Supplementary Materials

Table S1. The disturbance validation datasets used in this study.

Event	Dataset	Resolution	Time span	Earth Engine Snippet	Citations
Fire	The MODIS Fire_cci Burned Area pixel product version 5.1	monthly, 250 m spatial resolution	2001.01– 2020.12	ee.ImageCollection(" ESA/CCI/FireCCI/5_1 ")	[56]
Flood	Global Flood Database v1	250m spatial resolution	2000.02– 2018.12	ee.ImageCollection(" GLOBAL_FLOOD_D B/MODIS_EVENTS/ V1")	[57]
Drought	Standardised Precipitation-Evapotranspiration Index database, Version 2.9	Monthly, pixel size of 0.5 degree	1901.01– 2023.01	ee.ImageCollection(" CSIC/SPEI/2_9")	[58]

Table S2. Construction of RSEI indicators

Parameter	Parameter description and calculation method
Greenness (kNDVI)	NDVI = $(B_{nir} - B_{red})/(B_{nir} + B_{red})$, kNDVI=tanh (NDVI²) B-represents the reflectance band, the following are the same.
Humidity (Wet)	Wet is obtained through the tasseled cap transformation, as referenced in [59,60]. Wet = $\alpha_1 B_{blue} + \alpha_2 B_{green} + \alpha_3 B_{red} + \alpha_4 B_{nir} + \alpha_5 B_{swir1} + \alpha_6 B_{swir2}$
Heat (LST)	The heat index is replaced by surface temperature, calculated using the radiative transfer equation method. LST = $T/[1 + (\lambda T/\rho) \ln \varepsilon]$ as referenced in [61–63]
Dryness (NDSI)	The mean value of an index-based built-up index (IBI) and soil index (SI) is substituted for dryness. NDSI = (SI + IBI)/2 For the calculation of IBI, we refer to [64]. SI = $[(B_{swir1} + B_{red}) - (B_{nir} + B_{blue})]/[(B_{swir1} + B_{red}) + (B_{nir} + B_{blue})]$.