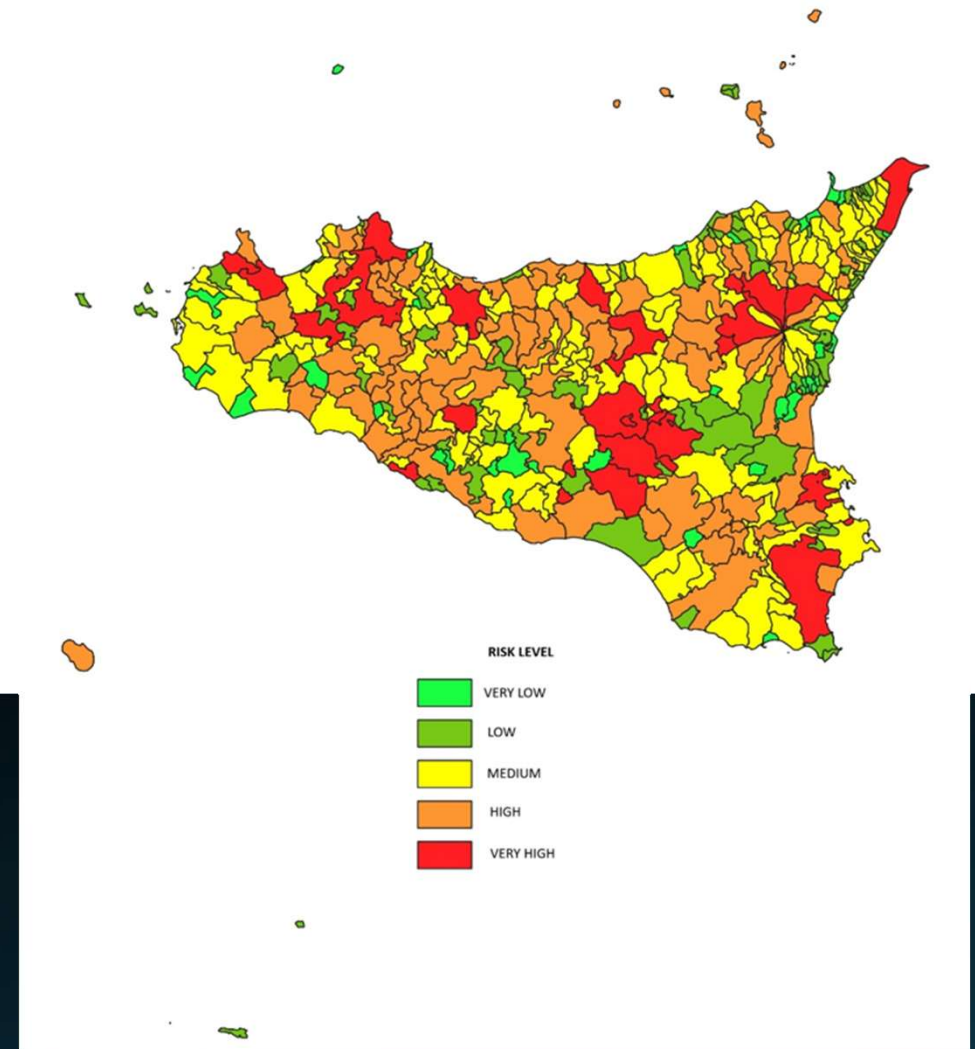


Forest fires in Sicily. Statistical risk analysis based on 2010-2023 data



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Introduction

- Forest fires are complex phenomena detrimental to the environment
- This work based on the analysis of 24 years of forest fire data in Sicily
- A definition of forest fire risk is here formulated



Multidisciplinary team work



SIF – ISTAT –
ISPRA
official
databases



Wildfires competences

methods for
data extraction
and data
analysis

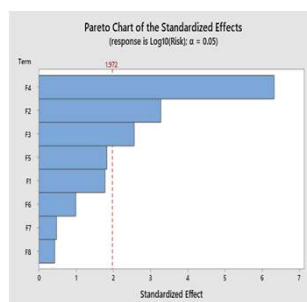
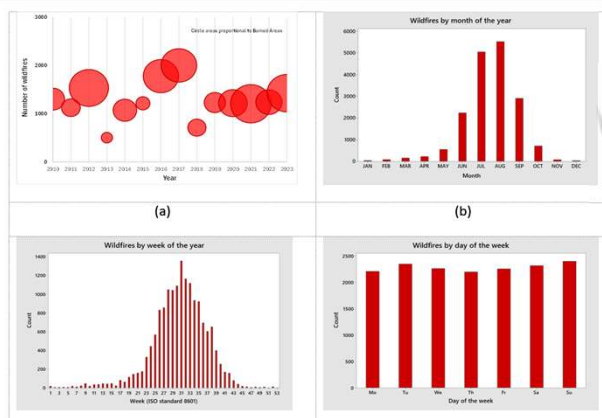


Geo data competences

Statistical competences

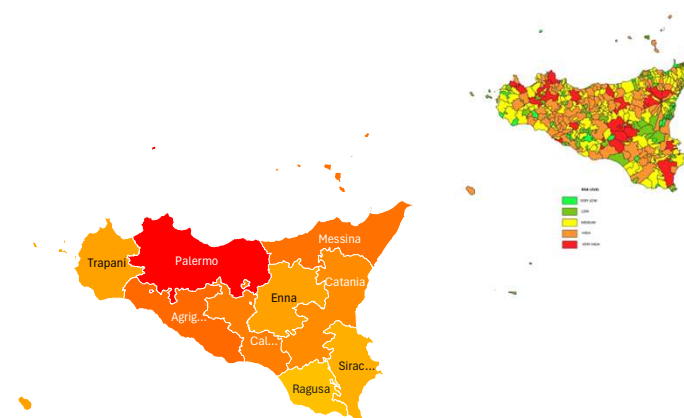


Exploratory data analysis



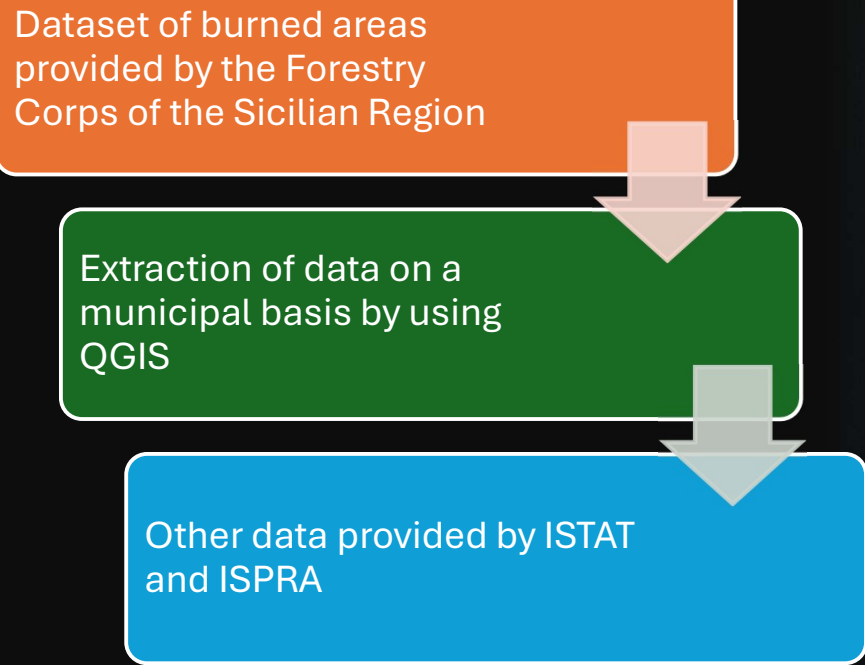
Risk assessment at municipal level

Municipality	FA	NF	BA	Forest Fire Risk	Risk level
Monreale	8720	475	14560	6.03E+10	very high
Mazzarino	8455	374	13767	4.35E+10	very high
Messina	7488	492	10460	3.85E+10	very high
Randazzo	9801	308	6449	1.95E+10	very high
Enna	7856	144	9008	1.02E+10	very high
Noto	9364	250	3961	9.27E+09	very high
Bronte	9614	158	5289	8.03E+09	very high
Palermo	4274	212	7997	7.25E+09	very high
Piazza Armerina	4974	188	4235	3.96E+09	very high
Castiglione di Sicilia	4570	207	4036	3.82E+09	very high
Castellammare del Golfo	3604	156	5777	3.25E+09	very high
San Mauro Castelverde	7276	55	6777	2.71E+09	very high
Caccamo	4595	147	3166	2.14E+09	very high
Aidone	4797	108	3957	2.05E+09	very high
Nicosia	5458	76	4782	1.98E+09	very high
Siculiana	745	427	6105	1.94E+09	very high
Casteltermini	2582	120	5741	1.78E+09	very high
Mclilli	4851	69	4974	1.66E+09	very high
Custonaci	2707	68	8536	1.57E+09	very high



Data sources and pre-processing

Dataset of burned areas
provided by the Forestry
Corps of the Sicilian Region



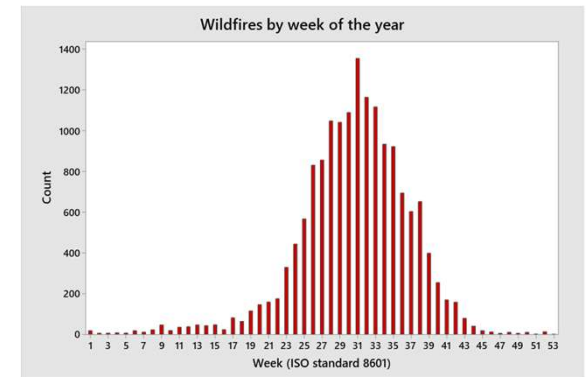
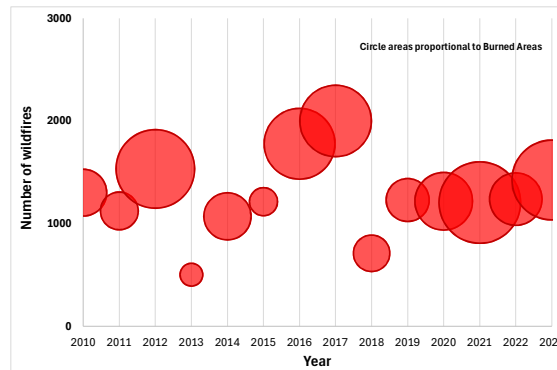
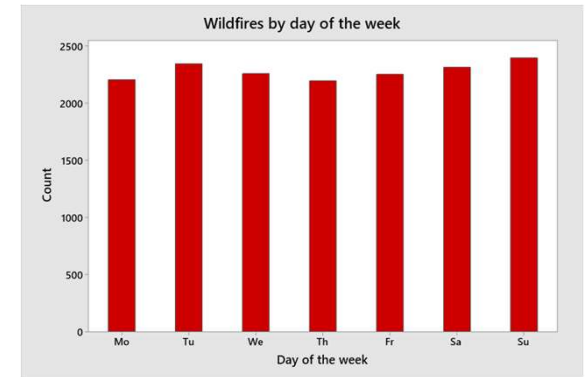
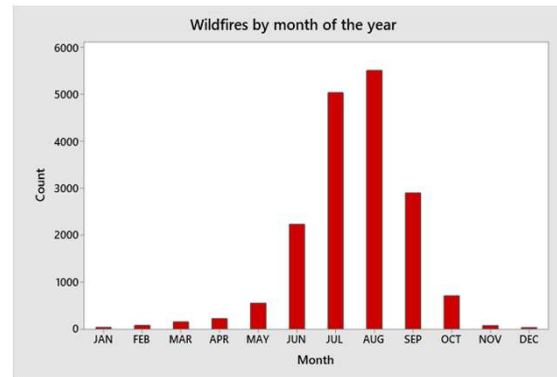
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graph TD; A[Dataset of burned areas provided by the Forestry Corps of the Sicilian Region] --> B[Extraction of data on a municipal basis by using QGIS]; B --> C[Other data provided by ISTAT and ISPRA];
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The diagram illustrates a three-step process for data pre-processing. It begins with an orange box at the top, followed by a green box in the middle, and a blue box at the bottom. Arrows indicate a downward flow from the first box to the second, and from the second to the third.

Extraction of data on a
municipal basis by using
QGIS

Other data provided by ISTAT
and ISPRA

Exploratory data analysis – time trends





Forest Fire Risk

$$\text{Forest Fire Risk} = \text{NF} \cdot \text{BA} \cdot \text{FA}$$

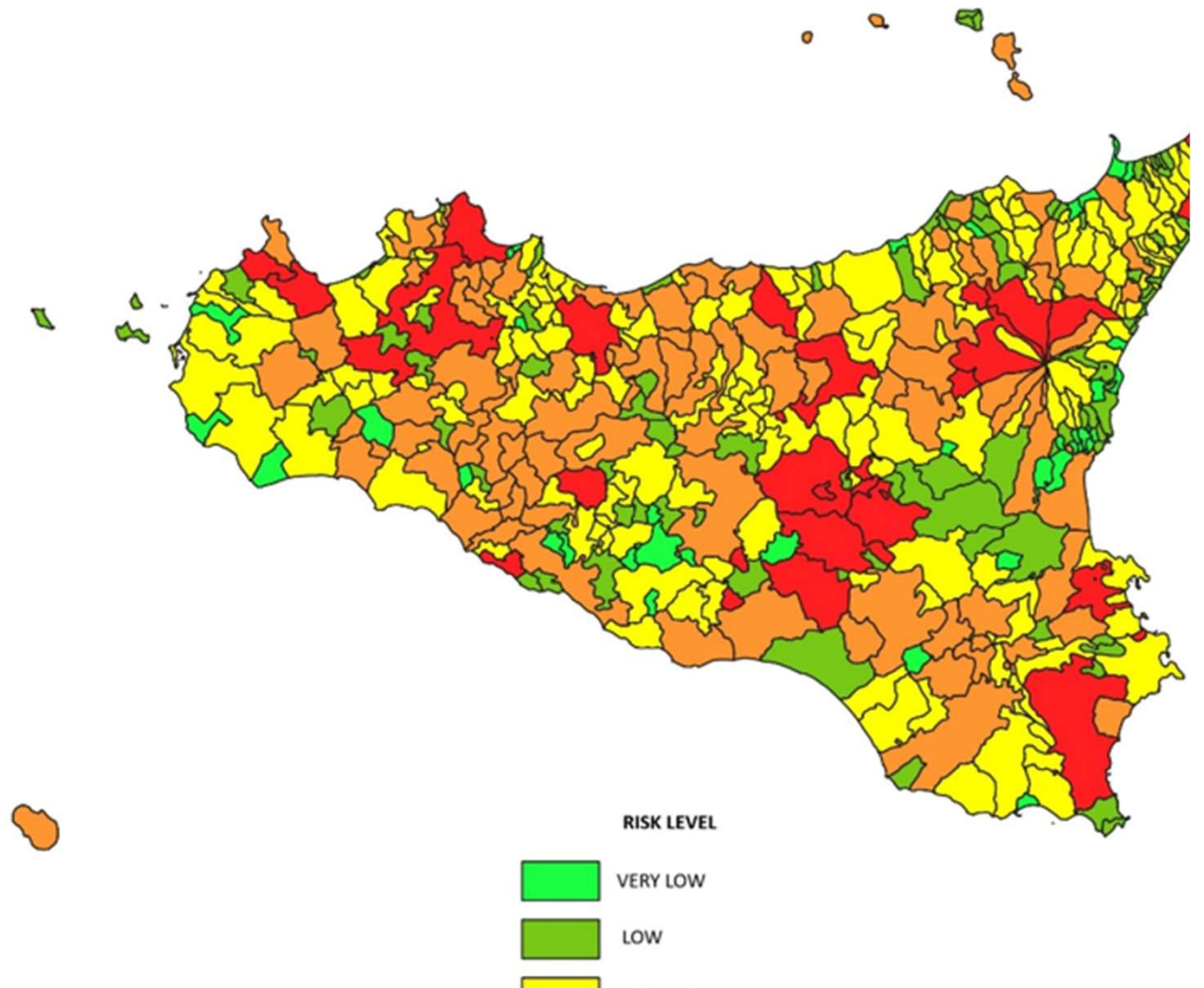
Where:

NF = number of fire events which affected the municipality;

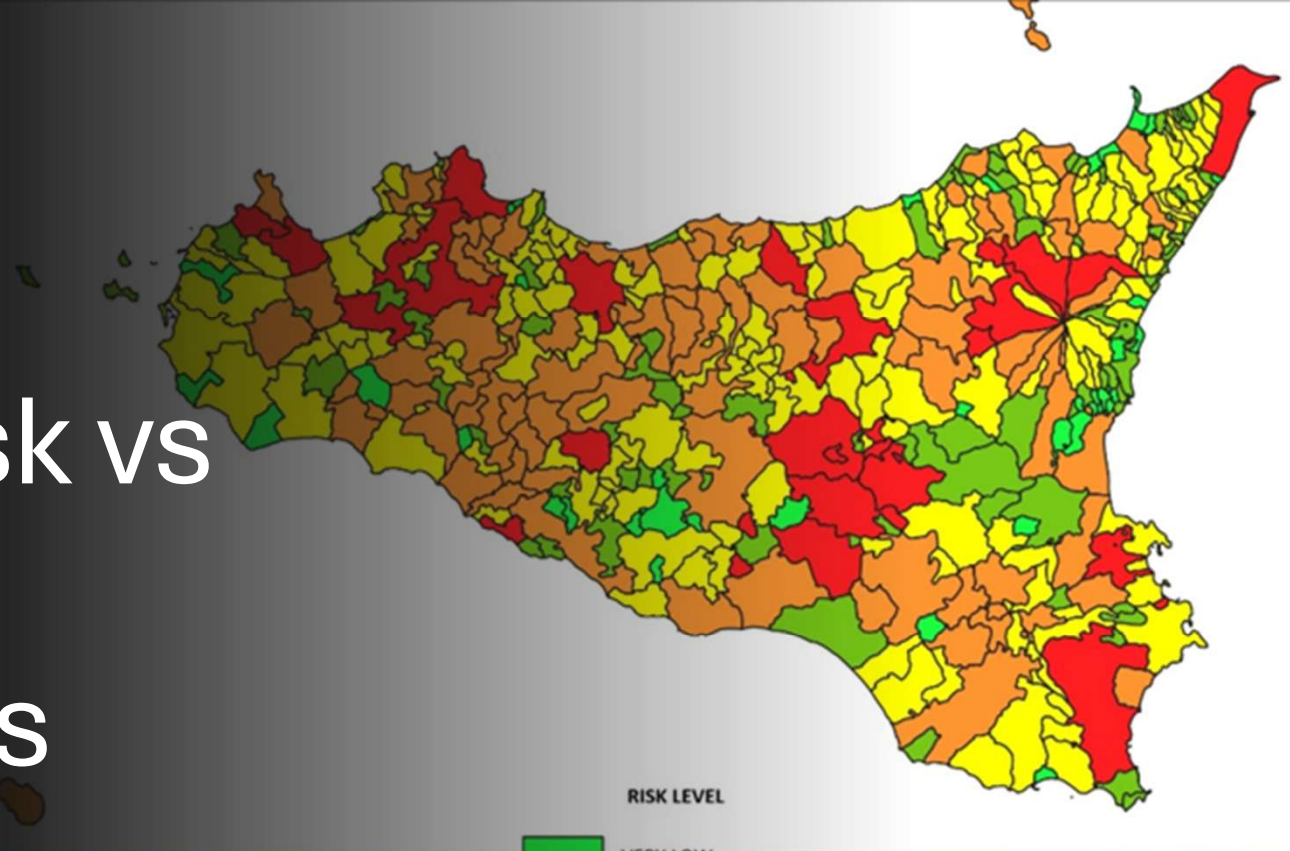
BA = total burned forest areas in the time period considered;

FA = forested areas currently present in that municipality

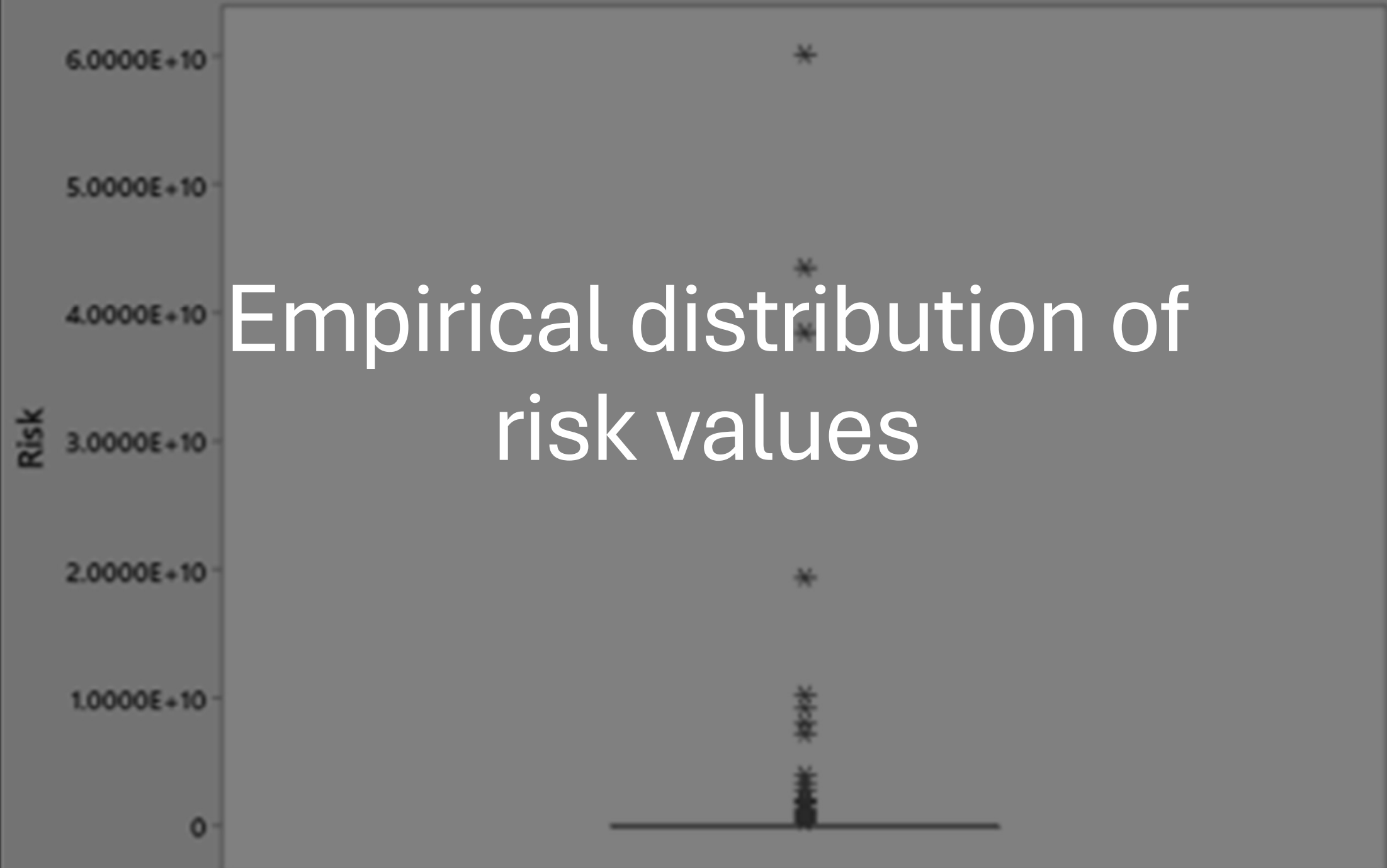
Risk map



Correlation risk vs geophysical characteristics



Boxplot of Risk



Empirical distribution of
risk values

Regressors: geographical, economic, and social factors

Agricultural
areas

Altitude

Artificial areas

Compactness
index

Fragmentation
index

Land area

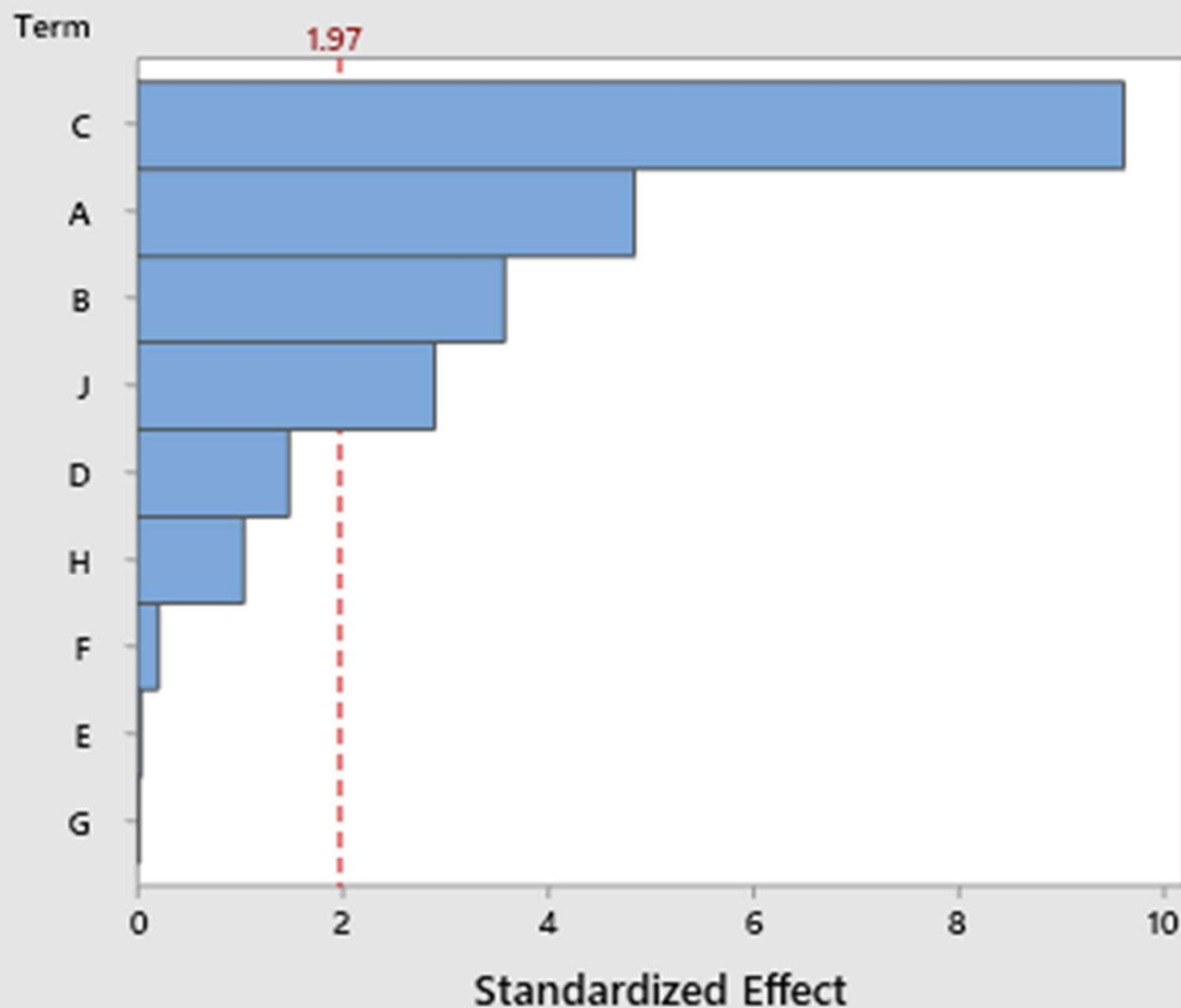
Number of
residents

Urban green
areas

Water bodies

Wetlands

Pareto Chart of the Standardized Effects (response is Risk; $\alpha = 0.05$)



Predictor	Name
A	Agricultural areas
B	Altitude
C	Artificial areas
D	Compactness index
E	Fragmentation index
F	Population density
G	Urban green areas
H	Water bodies
J	Wetlands

Conclusions



Forest fire data collection empowerment is needed



balancing between ecology and risk management



optimal distribution of regional budget