

Online Resource 1

Electronic Supplementary Material — description of the supplementary dataset

Article title: From Grey Gap to Ecological Resilience: Quantifying the Spatiotemporal Evolution of Hybrid Water Infrastructure in a Subtropical Megacity (1994–2024)

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1. Contents of Online Resource 2 (ESM_2.xlsx)

The supplementary data file contains the underlying records supporting every analysis reported in the main text. All primary data are official open-government records of Taiwan; no proprietary or restricted data were used. Chinese station, river, city and region names are given with their English equivalents throughout, and years are reported in both Common Era and Republic of China notation.

Sheet	Content	Corresponds to	Primary source
S1. Water quality (annual)	Annual means of NH ₃ -N, DO, BOD, SS and the River Pollution Index for each of the 38 monitoring stations, 1994–2024 (1,165 station-year records).	Fig. 3	Ministry of Environment
S2. Overall descriptives	Descriptive statistics for the five parameters across the full record, with a reconciliation column against the published table.	Table 1	Derived from S1
S3. Phase statistics	NH ₃ -N and DO compared between Phase I (2004–2012) and Phase II (2013–2024), with reconciliation.	Table 3, Fig. 4	Derived from S1
S4. Two-sample t-tests	Early Period (1994–1999) against Late Period (2019–2024) for the four pollution indicators, with reconciliation.	Table 2	Derived from S1
S5. Sewerage connection	Monthly public, special-purpose, user-end and total connection ratios for New Taipei City.	Fig. 3	Construction and Planning Agency
S6. Annual runoff	Regional annual runoff against the long-term mean, northern Taiwan, 2004–2023.	Fig. 6	Water Resources Agency
S7. Station inventory	The 38 monitoring stations, with river system, period of record and record counts.	Section 2.1.2	Derived from S1

2. Data provenance and processing

Water-quality records were obtained from the national river monitoring programme for the Danshui River Basin covering 1994–2024. The raw file comprises 17,564 parameter-records across 38 stations on the Danshui main stem and its tributaries (the Dahan, Xindian, Keelung, Jingmei and Sanxia rivers). After removal of duplicate and non-parsable entries, 17,525 records (99.78%) are retained. Valid observations per parameter range from 12,174 for the River Pollution Index to 14,566 for ammonia nitrogen, because not every parameter was measured on every sampling occasion.

Values reported below the limit of detection are retained at their reported numeric value, and non-numeric entries are treated as missing. Dissolved oxygen is taken from the electrode method where available and from the titrimetric method otherwise, which preserves continuity across the full record. Standard deviations are population standard deviations, consistent with the values reported in the main text.

The watercourse is referred to throughout as the Danshui River, following the main text. The source monitoring file labels the main stem “Main Stream of Tamsui River”; this is the same watercourse under an alternative romanisation, and the label has been harmonised in the supplementary tables.

3. Reconciliation with the main text

Sheets S2, S3 and S4 each carry a reconciliation column recording the correspondence between values recomputed from the raw records and those published in the main text. Recomputation from the 38-station dataset reproduces Table 1, Table 2 and Table 3 exactly, including the difference in sample size between ammonia nitrogen (3,939) and dissolved oxygen (3,940) in Phase I noted beneath Table 3.

Sheet S1 reproduces the annual series plotted in Fig. 3; sheet S3 underlies the phase comparison in Fig. 4; sheet S5 provides the sewerage connection series shown against water quality in Fig. 3; and sheet S6 provides the runoff series in Fig. 6. Sheets S2, S3, S4 and S7 are derived wholly from S1, so every derived statistic can be recomputed from the station-year records supplied.