- Supplementary materials -
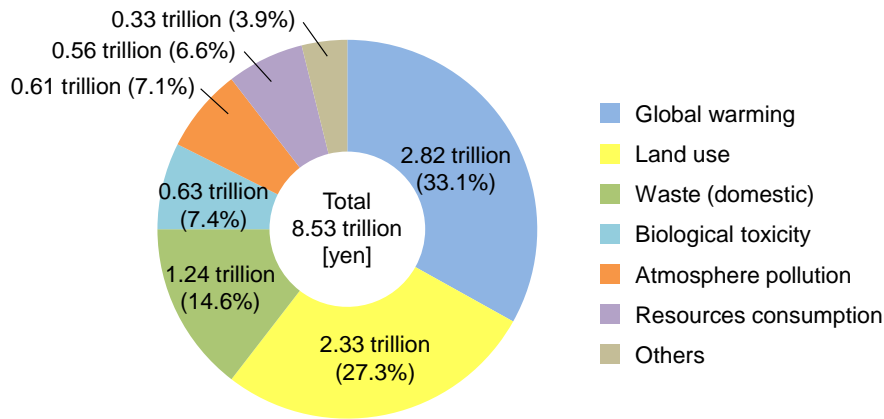

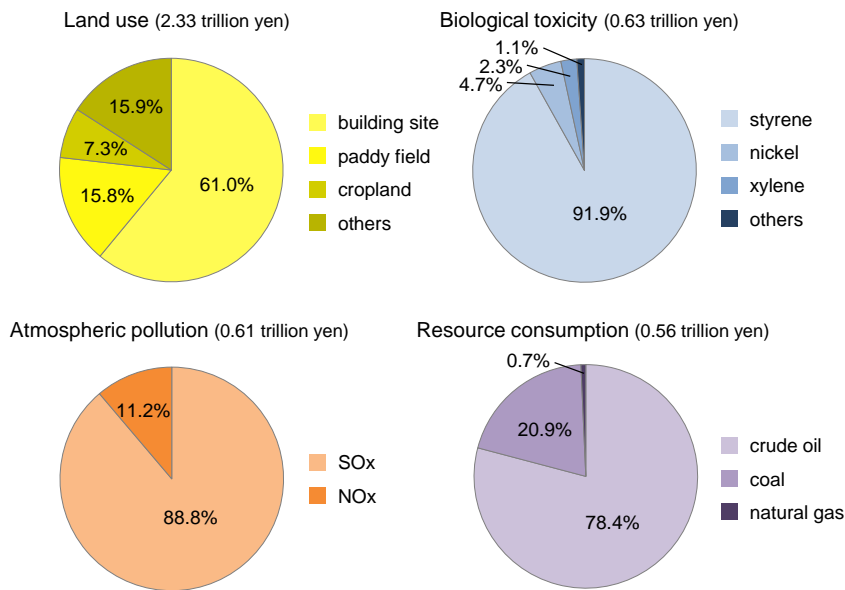**Figure S1.** Total damage amounts for Japan by impact category (in JPY).

Figure S2. Breakdowns of inventory data for total damage amount by major impact categories (in JPY).

Table S1. Damage amounts per unit area and per capita (in JPY).

Impact category	Damage amount per unit area			Damage amount per capita		
	Average (yen/km^2)	Standard deviation (yen/km^2)	Variation coefficient (-)	Average (yen/capita)	Standard deviation (yen/capita)	Variation coefficient (-)
Ozone layer destruction	1.41×10^5	3.92×10^6	27.91	9.24×10^1	2.29×10^3	24.78
Photochemical ozone	2.29×10^5	1.90×10^6	8.28	3.19×10^2	2.91×10^3	9.12
Human toxicity	4.29×10^5	4.68×10^6	10.91	2.90×10^2	2.52×10^3	8.70
Biological toxicity	6.75×10^6	4.01×10^7	5.94	6.08×10^3	5.72×10^4	9.41
Eutrophication	1.51×10^{-1}	3.21×10^0	21.23	2.19×10^{-4}	5.45×10^{-3}	24.81
Global warming	2.07×10^7	5.37×10^7	2.59	2.57×10^4	3.41×10^4	1.33
Land use	1.45×10^7	1.46×10^7	1.01	4.67×10^4	5.87×10^4	1.26
Resource consumption	3.91×10^6	1.12×10^7	2.86	4.11×10^3	1.12×10^4	2.72
Acidification	4.31×10^5	9.84×10^5	2.28	7.51×10^2	7.83×10^2	1.04
Atmospheric pollution	6.59×10^6	2.24×10^7	3.40	5.29×10^3	7.09×10^3	1.34
Domestic waste	7.82×10^6	1.54×10^7	1.97	9.61×10^3	3.50×10^3	0.36
Road traffic noise	1.19×10^6	1.71×10^6	1.44	3.90×10^3	4.29×10^3	1.10
Total	7.42×10^7	1.79×10^8	2.41	1.02×10^5	2.14×10^5	2.10

Note: Number of municipalities: 1741. The variation coefficient is calculated by dividing the standard deviation by the average, and it shows the relative variation in the data.
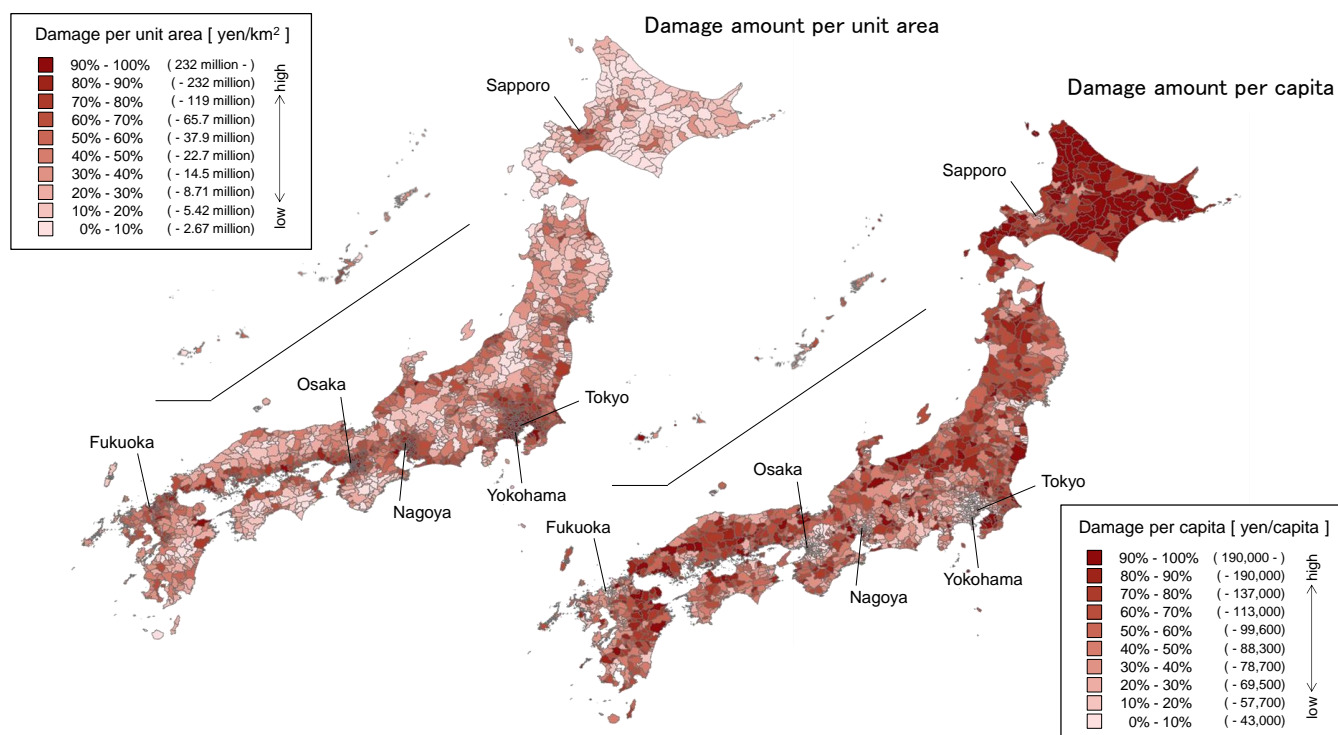
Figure S3. Spatially explicit total damage amount in Japanese municipalities (in JPY)
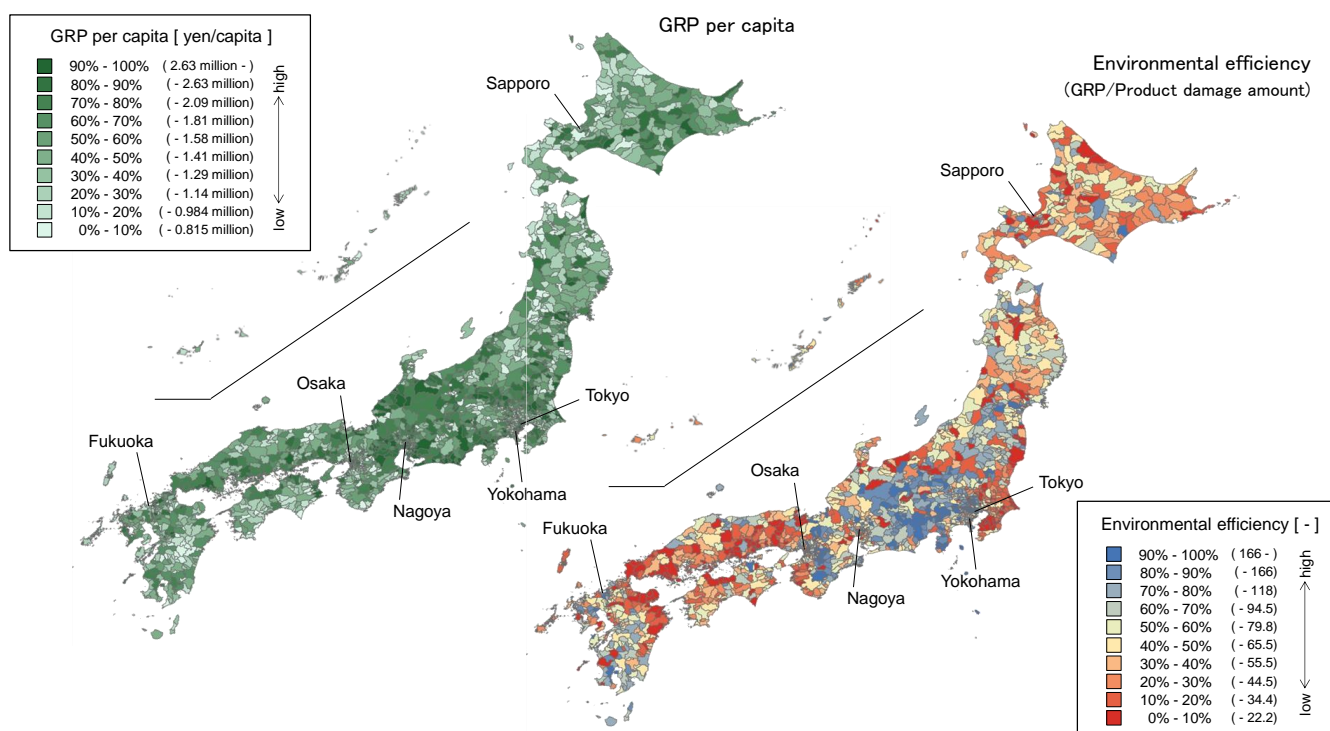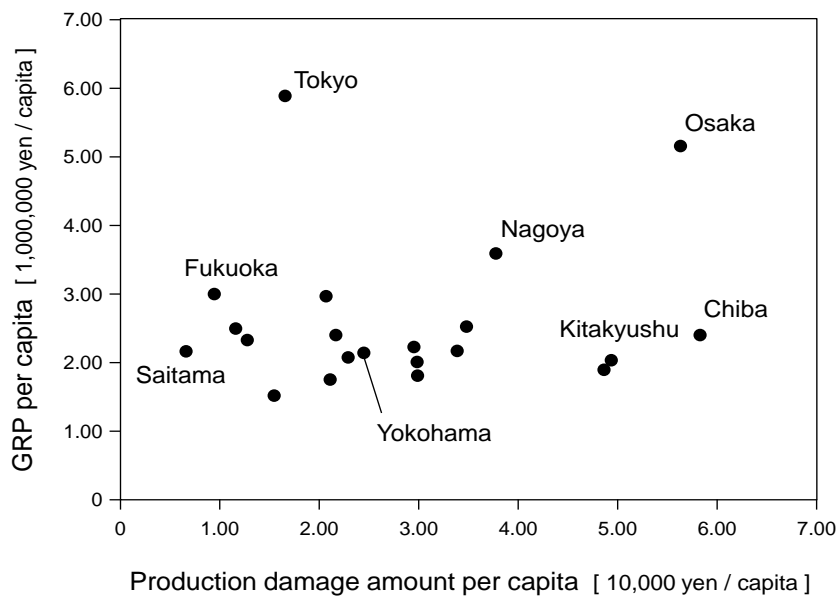(left map, damage amount per unit area; right map, damage amount per capita).

Figure S4. Gross regional product (GRP) per capita and environmental efficiency for Japanese municipalities (in JPY)
(left map, GRP per capita; right map, environmental efficiency).

Table S2. Assessment results for 21 major municipalities in Japan (in JPY).

Municipality	GRP per capita (yen/capita)		Production damage amount per capita (yen/capita)		Environmental Efficiency (-)	
Sapporo	2.00×10^6	(78.8%)	2.98×10^4	(65.6%)	67.2	(53.1%)
Sendai	2.96×10^6	(94.8%)	2.07×10^4	(47.8%)	143.1	(89.1%)
Saitama	2.16×10^6	(83.8%)	6.60×10^3	(4.8%)	327.0	(99.3%)
Chiba	2.39×10^6	(89.1%)	5.83×10^4	(84.9%)	41.1	(27.4%)
Tokyo (special ward)	5.88×10^6	(99.1%)	1.65×10^4	(38.5%)	355.0	(99.6%)
Yokohama	2.14×10^6	(83.2%)	2.45×10^4	(56.9%)	87.3	(68.0%)
Kawasaki	1.89×10^6	(75.0%)	4.86×10^4	(80.5%)	38.9	(25.2%)
Sagamihara	1.52×10^6	(57.2%)	1.55×10^4	(34.3%)	98.0	(74.7%)
Niigata	2.07×10^6	(81.2%)	2.29×10^4	(53.3%)	90.5	(70.4%)
Shizuoka	2.49×10^6	(90.4%)	1.16×10^4	(21.9%)	214.8	(96.6%)
Hamamatsu	2.32×10^6	(87.4%)	1.27×10^4	(25.8%)	182.2	(94.1%)
Nagoya	3.58×10^6	(97.0%)	3.77×10^4	(73.5%)	95.0	(72.8%)
Kyoto	2.22×10^6	(85.5%)	2.95×10^4	(65.3%)	75.3	(59.0%)
Osaka	5.14×10^6	(98.7%)	5.63×10^4	(84.0%)	91.4	(71.0%)
Sakai	1.80×10^6	(71.4%)	2.99×10^4	(65.7%)	60.4	(45.5%)
Kobe	2.39×10^6	(89.1%)	2.17×10^4	(49.9%)	110.6	(80.7%)
Okayama	2.17×10^6	(83.9%)	3.38×10^4	(70.0%)	64.0	(49.3%)
Hiroshima	2.52×10^6	(90.9%)	3.48×10^4	(71.2%)	72.4	(57.0%)
Kitakyushu	2.03×10^6	(79.5%)	4.93×10^4	(80.9%)	41.1	(27.4%)
Fukuoka	2.99×10^6	(94.9%)	9.45×10^3	(12.8%)	316.9	(99.2%)
Kumamoto	1.75×10^6	(68.9%)	2.11×10^4	(48.6%)	82.9	(64.9%)

Note: Cumulative relative frequency based on all municipalities is shown in parentheses.

Figure S5. Assessment results for 21 major municipalities in Japan (in JPY).