

## Appendix B – SCRESIS Index Calculation Methodology

This appendix presents the complete methodology used to calculate the SCRESIS Index for Scenarios I, II, and III. The process is designed to be replicable and transparent, enabling readers to apply the same logic to other supply chain configurations.

### Step 1 – Metric Selection

Four strategic metrics were selected based on their relevance to supply chain performance:

- Inventory Spend
- ELT Service Level
- Recovery Time
- Lead Time

### Step 2 – Metric Normalization

Each metric was normalized against its highest value observed within the scenario:

$$\text{Normalized Value} = \frac{\text{Metric Value}}{\text{Maximum Value in Scenario}} \times 100$$

### Step 3 – Weighted Contribution

Each normalized metric was multiplied by its respective resilience and robustness weights:

$$\text{Contribution} = \text{Normalized Value} \times \text{Resilience Weight} \times \text{Robustness Weight}$$

### Step 4 – Raw SCRESIS Score

The contributions of all four metrics were summed to obtain the raw SCRESIS score for each disruption event.

### Step 5 – SCRESIS Percentage

Each raw score was normalized against the highest raw score observed across all scenarios and events (216.8 from Scenario I – Factory Mexico closure):

$$\text{SCRESIS \%} = \frac{\text{Raw Score}}{216.8} \times 100$$

### Step 6 – Final SCRESIS Index

Each disruption event was assigned a strategic weight as shown in Table ??

The final SCRESIS Index for each scenario was calculated as:

$$\text{SCRESIS Index \%} = \sum (\text{SCRESIS \% per event} \times \text{Event Weight})$$

### Scenario Results Summary

TABLE I: SCRESIS Index Results for Scenarios I, II, and III

Scenario	Raw Scores (per event)	SCRESIS % (per event)	SCRESIS Index
I	136.17 / 164.45 / 128.99 / 176.99	62.94 / 75.99 / 59.46 / 81.76	70.69%
II	121.79 / 173.15 / 121.79 / 176.42	56.19 / 79.95 / 56.19 / 81.56	66.93%
III	177.29 / 196.71 / 187.51 / 216.80	81.79 / 90.51 / 86.35 / 100.00	90.10%

### Interpretation

The raw scores represent the aggregated contributions of normalized metrics weighted by resilience and robustness. These scores were converted into percentages to allow cross-scenario comparison. The final SCRESIS Index reflects the strategic importance of each disruption event, offering a comprehensive view of supply chain resistance.

Scenario I shows balanced performance with moderate sensitivity. Scenario II is cost-efficient, but it takes longer to recover. Scenario III is highly efficient but vulnerable to disruptions. These results support strategic decision-making in supply chain design and risk management.

## Appendix C – Variables

TABLE II: Scenario II Data: Variables and Metrics

Experiments	Resilience	Robustness	Free Disruption	DC Miami (closure)	Demand Variation (LatAm customers)	Factory Mexico (closure)
Inventory Spend (\$)	0.75	0.76	1,057,244	513,813	1,809,131	1,797,163
ELT Service Level (%)	0.70	0.86	1	0.95	1	0.91
Total Recovery Time (days)	0.89	0.80	0	25	0	75
Lead Time (days)	0.85	0.70	48.7	48.7	48.7	48.7

TABLE III: Scenario III Data Variables and Metrics

Experiments	Resilience	Robustness	Free Disruption	DC Miami (closure)	Demand Variation	Factory Mexico (closure)
Inventory Spend (\$)	0.75	0.76	513,156.00	1,090,331.00	510,753.00	864,644.00
ELT Service Level (%)	0.70	0.86	1	0.90	1	0.98
Total Recovery Time (days)	0.89	0.80	0	82	0	110
Lead Time (days)	0.85	0.70	84.12	84.12	84.12	84.12

TABLE IV: Scenarios: Normalized Values by Variable

Variable	Scenario I	Scenario II	Scenario III	$V_{\max}$	Normalized $V_i/V_{\max}$
Inventory Spend (\$)	1,531,043	1,809,131	1,090,331	1,809,131	0.846
ELT Service Level (%)	0.959	1.00	1.00	1.00	0.959
Recovery Time (days)	65	75	110	110	0.591
Lead Time (days)	57.00	48.70	84.12	84.12	0.678

TABLE V: SC Resistance Results for Scenario II

Scenario II	Free Disrupt.	DC Miami (closure)	Demand Var. (LatAm)	Factory Mexico (closure)
SC Resistance	56.19	79.95	56.19	81.56

TABLE VI: SC Resistance Results for Scenario III

Scenario III	Free Disrupt.	DC Miami (closure)	Demand Var. (LatAm)	Factory Mexico (closure)
SC Resistance	81.79	90.51	86.35	100.00

### GitHub

Scenarios I,II and III.

Simulation database available @:<https://github.com/silvioluizalvim/AnyLogistix.git>