoring points; x-axis: time (hh:mm) and y-axis: flowrate (m³/day)

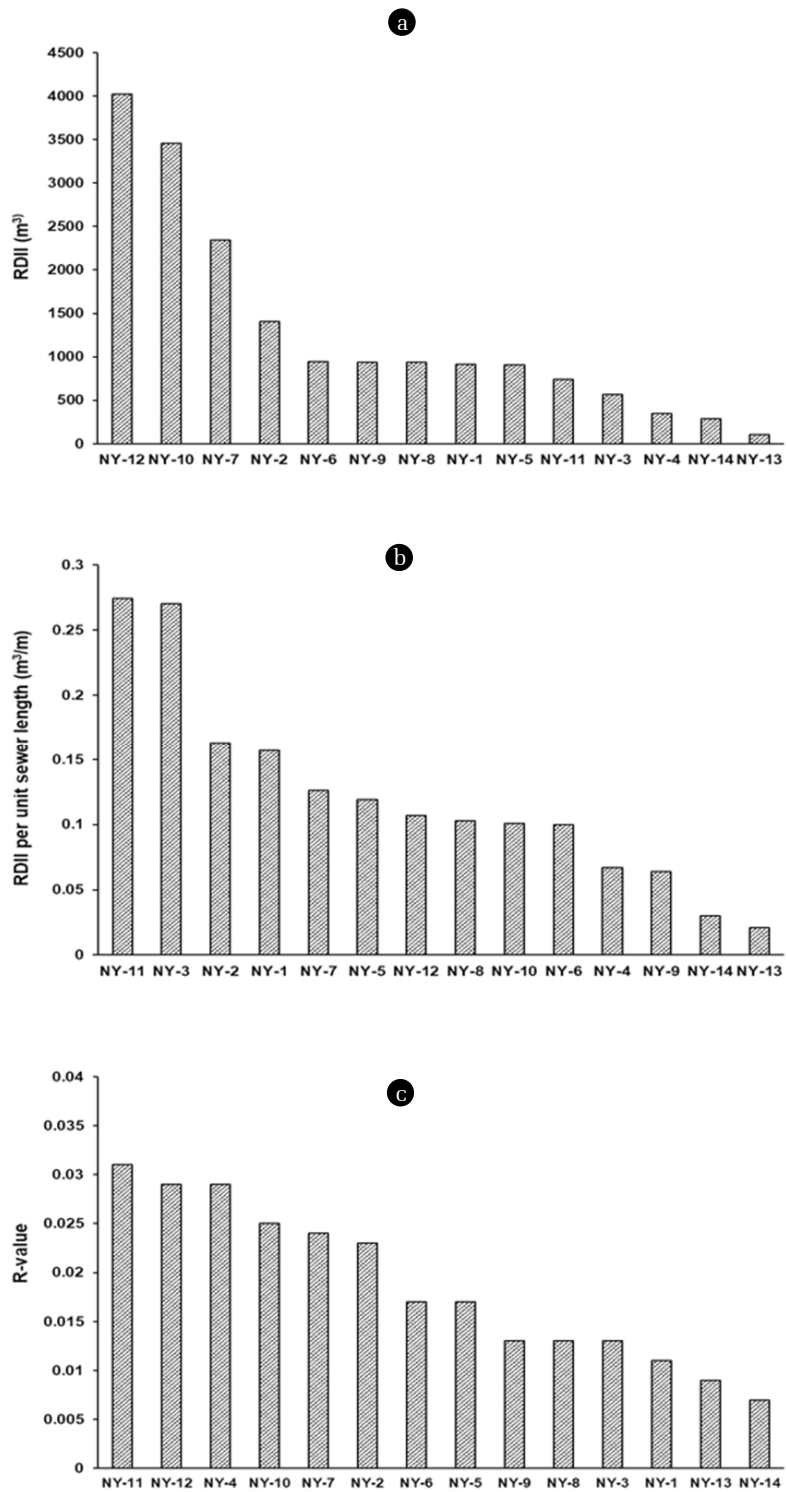


Fig. S5. Volume of RDII (a), RDII per unit sewer length (b) and R-value (c) at monitoring points during WWFs.

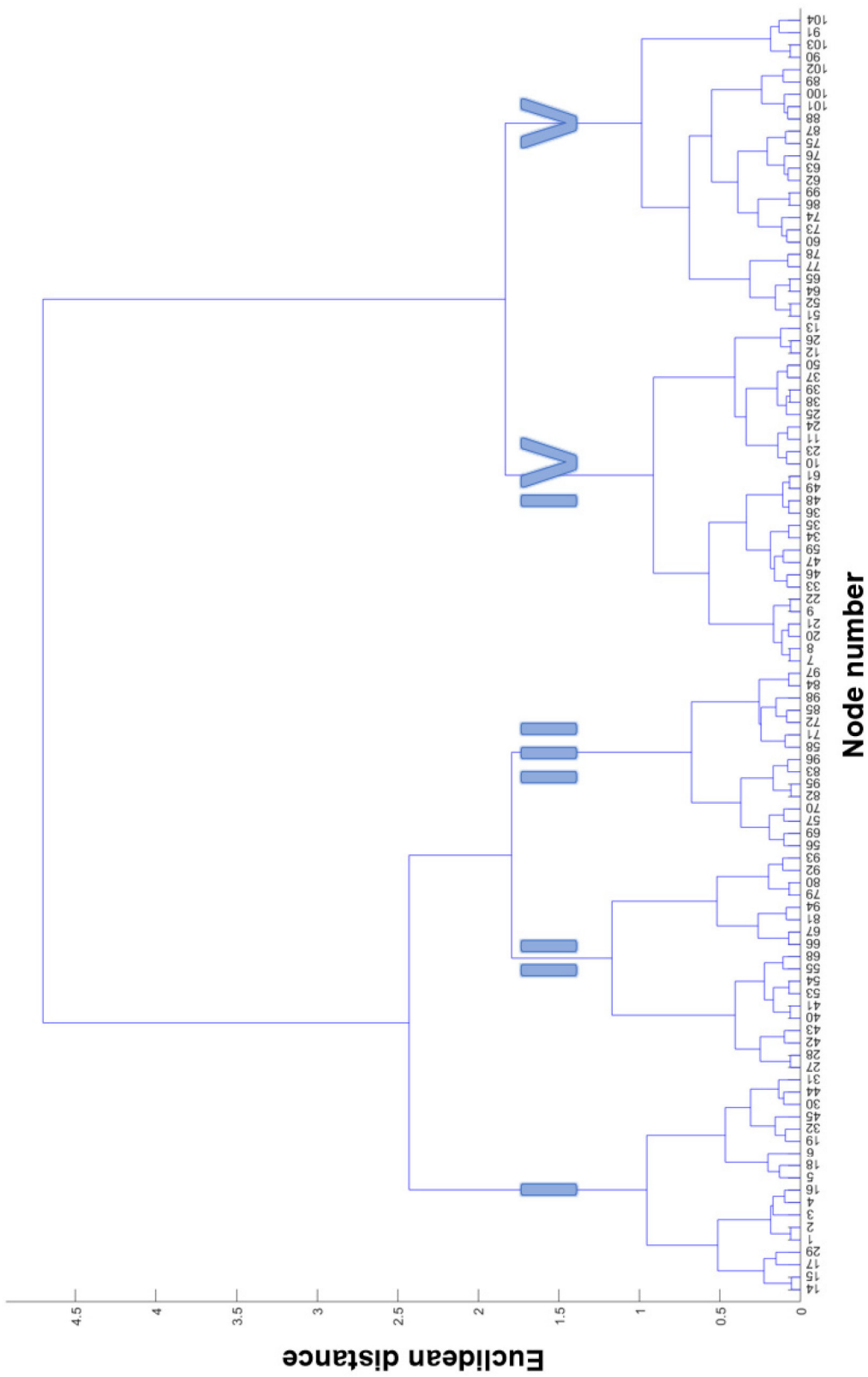


Fig. S6. Dendrogram with node numbers classified into five clusters.

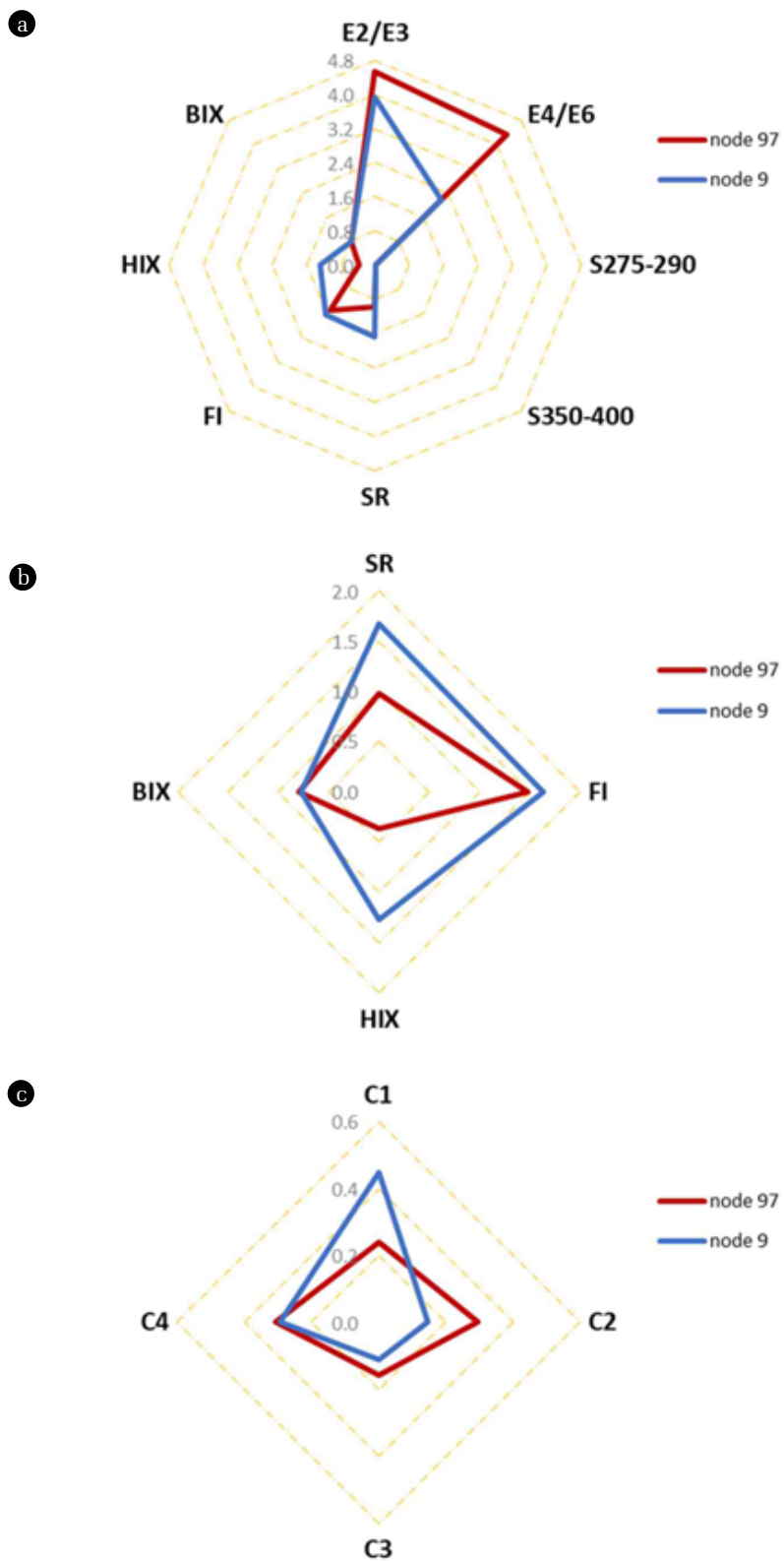


Fig. S7. Radar charts of the average optical indices and PARAFAC components for samples assigned in nodes 9 and 97.