

Supplementary Material

The Supplementary Material provides additional information on the operationalization and source-based ordinal classification of the indicators, detailed VIKOR results, and sensitivity analyses conducted to assess the robustness of the district-level intervention priority rankings.

Table S1. Indicator Operationalization and Classification Procedures.

Indicator	Measurement/Representation	Classification Procedure	Scale	Direction
Earthquake Risk	District-level spatial earthquake hazard information	Classification according to official hazard information and relative district condition	1–5	Cost
Landslide Risk	Proportion/distribution of landslide-susceptible areas	Classification according to susceptibility distribution within district boundaries	1–5	Cost
Flood Risk	Proportion/distribution of flood-prone areas	Classification according to flood exposure within district boundaries	1–5	Cost
Extreme Rainfall	Meteorological station observations	Classification according to relative long-term precipitation and extreme rainfall conditions among districts	1–5	Cost
Mining Accident Risk	Mining sites and extraction areas	Classification according to relative mining exposure/activity among districts	1–5	Cost
Industrial Accident Risk	OIZs and industrial facilities	Classification according to relative concentration of industrial facilities and production areas	1–5	Cost
Air Pollution	PM10 measurements	Classification according to relative district-level PM10 conditions	1–5	Cost
Water Infrastructure Capacity	Water consumption and service interruption characteristics	Classification according to relative service capacity and reliability among districts	1–5	Benefit
Energy Infrastructure Reliability	Electricity/natural gas supply and outage characteristics	Classification according to relative energy service reliability among districts	1–5	Benefit
Healthcare Accessibility	Healthcare facilities and accessibility	Classification according to relative accessibility to healthcare services	1–5	Benefit
Public Transport Accessibility	Public transportation/accessibility data	Classification according to accessibility of district centers by public transport	1–5	Benefit
Road Infrastructure Quality	Road network/infrastructure characteristics	Classification according to relative availability and accessibility of paved roads	1–5	Benefit
Emergency Response Capacity	AFAD, fire, ambulance, police, and other emergency response facilities	Classification according to relative availability and accessibility of response units in relation to district demand/population	1–5	Benefit

*Note: The underlying indicator data were heterogeneous in format and measurement structure and were not available as a single harmonized quantitative database at the district level. Where officially defined quantitative thresholds or hazard classes were available, source-defined classifications were followed. For indicators without predefined numerical thresholds, the five-level ordinal classes were established through a source-based comparative assessment of the eight districts using the indicator-specific evidence described in the “Measurement/Representation” and “Classification Procedure” columns, including documented hazard conditions and recurrence, spatial exposure or susceptibility, facility and infrastructure distribution, service accessibility, and service capacity or reliability, as applicable. Therefore, no universal numerical or percentile-based class boundaries were applied across the thirteen indicators. The resulting classes represent relative district conditions within Zonguldak rather than absolute hazard or capacity thresholds. Higher scores indicate greater risk for cost-type criteria and stronger capacity for benefit-type criteria.