HELLENIC REPUBLIC

Ministry for Climate Crisis and Civil Protection

Visual Analytics 3rd Assignment

Report on Wildfires from 2012 to 2016

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Executive Summary

Dataset Characteristics:

This report is based on data covering wildfires in Greece from January 1, 2012, to December 31, 2016. The dataset includes detailed information on wildfire occurrences, meteorological data, firefighting resources, and geographical information. Key data points include:

- Wildfire incidents: start and finish times, affected areas by type (forests, woodlands, etc.)
- Meteorological data: daily temperatures, wind speed and direction, rainfall
- Firefighting resources: types and quantities of equipment and personnel involved
- Geographical coordinates for relevant locations

The insights derived from this comprehensive dataset are crucial for improving wildfire preparedness and response strategies. By focusing on critical factors such as temperature and wind speed, and ensuring adequate resource allocation, the Hellenic Civil Protection authorities can better manage and mitigate the impact of wildfires.

Key Findings:

- **Factors Influencing Wildfire Duration:** The duration of wildfires is primarily influenced by higher wind speeds and temperatures. These conditions accelerate fire spread and increase vegetation combustibility. Rainfall has a minimal effect on fire duration, highlighting the need to focus on wind and temperature in managing fire duration.

- **Factors Influencing Burned Area Size:** Higher temperatures and strong winds significantly increase the size of the burned area. These conditions lead to more extensive wildfires, emphasizing the importance of monitoring and predicting these factors to mitigate wildfire damage effectively.

- **Alert Criteria for High Wildfire Risk:** Alerts should be issued when average temperatures exceed 20 degrees Celsius and wind speeds rise above 15 km/h. These thresholds indicate a high risk of extensive wildfires, necessitating timely alerts and resource mobilization to mitigate potential impacts.

- **Burned Area by Geography and Date:** The most extensive wildfire activity occurs during the second and third quarters of each year, especially in Northern Greece and the Islands. This temporal and geographical pattern necessitates enhanced preparedness during these high-risk periods.

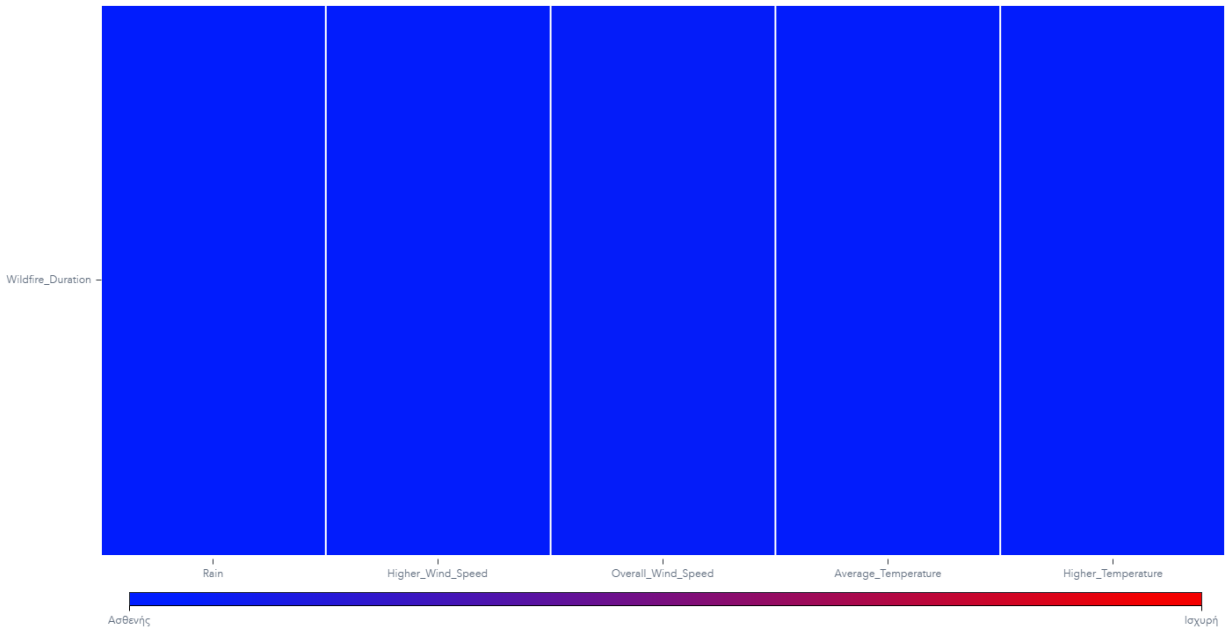
- **Periods of High Wildfire Activity:** Wildfires predominantly break out during the third quarter (July to September), followed by the second quarter. This pattern underscores the need for

heightened vigilance and preparedness during the summer months when wildfire conditions are most conducive.

- **Utilization of Firefighting Resources:** Firetrucks are the most heavily utilized resource, particularly during the third quarter each year. Aerial resources like helicopters and planes are also deployed more frequently during these periods, supporting ground efforts in combating fires.

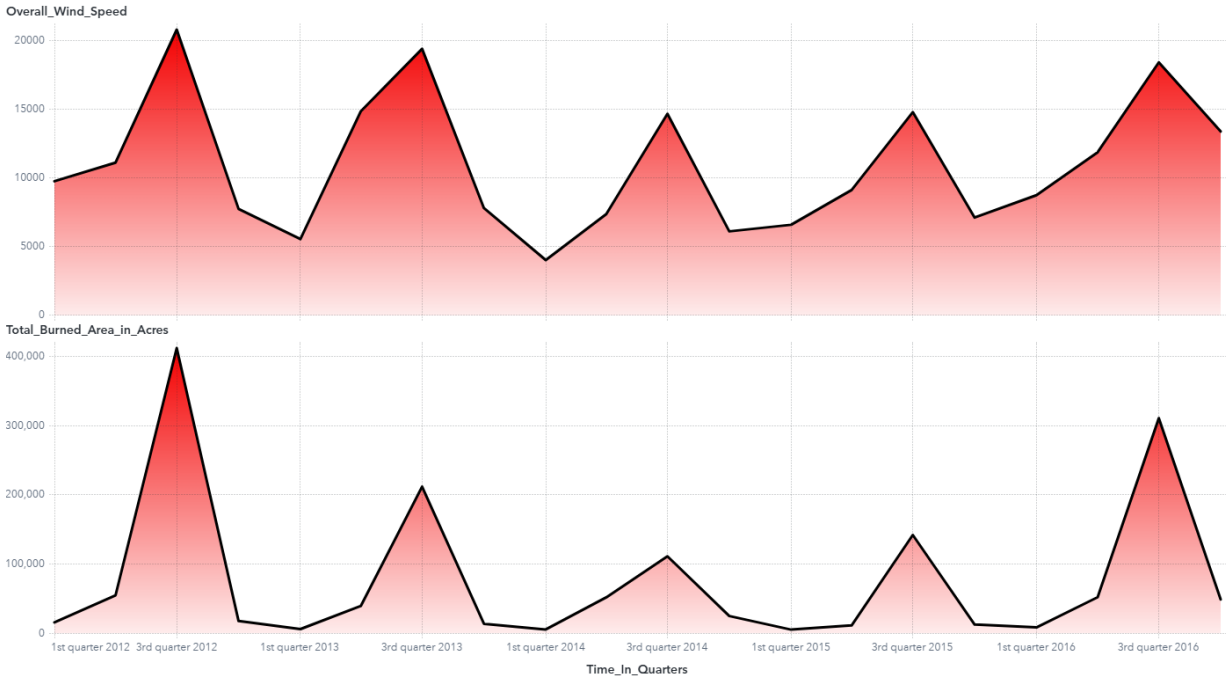
- **Personnel Deployment:** The highest deployment of personnel is in regions such as the Peloponnese and Attica, correlating with high wildfire incidences. Personnel deployment peaks in the third quarter, highlighting the importance of regional and seasonal planning in resource allocation.

Which factors influence the duration of a wildfire



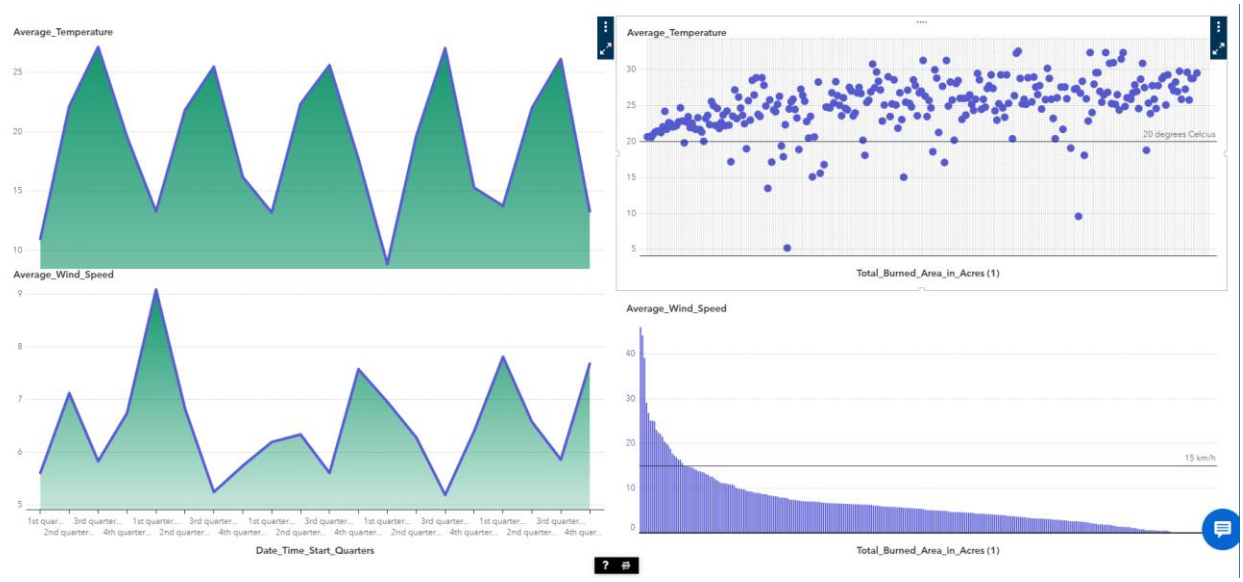
The visualization is a stacked bar chart that analyzes the impact of different factors on wildfire duration. The factors considered include rain, higher wind speed, overall wind speed, average temperature, and higher temperature. The chart clearly shows that all the variables don't contribute to longer wildfire durations, as indicated by the larger blue bars. That means that no reliable conclusions can be exported for the duration of the fire. The duration of a wildfire probably is explained by multiple factors combined together and not one alone. That's why in this visualization is visible that one by one the duration of thee fire is not determined by weather conditions.

Which factors influence the size of the area that was burnt



The visualization above uses two area charts to depict overall wind speed and total burned area in acres over several quarters from 2012 to 2016. The top chart shows overall wind speed, which exhibits significant peaks, especially noticeable in the third quarters of 2012, 2014, and 2016. The bottom chart correlates these peaks with the total burned area, showing that higher wind speeds often correspond to larger burned areas. This visualization emphasizes the influence of wind speed on the extent of wildfires, suggesting that periods of higher wind speeds can lead to more extensive wildfire damage.

When an alert should take place to inform the civil protection authorities about the high risk of a wildfire



The green area charts on the left side of the visualization **show the patterns of average temperature and average wind speed over different quarters**. Both charts reveal a cyclical pattern, with temperatures and wind speeds rising and falling in a predictable manner. The average temperature chart displays peaks in the middle of each period, suggesting a seasonal increase during certain times of the year, likely corresponding to summer months. Similarly, the average wind speed chart shows periodic spikes, indicating times of the year when wind speeds are significantly higher. **These cyclical trends suggest that both temperature and wind speed have regular patterns that could potentially be predicted and factored into wildfire management strategies.**

The blue scatter plots on the right side of the visualization provide insight into how average temperature and wind speed correlate with the total burned area in wildfires. The top scatter plot compares average temperature with total burned area, indicating a positive correlation where higher temperatures often lead to larger burned areas. **A reference line at 20 degrees Celsius** helps to highlight this relationship. The bottom scatter plot examines average wind speed against total burned area, showing that higher **wind speeds (more than 15km/h)** are also associated with larger burned areas. The distribution of data points in these scatter plots emphasizes that both higher temperatures and wind speeds contribute significantly to the extent of wildfires, suggesting these factors are critical in predicting and managing wildfire risks.

Suggestion to Hellenic Civil Protection:

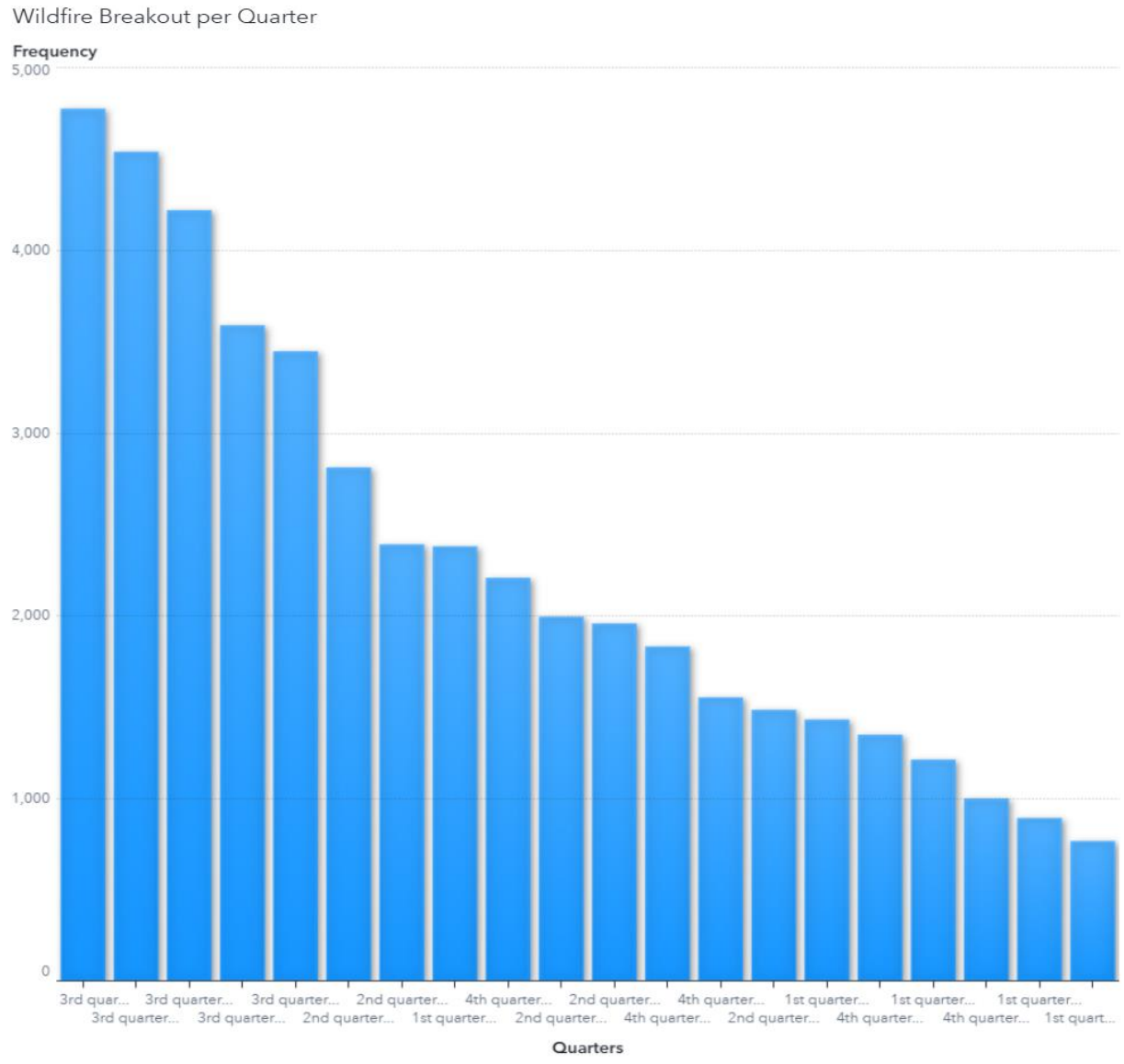
Civil protection authorities should alert about high wildfire risks based on thresholds of temperature and wind speed. The data suggest that when average temperatures exceed 20

degrees Celsius and wind speeds rise above 15 km/h, the risk of extensive wildfires increases significantly. These thresholds can serve as critical markers for triggering alerts, allowing for timely preparation and mobilization of firefighting resources to mitigate potential wildfire impacts. **Regular monitoring of these meteorological conditions is essential for proactive wildfire risk management**.

What area size was burnt by geographical area and by date

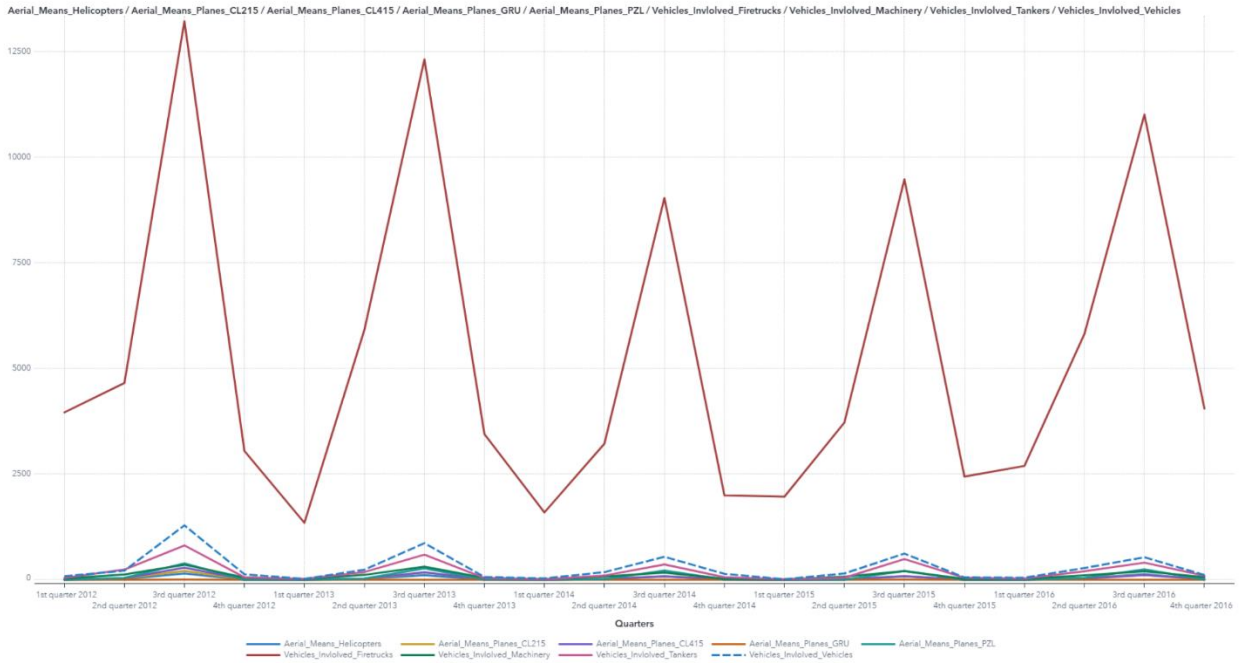
The heat map visualization above highlights the total burned areas across various regions in Greece over different quarters from 2012 to 2016. The intensity of the colors represents the extent of the burned areas, with darker red indicating larger burned areas. The data reveals that significant wildfire activity, leading to extensive burned areas, predominantly occurs during the second and third quarters of each year, particularly in 2012 and 2016. Regions such as Northern Greece and the Islands show higher wildfire incidences during these periods. This temporal and geographical pattern emphasizes the critical need for enhanced wildfire preparedness and response strategies during the summer months when the risk is highest. By focusing resources and monitoring efforts in these high-risk regions and periods, civil protection authorities can better mitigate the impact of wildfires.

Which periods throughout the year the majority of wildfires were broken out



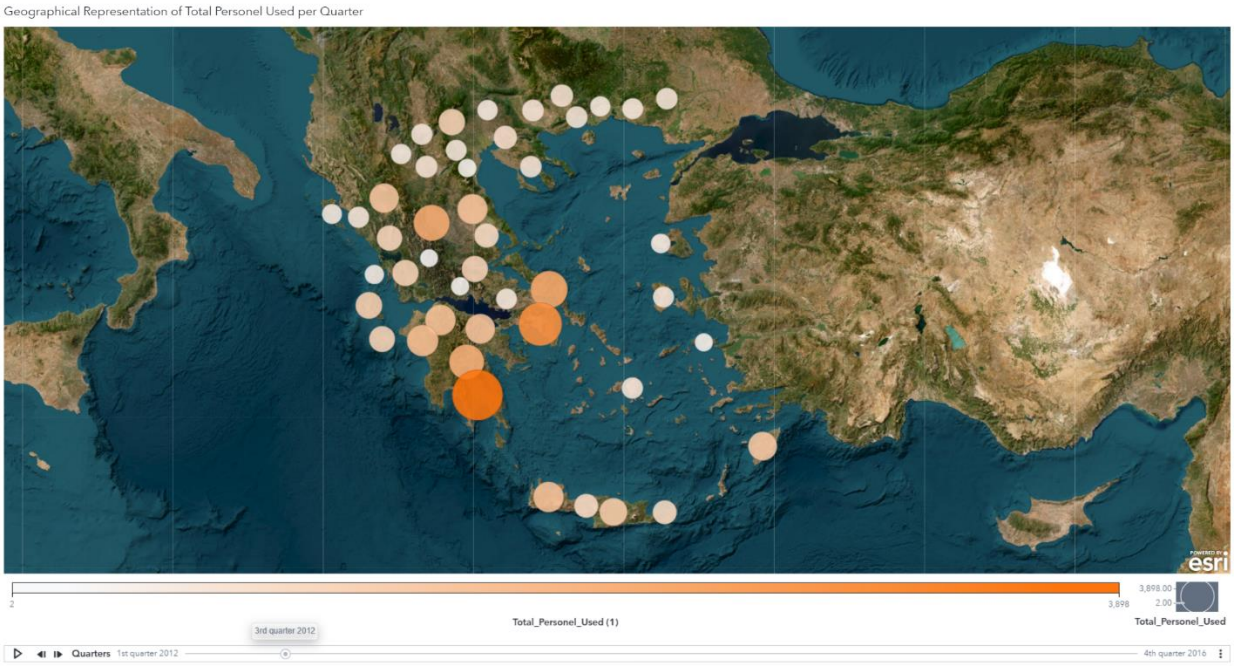
The bar chart visualization illustrates the frequency of wildfire breakouts per quarter from 2012 to 2016. The data shows a clear pattern of higher wildfire incidents during the third quarter of each year, with a noticeable peak, followed by the second quarter. This trend indicates that the summer months, particularly the third quarter (July to September), are the most prone to wildfire outbreaks. The frequency significantly decreases during the first and fourth quarters, corresponding to the cooler and wetter seasons. This seasonal trend emphasizes the need for heightened vigilance and preparedness during the summer months when the conditions are most conducive to wildfires. By focusing prevention and response efforts during these high-risk periods, civil protection authorities can better manage and reduce the impact of wildfires.

What was the utilization of means for stopping wildfires such as firetrucks, fire helicopters and fire planes



The line chart visualization illustrates the utilization of various firefighting resources over different quarters from 2012 to 2016. The resources tracked include aerial means such as helicopters and planes (CL215, CL415, GRU, PZL) and ground vehicles like firetrucks, machinery, tankers, and other vehicles. The data clearly shows that firetrucks are the most heavily utilized resource, with significant peaks during the third quarter of each year, corresponding to the peak wildfire season. Aerial resources are also used more frequently during these periods, albeit to a lesser extent compared to firetrucks. This trend indicates the critical role of firetrucks in wildfire response, supported by aerial means for more challenging fires. The consistent pattern of resource utilization underscores the importance of ensuring these resources are adequately maintained and available during high-risk periods to effectively combat wildfires.

How many people (e.g. firemen, volunteers, and soldiers) participated in efforts for stopping wildfires per period and per geographical area



The geographical representation map shows the total personnel deployed to combat wildfires across various regions in Greece from 2012 to 2016. The size of the circles indicates the number of personnel used, with larger circles representing higher personnel deployment. At the bottom a slidebar is deployed to provide us with the ability to select specific time frame. The map highlights that regions in Southern Greece, particularly the Peloponnese and Attica, had the highest deployment of personnel. This is consistent with the high incidence and severity of wildfires in these areas. Additionally, the data shows significant personnel deployment in the third quarter of each year, aligning with the peak wildfire season. This visualization underscores the critical role of regional and seasonal planning in resource allocation, ensuring that areas with higher wildfire risks receive adequate manpower for effective firefighting efforts.