FVI Resource Extraction & Scarcity – Formulas Using Current ZIP

The new ZIP appears to include the ‘Waste to use ratio.csv’ dataset. Below are complete, implementable formulas that fully leverage this file for scarcity scoring, plus placeholders for supplier concentration if partner data are added.

Dataset & fields

• Waste to use ratio.csv — long panel by Country × Category × Flow with year columns 1970…2024.

Fields: Country, Category (use ‘Fossil fuels’), Flow name ∈ {Domestic Extraction, Domestic Material Consumption, Domestic Material Input, Exports, Imports}, Flow unit=t, year columns.

Pre■processing

• Choose year Y (e.g., 2023). Filter Category=‘Fossil fuels’. Pivot to columns: DE, DMC, DMI, Imports, Exports.

• Use ε=1e■6 to avoid division by zero; coerce ‘..’ to NA.

Submetrics (0–100, higher = greater scarcity risk)

RS1 — Import Reliance

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RS1 = 100 × MIN(1, Imports / MAX(DMC, ε))
```

RS2 — Extraction Adequacy (DE/DMC)

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RS2 = 100 × (1 − MIN(1, DE / MAX(DMC, ε)))
```

RS3 — Trade Balance Instability

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RS3 = 100 × MIN(1, ABS(Imports − Exports) / MAX(DMC, ε))
```

RS4 — Export Exhaustion Pressure

```
RS4 = 100 × MIN(1, Exports / MAX(DE, ε))
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RS5 — Demand Pressure (DMC CAGR)

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RS5 = 100 × percentile_rank( CAGR(DMC over N years) )
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RS6 — Depletion Momentum

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RS6 = 100 × percentile_rank( MAX(0, −slope(DE)) + MAX(0, slope(DMC)) )
```

RS7 — Material Efficiency Gap

```
RS7 = 100 × MIN(1, MAX(0, (DMI − DMC) / MAX(DMC, ε)))
```

Optional (requires partner breakdown data)

• RS8 — Supplier Concentration (HHI): HHI of top import partners by fossil flow share; higher HHI ⇒ higher risk.

• RS9 — Exposure to Single Supplier: Max partner share of fossil imports.

Composite assembly

• Normalize RS1–RS7 to 0–100 (winsorize 1st/99th pct). Suggested weights: 25, 20, 15, 15, 10, 10, 5.

• Produce country■level scarcity score for Y; keep coverage flags for missing flows.