

Impakti i thatesirave ne ekosisteme

Desard Poka , Klauberta Morina

Hyrje

- 1.Pse eshte e rendesishme te studjojme impaktin qe ka thatesia?
- 2.Nje pamje me e qarte nder vite.
- 3.Qellimi final i projektit.

Thatsirat mjedisore jane nje nga faktoret te cilet sfidojne boten e sotme duke shkaktuar deme mjaft te medha ne ekosisteme si dhe deme ekonomike etj. Thatesia eshte nje pjese normale e natyres ne disa vende te botes e cila ndodh nag rreshjet e pakta te nje periudhe te gjate kohore , kjo gje sjell(ne periudha te perzgjatura) , uljen e nivelit te ujrave siperfaqesore te cilet prekin negativisht agrikulturen , ekosistemet si dhe bio-diversitetin ne natyre . Periudha te perzgjatura thatesia shkaktone renie ne gjelberim total apo pyjeve , varferim te dheut ,ritje te zjarreve dhe ulje te gjallesave totale ne nje zone te caktuar .

Qellimi i projektit

Ky projekt ka qellim te analizoje se si thatesia ka goditur ekosistemet Europiane ne 20 vitet e fundit.

Duke perdorur nje dataset nga Agjensia Europiane e Mjedisit ose (EEA),ne do te shikojme pak nga afer zgjerimin e kete fenmeni gjithnje e me te pranishem ne europe nga viti 2000-2023.

Cfare do te shikojme ?

- Trendi nder vite i thatesires i shprehur ne km^2
- Diferenca midis shteteve dhe zonave te ndryshme.
- Marrdhenien midis kohes dhe intensitetit te thatesirave duke perdorur regresionin.

Dataseti

1.Periudha 2000-2023

2.Njesia km^2

Kolonat:

- **time:** Viti
- **geo:** Vendi
- **obs_value:** Siperfaqe e prekur nga thatesira ne KM
- **geo_label:** Emri i vendit
- **dimension_label:** Disa informata te tjera per pershkrim. ## Librarit

```
library(tidyverse)
```

```
## — Attaching core tidyverse packages ————— tidyverse 2.0.0 —
## ✓ dplyr      1.1.4      ✓ readr      2.1.5
## ✓ forcats    1.0.0      ✓ stringr    1.5.1
## ✓ ggplot2    3.5.2      ✓ tibble     3.2.1
## ✓ lubridate  1.9.4      ✓ tidyr      1.3.1
## ✓ purrr      1.0.4
## — Conflicts ————— tidyverse_conflicts() —
## ✗ dplyr::filter() masks stats::filter()
## ✗ dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(ggplot2)
library(knitr)
library(esquisse)
library(dplyr)
library(plotly)
```

```
##
## Attaching package: 'plotly'
##
## The following object is masked from 'package:ggplot2':
##
##   last_plot
##
## The following object is masked from 'package:stats':
##
##   filter
##
## The following object is masked from 'package:graphics':
##
##   layout
```

```
library(e1071)
data <- read_csv("eea_s_eu-sdg-15-42_p_2000-2023_v02_r00.csv")
```

```
## Rows: 1872 Columns: 10
## — Column specification —————
## Delimiter: ","
## chr (7): eu_sdg, dimension, dimension_label, unit, unit_label, geo, geo_label
## dbl (2): time, obs_value
## lgl (1): obs_status
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
head(data)
```

```
## # A tibble: 6 × 10
##   eu_sdg dimension dimension_label      unit unit_label      geo geo_label time
##   <chr>  <chr>      <chr>          <chr> <chr>      <chr> <chr>    <dbl>
## 1 15_42  KM2          Drought impact area KM2    Square kilom... EU27... European... 2000
## 2 15_42  KM2          Drought impact area KM2    Square kilom... EU27... European... 2001
## 3 15_42  KM2          Drought impact area KM2    Square kilom... EU27... European... 2002
## 4 15_42  KM2          Drought impact area KM2    Square kilom... EU27... European... 2003
## 5 15_42  KM2          Drought impact area KM2    Square kilom... EU27... European... 2004
## 6 15_42  KM2          Drought impact area KM2    Square kilom... EU27... European... 2005
## # i 2 more variables: obs_value <dbl>, obs_status <lgl>
```

```
#Mbajtja e kolonave qe na duhen.
```

```
Te_dhenat <- data %>%
  select(geo_label, time, obs_value) %>%
  rename(Shteti = geo_label, Year = time, zonat_e_thatesires = obs_value) %>%
  filter(!is.na(zonat_e_thatesires))
```

Permbledhje

```
str(Te_dhenat)
```

```
## tibble [1,872 × 3] (S3: tbl_df/tbl/data.frame)
## $ Shteti           : chr [1:1872] "European Union - 27 countries (from 2020)" "European Uni
on - 27 countries (from 2020)" "European Union - 27 countries (from 2020)" "European Union - 27
countries (from 2020)" ...
## $ Year             : num [1:1872] 2000 2001 2002 2003 2004 ...
## $ zonat_e_thatesires: num [1:1872] 182232 97656 109239 387793 17931 ...
```

```
summary(Te_dhenat)
```

```
##      Shteti           Year      zonat_e_thatesires
## Length:1872      Min.   :2000      Min.    :    0.00
## Class :character 1st Qu.:2006      1st Qu.:    0.01
## Mode  :character Median :2012      Median :    2.92
##              Mean   :2012      Mean   : 4714.61
##              3rd Qu.:2017      3rd Qu.:   321.88
##              Max.   :2023      Max.   :648748.59
```

```
summary_stats <- Te_dhenat %>%
  group_by(Shteti) %>%
  summarise(
    Mean = mean(zonat_e_thatesires),
    Median = median(zonat_e_thatesires),
    Min = min(zonat_e_thatesires),
    Max = max(zonat_e_thatesires),
    SD = sd(zonat_e_thatesires)
  ) %>%
  mutate(
    SD = format(round(SD, 2), scientific = FALSE)
  )

kable(summary_stats)
```

Shteti	Mean	Median	Min	Max	SD
Albania	530.32417	2.390	0.00	5417.22	1256.54
Austria	1507.17896	17.080	0.00	23665.10	3771.49
Belgium	818.73083	0.000	0.00	17350.13	3035.17
Bosnia and Herzegovina	1782.70375	1.245	0.00	24978.51	5403.30
Bulgaria	3436.04812	8.695	0.00	56149.52	10820.65
Croatia	1524.37313	1.960	0.00	18516.20	4527.82
Cyprus	304.33250	0.060	0.00	4437.26	1008.25
Czechia	1743.43604	7.825	0.00	20716.56	4155.46
Denmark	609.32583	2.365	0.00	19698.07	2871.66
Estonia	1404.18833	0.340	0.00	31570.87	5015.78
European Union - 27 countries (from 2020)	80603.67729	3625.340	0.18	648748.59	132533.85
Finland	3808.30604	8.105	0.00	37923.11	9140.11
France	11937.54000	30.740	0.00	240139.86	38335.56
Germany	6750.43125	14.590	0.00	70420.84	18606.25
Greece	2358.82438	12.610	0.00	30840.74	5530.80
Hungary	1951.34771	1.225	0.00	39873.53	6845.96
Iceland	442.08083	2.170	0.00	6496.03	1260.60
Ireland	176.19625	0.310	0.00	4956.34	742.02
Italy	5862.03187	304.125	0.20	53925.45	11894.81
Kosovo (under United Nations Security Council Resolution 1244/99)	175.79375	0.605	0.00	1775.57	446.97

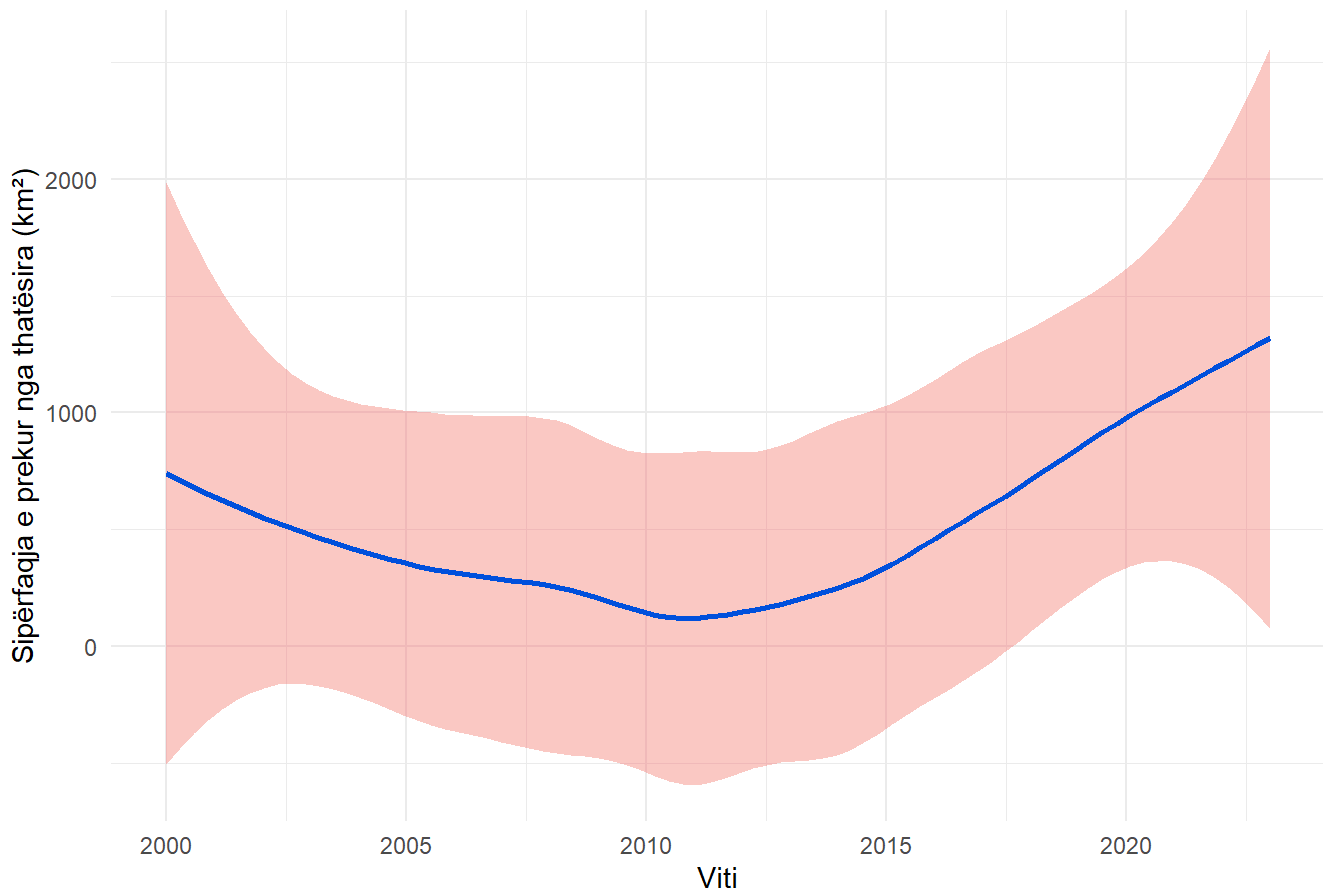
Shteti	Mean	Median	Min	Max	SD
Latvia	1408.54521	9.475	0.00	13924.50	3222.01
Liechtenstein	2.24500	0.000	0.00	39.71	6.90
Lithuania	1878.45208	2.735	0.00	31960.64	5864.35
Luxembourg	111.97167	0.000	0.00	1824.42	376.93
Malta	11.92062	0.000	0.00	212.31	36.29
Montenegro	335.97417	0.170	0.00	4274.38	924.91
Netherlands	473.91521	0.000	0.00	9031.60	1750.88
North Macedonia	665.27667	0.000	0.00	9125.56	2128.97
Norway	2257.09667	8.315	0.00	24137.94	4814.32
Poland	5883.15667	10.930	0.00	55246.74	12536.25
Portugal	3304.56167	3.120	0.00	55432.94	10639.82
Romania	4264.14146	12.935	0.00	39937.13	10194.02
Serbia	1785.69146	3.405	0.00	33894.24	5592.22
Slovakia	883.50688	3.900	0.00	13965.29	2666.98
Slovenia	570.54354	1.695	0.00	11196.65	1975.42
Spain	12791.23021	30.610	0.00	156588.83	32061.30
Sweden	4888.88562	15.530	0.00	60701.62	10420.09
Switzerland	517.39167	4.785	0.00	6316.81	1241.02
Türkiye	14108.50333	16.290	0.00	155982.05	30619.67

Trendi i thatesirave në shqiperi

```
Te_dhenat %>%
  filter(Shteti == "Albania") %>%
  ggplot(aes(x = Year, y = zonat_e_thatesires)) +
  geom_smooth(se = TRUE, colour = "#0452DE", fill = "#F8766D") +
  labs(
    title = "Trendi i thatësirës në Shqipëri (2000–2023)",
    x = "Viti",
    y = "Sipërfaqja e prekur nga thatësira (km²)"
  ) +
  theme_minimal()
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```

Trendi i thatësirës në Shqipëri (2000–2023)



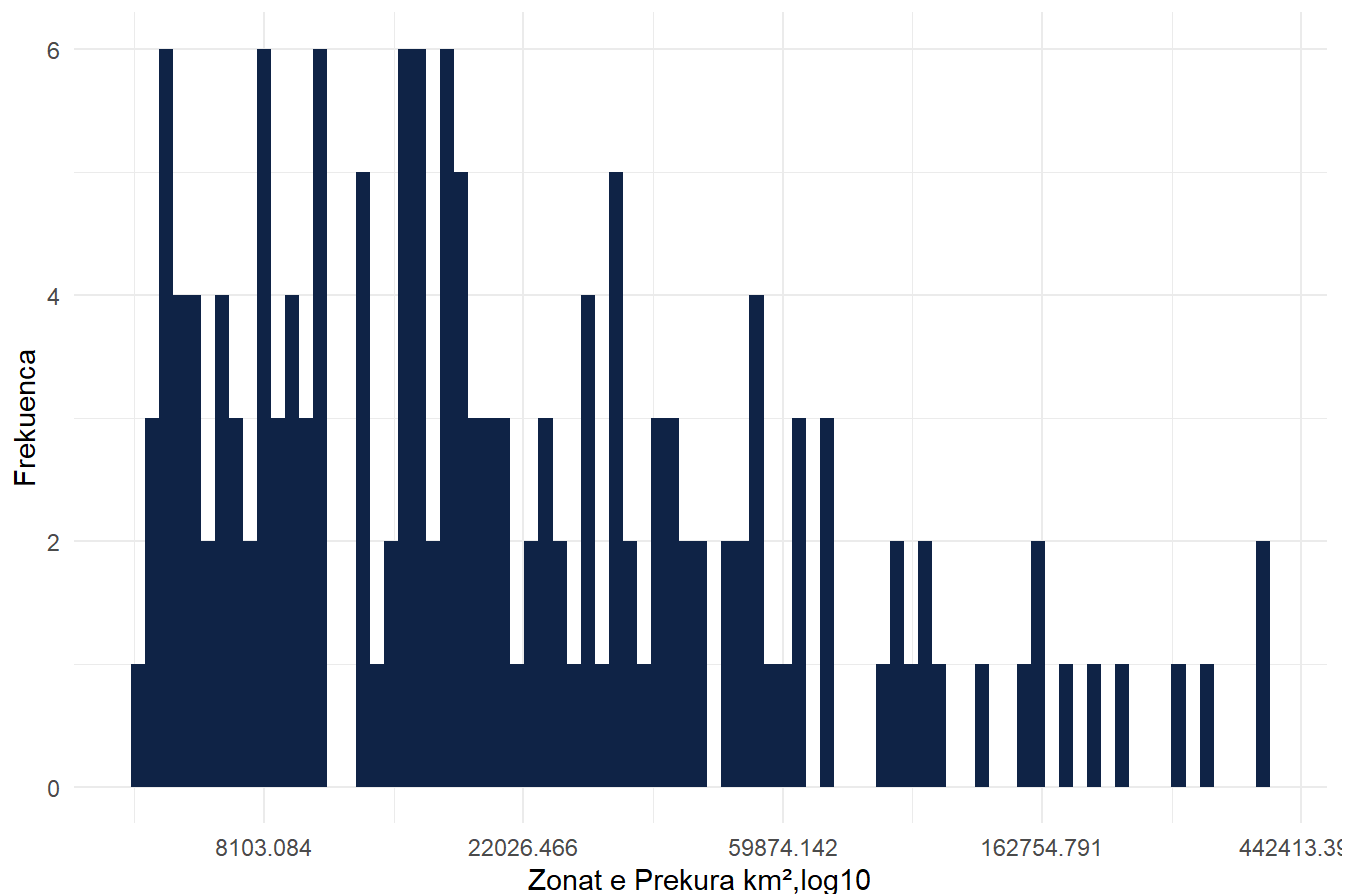
#Ky grafik tregon zonat e mbuluara nga thatesirat ne Shqiperi nga viti 2000-2023,vija tregon se ka pasur nje perkeqesim te situates gjate ketyre viteve e cila tregohet nga vija e lemuar e grafikut ne fjale.

Histogrammi i te dhenave

```
data$time <- as.numeric(as.character(data$time))

data %>%
  filter(
    time >= 2000, time <= 2020.6,
    obs_value >= 5000, obs_value <= 650000
  ) %>%
  ggplot(aes(x = obs_value)) +
  geom_histogram(bins = 81, fill = "#112446") +
  scale_x_continuous(trans = "log") +
  labs(
    title = "Zonat e Prekura(2000-2023)",
    x = "Zonat e Prekura km²,log10",
    y = "Frekuenca")+
  theme_minimal()
```

Zonat e Prekura(2000–2023)



#Histogrami i treguar me siper tregon zonat e prekura nga thatesira dhe kryesisht shperndarjen e tyre nga niveli minimal deri ne nivel maximal , verehet se rrall her verehen vlera shume te larta , duke u perqendruar kryesisht ne vjera me te vogla por me frekuenca me te larta.

Asimetria e histogramit

```
data %>%
  filter(obs_value >= 20000 & obs_value <= 650000) %>%
  summarise(asimetria = skewness(obs_value, na.rm = TRUE))
```

```
## # A tibble: 1 × 1
##   asimetria
##   <dbl>
## 1      3.28
```

#Kodi i mesiperme tregon veren e Asimetrise te te dhenave ku nje asimetri pozitive tregon se vlerat jane kryesisht te vogla , asimetri negative qe vlerat jane kryesisht te larta dhe asimetria e te barabarte me 0 tregon se kemi shperndarje uniforme.

Shtetet me te prekura nga thatesirat.

```
summary_table <- data %>%
  filter(!is.na(obs_value)) %>%
  filter(geo_label != "European Union - 27 countries (from 2020)") %>%
  group_by(geo_label) %>%
  summarise(
    Count = n(),
    Zonat_e_Prekura = sum(obs_value)
  ) %>%
  ungroup() %>%
  mutate(
    Perqindje = round(100 * Zonat_e_Prekura / sum(Zonat_e_Prekura), 2)
  ) %>%
  arrange(desc(Perqindje))

kable(summary_table, caption = "Kontributi i çdo shteti ne totalin e zonave te prekura nga thate
sira.")
```

Kontributi i çdo shteti ne totalin e zonave te prekura nga thatesira.

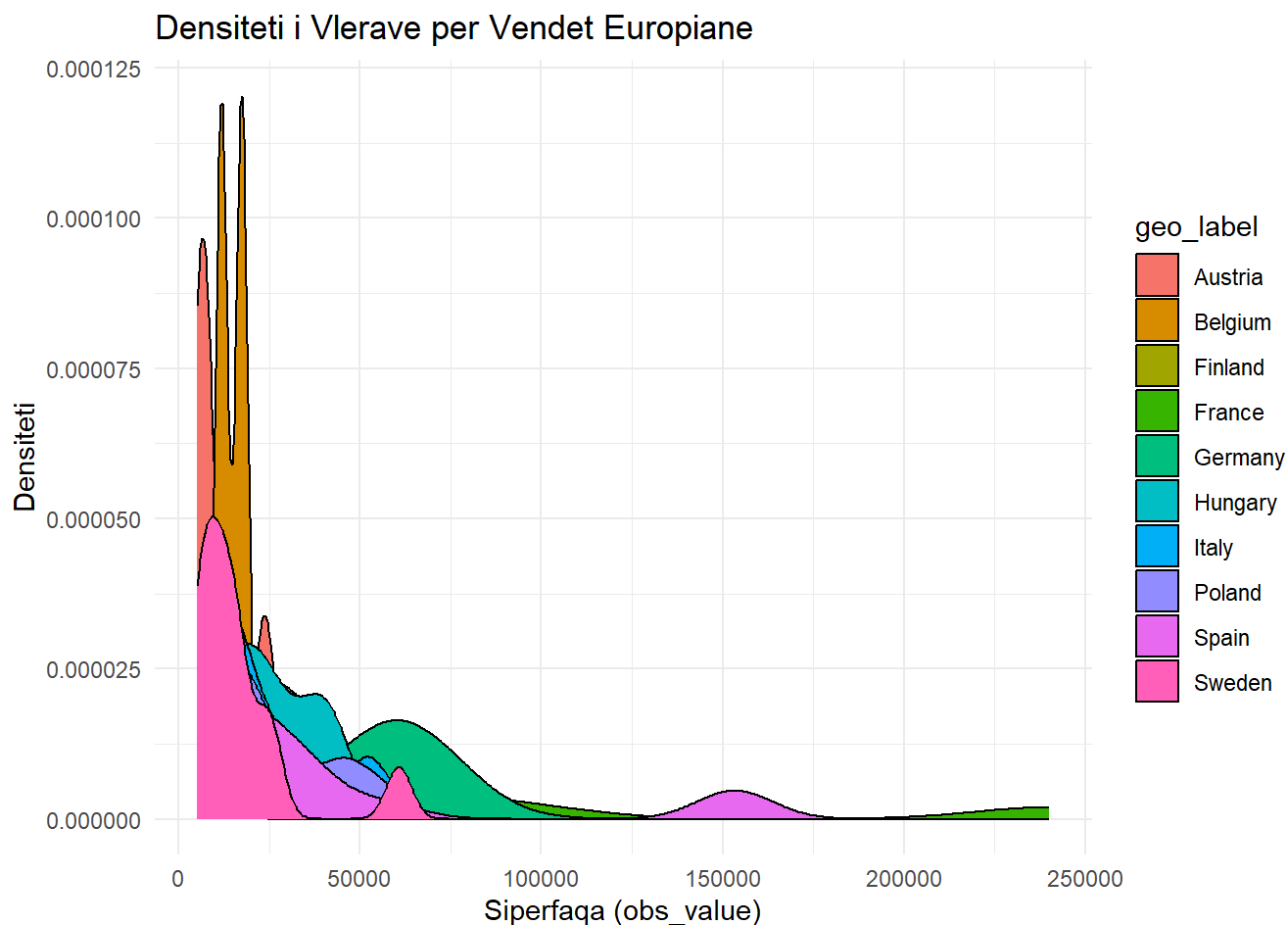
geo_label	Count	Zonat_e_Prekura	Perqindje
Türkiye	48	677208.16	13.66
Spain	48	613979.05	12.39
France	48	573001.92	11.56
Germany	48	324020.70	6.54
Poland	48	282391.52	5.70
Italy	48	281377.53	5.68
Sweden	48	234666.51	4.73
Romania	48	204678.79	4.13
Finland	48	182798.69	3.69
Bulgaria	48	164930.31	3.33
Portugal	48	158618.96	3.20
Greece	48	113223.57	2.28
Norway	48	108340.64	2.19
Hungary	48	93664.69	1.89
Lithuania	48	90165.70	1.82
Bosnia and Herzegovina	48	85569.78	1.73

geo_label	Count	Zonat_e_Prekura	Perqindje
Serbia	48	85713.19	1.73
Czechia	48	83684.93	1.69
Croatia	48	73169.91	1.48
Austria	48	72344.59	1.46
Estonia	48	67401.04	1.36
Latvia	48	67610.17	1.36
Slovakia	48	42408.33	0.86
Belgium	48	39299.08	0.79
North Macedonia	48	31933.28	0.64
Denmark	48	29247.64	0.59
Slovenia	48	27386.09	0.55
Albania	48	25455.56	0.51
Switzerland	48	24834.80	0.50
Netherlands	48	22747.93	0.46
Iceland	48	21219.88	0.43
Montenegro	48	16126.76	0.33
Cyprus	48	14607.96	0.29
Ireland	48	8457.42	0.17
Kosovo (under United Nations Security Council Resolution 1244/99)	48	8438.10	0.17
Luxembourg	48	5374.64	0.11
Malta	48	572.19	0.01
Liechtenstein	48	107.76	0.00

#Tabela e dhene tregon frekuencen qe secili shtet shfaqet ne dataset e cila eshte nje vlere e barabarte per te siguruar sakte si me te larte si dhe permban vleren e kontributeve te secilit shtet ne siperfaqen totale te thate ne %.

Densiteti i vlerave per disa nga vendet e europes.

```
data %>%
  filter(!(geo %in% c("EU27_2020", "BG", "CY", "MT", "IS",
    "LI", "NO", "CH", "MK", "AL", "TR", "XK", "BA", "CZ", "DK", "EE", "IE", "EL", "HR", "CY", "LV", "LT", "LU", "PT", "RO", "SI", "SK", "RS", "NL"))) %>%
  filter(obs_value >= 5000L & obs_value <= 650000L) %>%
  ggplot(aes(x = obs_value, fill = geo_label)) +
  geom_density(adjust = 1L) +
  scale_y_continuous(labels = scales::comma) +
  scale_fill_hue(direction = 1) +
  theme_minimal() +
  labs(
    x = "Siperfaqja (obs_value)",
    y = "Densiteti",
    title = "Densiteti i Vlerave per Vendet Europiane"
  )
```



#Ky krafik tregon densesine per sa i perket disa vendeve europian te cilat un i kam zgjedur , mun d te verehen vendet me te prekura se te tjerat bazuar ne pozicionin i cila ka secili shetet.

Asimetria e Ketyre vlerave.

```
data %>%
  filter(!(geo %in% c("EU27_2020", "BG", "CY", "MT", "IS",
    "LI", "NO", "CH", "MK", "AL", "TR", "XK", "BA", "CZ", "DK", "EE", "IE", "EL", "HR", "CY", "LV", "LT", "LU", "PT", "RO", "SI", "SK"))) %>%
  filter(obs_value >= 5000L & obs_value <= 650000L) %>%
  group_by(geo_label) %>%
  summarise(Skewness = skewness(obs_value, na.rm = TRUE)) %>%
  arrange(desc(Skewness))
```

```
## # A tibble: 12 × 2
##   geo_label  Skewness
##   <chr>      <dbl>
## 1 Sweden      1.95
## 2 Spain       1.74
## 3 France      1.67
## 4 Italy       1.02
## 5 Serbia      0.792
## 6 Poland      0.746
## 7 Austria     0.725
## 8 Netherlands 0.370
## 9 Hungary     0.141
## 10 Finland    0.0769
## 11 Belgium    0
## 12 Germany   -0.583
```

#Vlera e asimetrise te disa shteteve te europes te cilat tregojne se si eshte shperndarja e vlerave ne grafik , me shume vlera te ulta ? Te mesme ? apo te lart...etj.

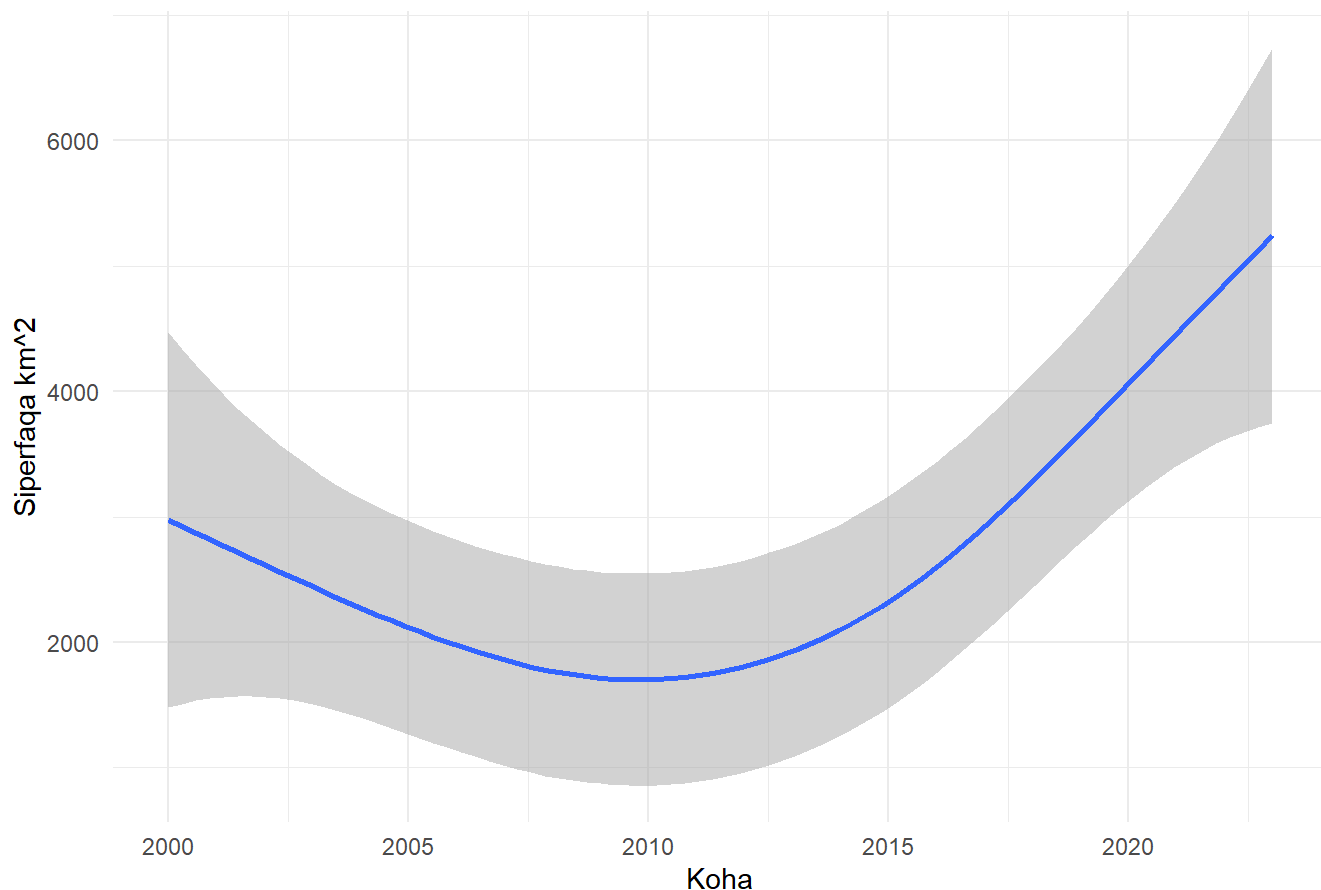
Korrelacioni mmidis Kohes dhe Siperfaeve te prekura.

```
data %>%
  filter(!(geo %in% "EU27_2020")) %>%
  filter(!(geo_label %in% "European Union - 27 countries (from 2020)")) %>%
  ggplot(aes(x = time, y = obs_value, colour = time)) +
  geom_smooth(se = TRUE) +
  scale_color_gradient() +
  labs(
    x = "Koha",
    y = "Siperfaqe km^2",
    title = "Korrelacioni Midis Kohes dhe Siperfaqes se prekur"
  ) +
  theme_minimal()
```

```
## `geom_smooth()` using method = 'gam' and formula = 'y ~ s(x, bs = "cs")'
```

```
## Warning: The following aesthetics were dropped during statistical transformation:
## colour.
## i This can happen when ggplot fails to infer the correct grouping structure in
## the data.
## i Did you forget to specify a `group` aesthetic or to convert a numerical
## variable into a factor?
```

Korrelacioni Midis Kohes dhe Siperfaqes se prekur

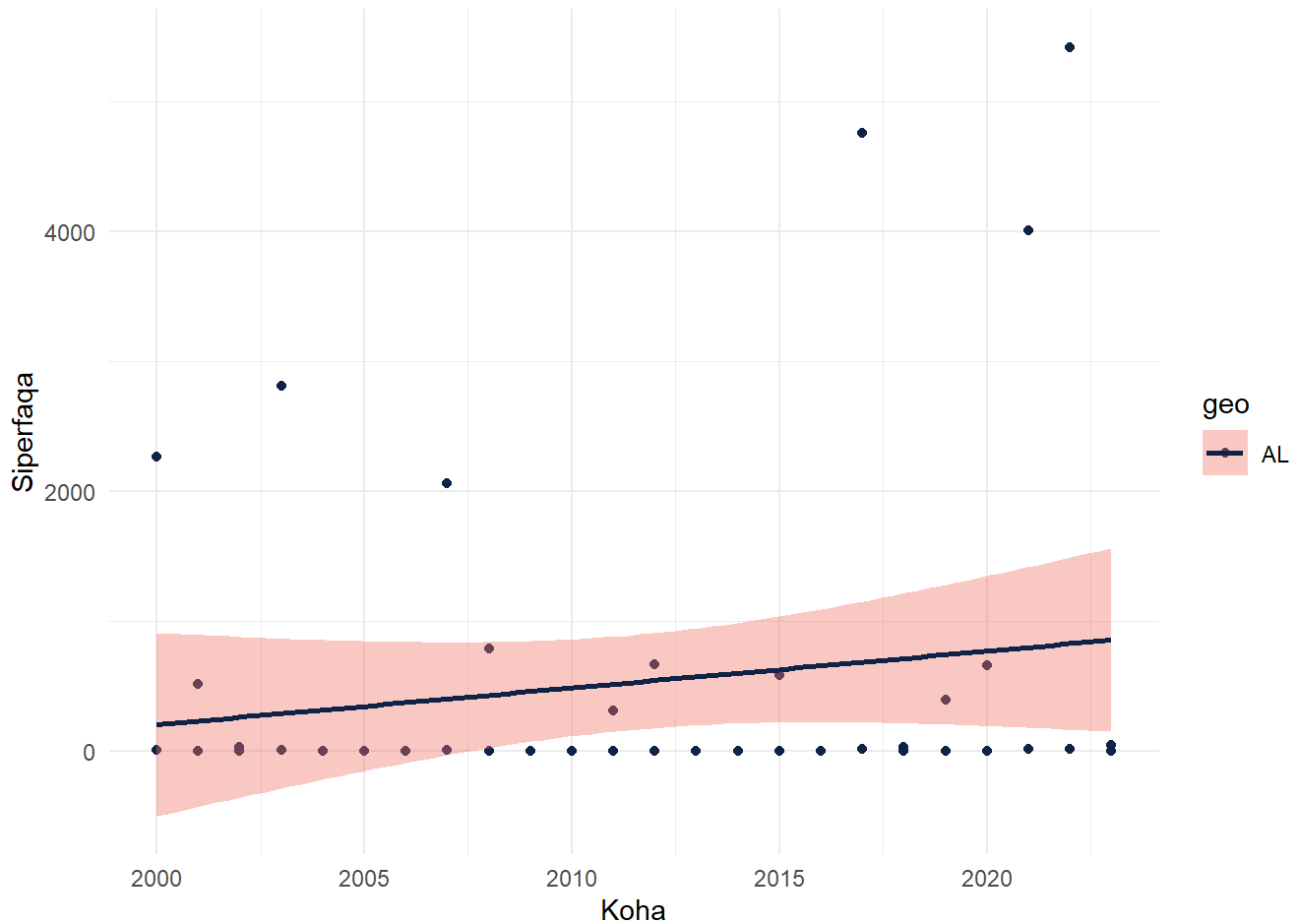


#Me sipër kemi drejteszen e regresit per secilin shtet europian i cili na ndihmon per te pare trendin e thatesirave gjate viteve.

Drejtez regresi per vendin tone.

```
data %>%
  filter(geo %in% "AL") %>%
  filter(geo_label %in% "Albania") %>%
  ggplot(aes(x = time, y = obs_value, fill = geo)) +
  geom_point(colour = "#112446") +
  geom_smooth(method = "lm", se = TRUE, colour = "#112446") +
  scale_fill_hue(direction = 1) +
  labs(x = "Koha", y = "Siperfaqe") +
  theme_minimal()
```

```
## `geom_smooth()` using formula = 'y ~ x'
```



Dhe ne fund kemi nje drejtez regresi per vendin tone e cila tregon nje trend rrites te zonave te prekura nga viti 2000-2023.

Krijojme nje kategori per siperfaqet

```
Te_dhenat_kategori <- Te_dhenat %>%
  filter(Shteti != "European Union - 27 countries (from 2020)") %>%
  mutate(Kategoria = case_when(
    zonat_e_thatesires < 100000 ~ "E ulët",
    zonat_e_thatesires < 300000 ~ "Mesatare",
    TRUE ~ "E lartë"
  ))

## Tabela e kontigjences

tabela_kontigjence <- table(Te_dhenat_kategori$Shteti, Te_dhenat_kategori$Kategoria)

kable(as.data.frame.matrix(tabela_kontigjence), caption = "Tabela e kontigjences: Shteti vs Kate
goria e siperfaqes")
```

Tabela e kontigjences: Shteti vs Kategoria e siperfaqes

	E ulët	Mesatare
Albania	48	0
Austria	48	0
Belgium	48	0
Bosnia and Herzegovina	48	0
Bulgaria	48	0
Croatia	48	0
Cyprus	48	0
Czechia	48	0
Denmark	48	0
Estonia	48	0
Finland	48	0
France	47	1
Germany	48	0
Greece	48	0
Hungary	48	0
Iceland	48	0
Ireland	48	0
Italy	48	0
Kosovo (under United Nations Security Council Resolution 1244/99)	48	0
Latvia	48	0
Liechtenstein	48	0
Lithuania	48	0
Luxembourg	48	0
Malta	48	0
Montenegro	48	0
Netherlands	48	0
North Macedonia	48	0
Norway	48	0
Poland	48	0

	E ulët	Mesatare
Portugal	48	0
Romania	48	0
Serbia	48	0
Slovakia	48	0
Slovenia	48	0
Spain	46	2
Sweden	48	0
Switzerland	48	0
Türkiye	47	1

#Tabela eshte e organizuar ne 2 kolona , e ultet dhe mesatare , numrat qe shfaqen ne kolona tregojne se sa here nje vlere e vogel apo mesatare eshte shfaqur per secilen nga shtetet.

```
# Testi Hi katrorit
chisq.test(tabela_kontigjence)
```

```
## Warning in chisq.test(tabela_kontigjence): Chi-squared approximation may be
## incorrect
```

```
##
## Pearson's Chi-squared test
##
## data:  tabela_kontigjence
## X-squared = 53.116, df = 37, p-value = 0.04182
```

#Testi Hi-Katroerit tregon se ka nje lidhje domethenese midis shteteve dhe siperfaqen e prekur nga a thatesirat.

Konkluzion

Nga datasiti i studiuar nga viti 2000-2023 verehet se vlerat dhe rrjedhimisht zonat e prekura jane kryesisht ne rritje ne shumicen e vendeve europiane , duke theksuar se kontributorent me te medhenj jan shtete si Franca , Spanja dhe Italia , Turqia te culat permbajne perqindjen me te larte.Ne shqiperi gjithatshtu verehet nje trend rrites duke reflektuar ndjeshmerine e europes ndaj ndryshimeve klimatike.Shperndarja e te dhenave tregojne nje asimetri te theksuar e cila do te thote qe vlerat jane kryesisht te ulta por me nje frekence me te larte.Marredhenia midis viteve dhe zonave te prekura tregon nje trend rrites te ketyre zonave i cili mund te lidhet me ndryshimet klimatike etj.