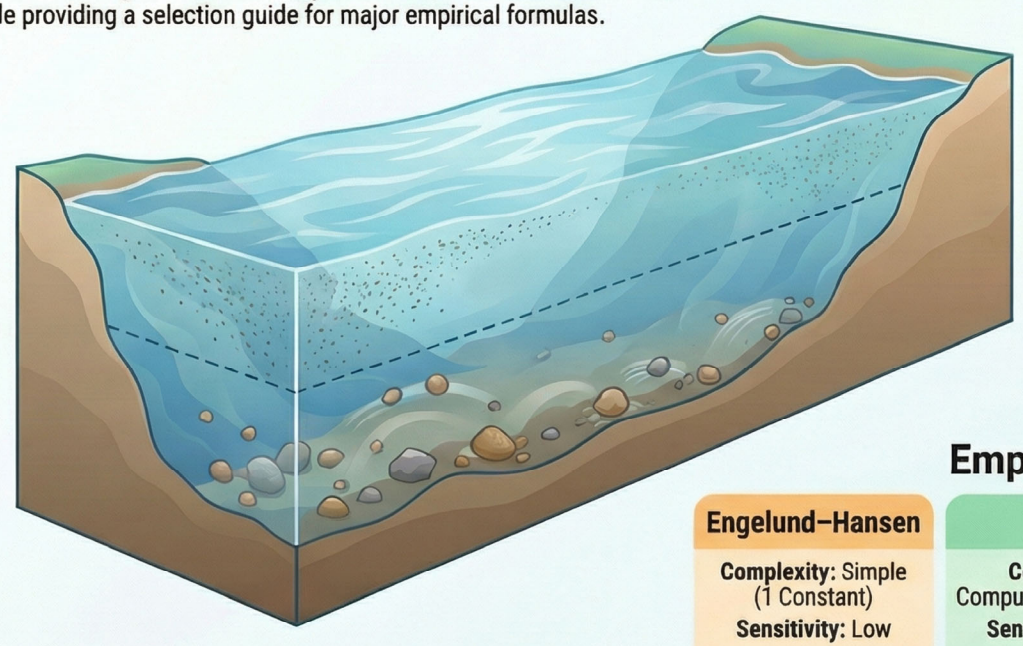
Total Sediment Load: Quantifying River Transport

This infographic integrates sediment transport fundamentals (bed forms, bed load, and suspended load) into a unified Total Load framework. It distinguishes between hydraulic-controlled bed material and supply-controlled wash load while providing a selection guide for major empirical formulas.

The Total Load Equation:

$$q_s = q_b + q_{ss}$$



Bed-Material Load vs. Wash Load

Wash Load: Supply-controlled fine particles

Rouse Number (P) Defines Transport Mode

Bed-Material Load: Derived from the bed

Suspended ($P < 1.2$)

Mixed ($1.2 < P < 2.5$)

Bed Load ($P > 2.5$)

Empirical Formula Selection

Engelund–Hansen	Yang	Molinas–Wu	Ackers–White
Complexity: Simple (1 Constant)	**Complexity:** Computed Coefficients	**Complexity:** Fixed Constants	**Complexity:** Multi-parameter
Sensitivity: Low	**Sensitivity:** High	**Sensitivity:** Moderate	**Sensitivity:** High
Best Use Case: Quick estimates; Sand-bed rivers	**Best Use Case:** Fine sand/silt; Physically insightful	**Best Use Case:** Balanced and stable numerical modeling	**Best Use Case:** Sand-gravel mixtures; Detailed engineering

Engineering Application & Selection

The "2–5×" Variation Rule:
Using the wrong formula can easily lead to a 2–5× difference in results.

Silt (Yang)
Sand (Engelund-Hansen)
Gravel Mixes (Ackers-White)

Selection Based on Sediment Size

Never Mix Shear Stress Types:
Do not use grain shear stress with formulas calibrated for total shear stress.

Recommended Method Based on Available Data

Only Depth, Siope, Size	**Engelund–Hansen**
Velocity (U) Known	**Yang or Molinas–Wu**
Grain Shear Stress Known	**Einstein Divided Approach**