

Forest fire expansion under global warming conditions: multivariate estimation, function properties and predictions for 29 countries

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Problem:

Forest fires create large economical and environmental problems in many countries.

Question:

How will forest fires be affected by global warming in different countries?

Solution:

A new prediction model has been developed and used.

Slide 1: Results

The relative burned area ($B, \%$) in a country (i) is determined from the following equation. T represents the average temperature. P is the size of the population and A is the total forest area in the country.

$$B_i = e^{(k_0 + k_T T_i + k_P P_i + k_A \sqrt{A_i} + \varepsilon_i)}$$

Parameter statistics from the regression analysis based on the logarithmic version of the function in equation (4).

Parameter	Estimated value	Standard Error	t-value	P-value
k_0	-7,556784807	0,649653609	-11,63202159	1,39626E-11
k_T	0,436094188	0,057418758	7,594977775	5,97838E-08
k_P	-0,031821302	0,012207803	-2,606636244	0,015193428
k_A	0,460127404	0,097563843	4,716167264	7,77542E-05

Table 6. Predictions of average fire areas as functions of the level of change of the average temperature.

	dT= 0	dT= +1	dT= +2	dT= +3
Country	Average Fire Area (kha)	Average Fire Area (kha)	Average Fire Area (kha)	Average Fire Area (kha)
Algeria	32.105	49,651	76,786	118.750
Austria	0.072	0.111	0.171	0.265
Bulgaria	5.227	8.084	12.502	19.334
Croatia	12.248	18.942	29.293	45.303
Cyprus	1.673	2.587	4.001	6.187
Czech Republic	0.328	0.507	0.784	1.213
Estonia	0.055	0.086	0.132	0.205
Finland	0.519	0.802	1.241	1.919
France	10.906	16.867	26.084	40.340
Germany	0.541	0.837	1.294	2.002
Greece	25.894	40.046	61.931	95.778
Hungary	4.540	7.022	10.859	16.794
Italy	62.286	96.326	148.970	230.383
Latvia	0.591	0.913	1.413	2.185
Lithuania	0.087	0.134	0.208	0.321
Morocco	2.916	4.510	6.974	10.786
North Macedonia	4.433	6.856	10.603	16.398
Norway	0.844	1.306	2.019	3.123
Poland	2.966	4.588	7.095	10.972
Portugal	144.555	223.555	345.730	534.674
Romania	1.757	2.717	4.201	6.497
Russian Fed.	2218.100	3430.311	5305.007	8204.239
Slovakia	0.424	0.655	1.013	1.567
Slovenia	0.283	0.438	0.678	1.048
Spain	95.686	147.979	228.851	353.921
Sweden	5.085	7.864	12.162	18.809
Switzerland	0.116	0.180	0.278	0.429
Turkey	6.885	10.648	16.468	25.468
Ukraine	3.625	5.606	8.670	13.408

Slide 2: Main Conclusion and Articles

The estimated model predicts that global warming will increase the areas of forest fires. The future developments of expected forest fire areas in the different 29 countries have been predicted for alternative levels of global warming.

The published open access article (with some misprints):

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The original version without misprints:

http://www.lohmander.com/PL_CAJESTI_20_2_MANUS.pdf

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