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SDP/CND 223/255: Introduction to QGIS
Project Report

Suicide Bombing Attacks in Pakistan

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1 Introduction

1.1 Context and Motivation

In recent decades, Pakistan has been one of the countries most affected by the scourge of terrorism, particularly in the form of suicide bombings. This geographic information system (GIS) project was initiated to analyze the impact of suicide bombings across Pakistani provinces from 1970 to 2017, with a detailed focus on spatial and temporal patterns of these devastating events. The primary motivation behind creating this map-based analysis is to provide a visual and analytical tool to policymakers, security analysts, and academic researchers. By doing so, this work aims to contribute to understanding the dynamics of terror, enhance security measures, and support the development of targeted interventions to mitigate these attacks.

1.2 Overview of Suicide Bombings in Pakistan

Suicide bombings have escalated dramatically in Pakistan, especially following the US-led Operation Enduring Freedom in Afghanistan in 2001. Initially rare before the year 2000, such attacks have increased significantly, marking the last decade as one of the deadliest periods in the country's history. The dataset reveals a terrifying toll: **6,982** civilians have lost their lives and another **17,624** have been wounded in **475** attacks since 1995, with a sharp increase noted from 2006 onward. On average, every attack has directly impacted 48 individuals, either through loss of life or severe injuries.

1.2.1 Dynamics of the Attacks

Frequency and Intensity: The frequency of attacks has shown alarming trends; while there was a suicide bombing every sixth day on average from 2007 to 2012, this frequency increased to every fourth day by 2013, underscoring a significant escalation in attack planning and execution.

Geographical Distribution The heatmaps generated in this project illustrate how different provinces have been affected, highlighting regions that have been disproportionately impacted. Such spatial analysis is crucial for understanding regional vulnerabilities and response efficacy.

1.2.2 Underlying Causes and Targets

Political and Socio-Economic Factors: The rise in suicide bombings can be attributed to a complex interplay of geopolitical, socio-economic, and ideological factors. The regional instability spurred by international military actions, the presence of extremist ideologies, and the use of territory by various militant groups contribute to this complex scenario.

Targets The choice of targets has been both strategic and opportunistic, encompassing military installations, government buildings, public squares, and places of worship. This choice reflects the terrorists' objectives to undermine state authority, instill fear among civilians, and spread sectarian discord.

The creation of a comprehensive GIS mapping of suicide bombings from 1970 to 2017 illuminates not only the sheer scale of devastation but also the patterns that could guide future security frameworks in Pakistan. By integrating geographical data with historical contexts, this project serves as a significant step towards a deeper understanding of the factors driving such attacks and enhancing

the mechanisms for their prevention. Through this endeavor, we aim to contribute effectively to the ongoing discussions and efforts in counter-terrorism strategies within the region.

2 Data

The dataset used for this project was obtained from Kaggle, a platform for sharing datasets and machine learning resources. The dataset contains comprehensive information regarding suicide bombing attacks in Pakistan, spanning from 1995 to 2017. Each entry in the dataset includes the following attributes:

- Serial Number
- Date (Gregorian)
- Islamic Date
- Blast Day Type
- Holiday Type
- Time
- City
- Latitude (City Wise)
- Longitude (City Wise)
- Province

This dataset (in its CSV format) was cleaned to ensure data integrity and consistency. Missing or erroneous entries were addressed, and the dataset was prepared for analysis using QGIS software. The cleaned dataset serves as the foundation for generating spatial visualizations and conducting spatial analysis to explore the patterns and trends of suicide bombing attacks across the provinces of Pakistan.

Using filtering tools in Excel, we extracted the following datasets to be used for making our maps. Using Excel functions, the minimum number of fatalities and injuries were summed up for each province and extracted in separate CSV files. Moreover, we applied a keyword filter and obtained a CSV with only suicide bombings within Karachi to be used for our story map and a bombing location pinpoint map.

During the data cleaning process, special attention was given to ensuring consistency and accuracy in the naming of provinces and cities. The names of provinces and cities in the original dataset were modified to match the data obtained for the administrative shape files of Pakistan from Al Hasan Systems Private Limited. This was necessary to maintain uniformity and compatibility between the dataset and the administrative boundaries used for spatial analysis. Corrections and modifications were made meticulously to align with the official administrative divisions of Pakistan.

3 Methodology

3.1 Overview of Tools and Data

For our analysis, we utilized QGIS, an open-source Geographic Information System software, to develop detailed maps. Initially, we incorporated our dataset in CSV format along with provincial and national boundary shapefiles from Al Hasan Systems Limited to set the spatial context.

3.2 Data Integration and Mapping

We linked the information from the CSV file with the shapefiles by joining attributes based on province names. This linkage helped visualize various data points like the number of attacks or casualties on province-specific maps.

3.3 Data Processing for Thematic Maps

For creating thematic maps across different time ranges (2000-2017), we used the QGIS field calculator. Commands such as `count("City", group_by:= "ADM1_EN")` and `sum("Injured Mi", group_by:="ADM1_EN")` were executed to compile the total number of blasts, injuries, and fatalities in each province.

3.4 Data Processing for Story Map

For the story map illustrating suicide bomb attacks in Karachi over the years, we faced the challenge of obtaining precise coordinates for each incident, as our initial dataset lacked latitude and longitude coordinates. To address this, we manually determined the latitude and longitude coordinates based on known locations using Google Maps. Subsequently, we imported this updated CSV dataset into QGIS, ensuring to check the ‘point geometry’ option. To enrich the story map, we utilized the OpenStreetMap plugin and QGIS to Web plugin, leveraging the power of open-source geographic data to create an interactive and visually engaging narrative of suicide bombing incidents in Karachi over time.

3.5 Visualization Tactics

We further enhanced our analysis by constructing graduated heatmaps to illustrate the intensity and distribution of suicide attacks. Each map was customized with ranges and color gradients to highlight the variation in attack magnitudes clearly.

3.6 Map Layouts and Components

Each thematic map’s layout incorporated:

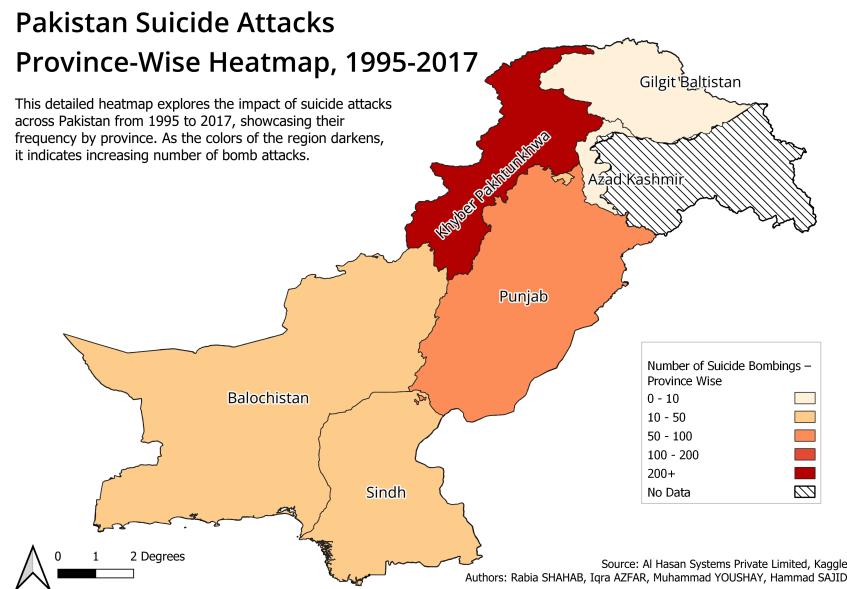
- **Appropriate Title:** Reflecting the map’s focus.
- **Description:** Brief summary of depicted data and its relevance.
- **North Arrow and Scale:** To provide geographical context and scale.
- **Source and Author Names:** Acknowledgment of data sources and creators.

- **Legend:** Detailed explanation of symbology for accessibility.

We ensured that these maps adhered to cartographic standards, making them both informative and visually engaging. This methodology provided a comprehensive spatial analysis of suicide bombings in Pakistan, enhancing understanding of geographic patterns associated with this security threat.

4 Result

4.1 Province-Wise Collective Suicide Attacks (1995-2017)



The map above shows the total number of suicide bombing attacks all across Pakistan province-wise, from the years 1995 till 2017. From this heatmap, we can observe the area with most attacks (KPK with over 200+ incidents) and the province with the least attacks (Gilgit Baltistan with 10 or less incidents). By dissecting the data into year ranges, assessing the cumulative impact through injuries and fatalities, and scrutinizing district-level patterns, our subsequent heatmaps and story maps aim to provide nuanced perspectives and actionable insights crucial for informed policymaking and strategic intervention.

4.2 Province-Wise Suicide Attacks (2000-2017)

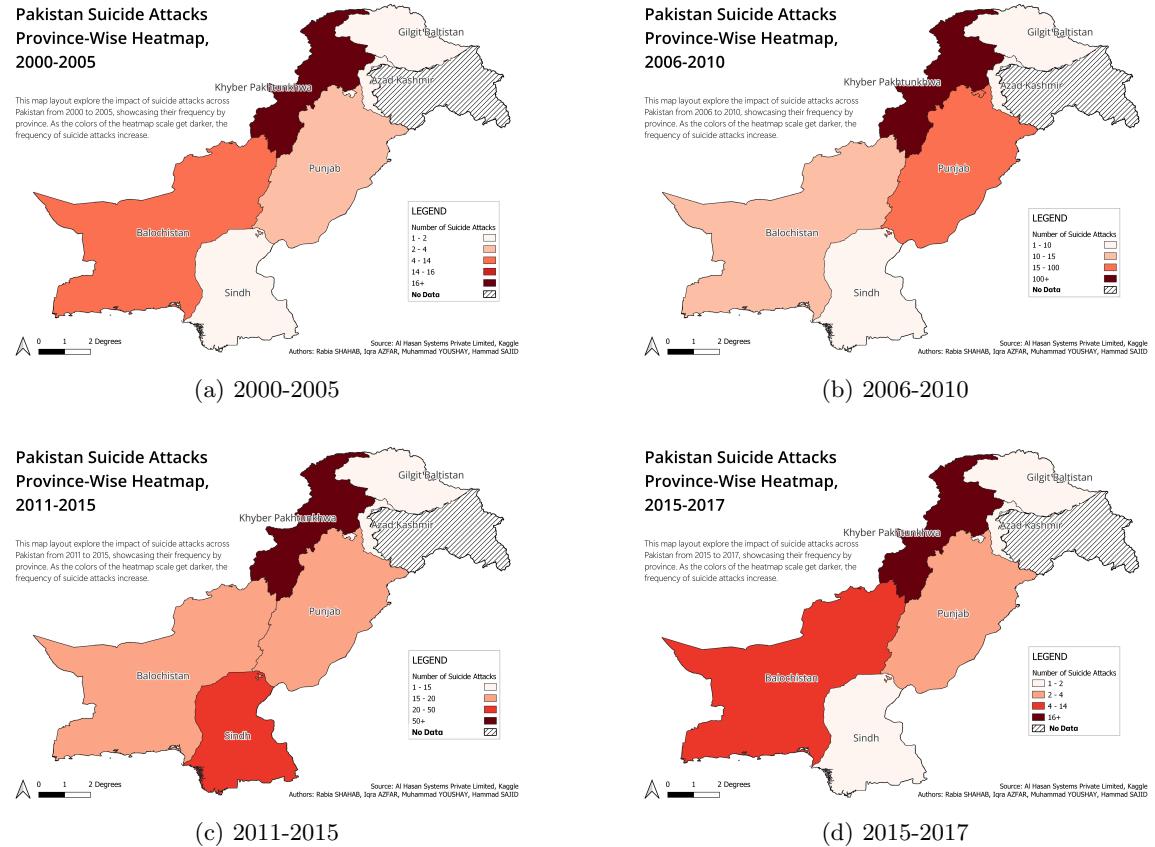


Figure 1: Province-Wise Suicide Attacks Over Year Intervals

4.2.1 Description

Below are the key takeaways observed from the maps stating the most and least bombed provinces:

- **Figure 1.a:**
 - KPK: Above 16
 - Sindh, Gilgit Baltistan: Between 1 and 2
- **Figure 1.c:**
 - KPK: Above 50
 - Gilgit Baltistan: Between 1 and 15
- **Figure 1.b:**
 - KPK: Above 100
 - Sindh, Gilgit Baltistan: Between 1 and 10
- **Figure 1.d:**
 - KPK: Above 16
 - Sindh, Gilgit Baltistan: Between 1 and 2

4.2.2 Analysis

From this, we can observe that the most attacks were always observed in KPK, and the least attacks were seen in Sindh and Gilgit Baltistan. A reason for this can be that Central and Western Khyber Pakhtunkhwa (KP), including Peshawar, face instability due to terrorism, sectarian strife, political violence, and high crime rates.

We observe a peak in suicide attacks between 2005 and 2010. This can be explained due to the War in the North-West Pakistan in 2004 between Pakistan and the Al-Qaeda terrorist settlers in those areas of the country. These districts are impacted by the security situation in Afghanistan, and this causes civil unrest within the province^{1, 2}.

4.3 Province-Wise Injuries and Fatalities (1995-2017)

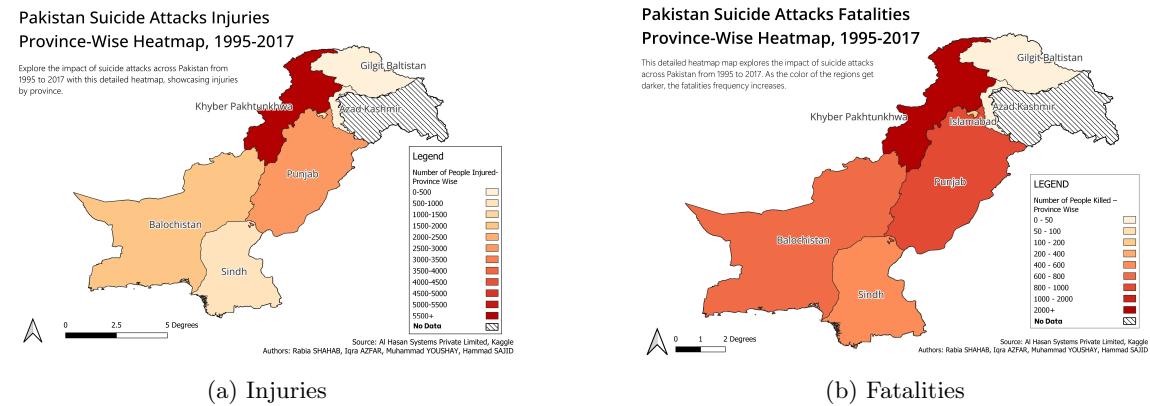


Figure 2: Heatmap for Injuries and Fatalities, 1995-2017

4.3.1 Description

Below are the key takeaways observed from the maps stating the most and least injuries and fatalities:

- **Figure 2.a: Injuries::**
 - KPK: Above 5500
 - Sindh, Gilgit Baltistan: Less than 500
- **Figure 2.b: Fatalities:**
 - KPK: Above 2050
 - Gilgit Baltistan: Less than 50

4.3.2 Analysis

As explained above, KPK tends to be the most targeted province for terrorist activities including suicide bombings. Most of these bombings take place in public spaces to inflict maximum casualties such as a mosque. In these attacks, the security forces are the primary targets, with civilians constituting the second-largest victim category³.

4.4 Suicide Bombs City Wise

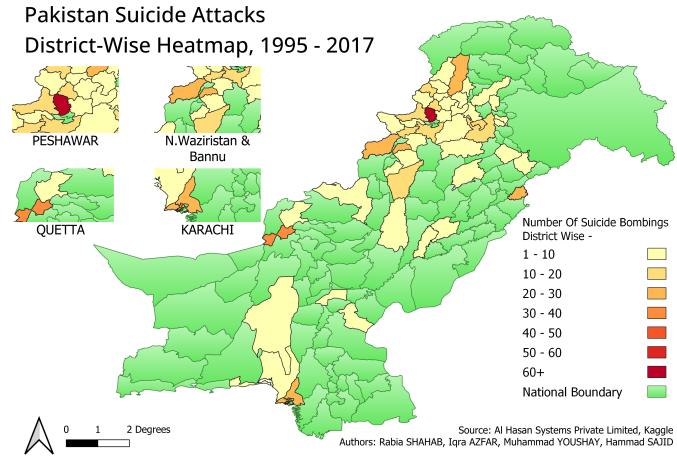


Figure 3: City Wise Suicide Attacks.

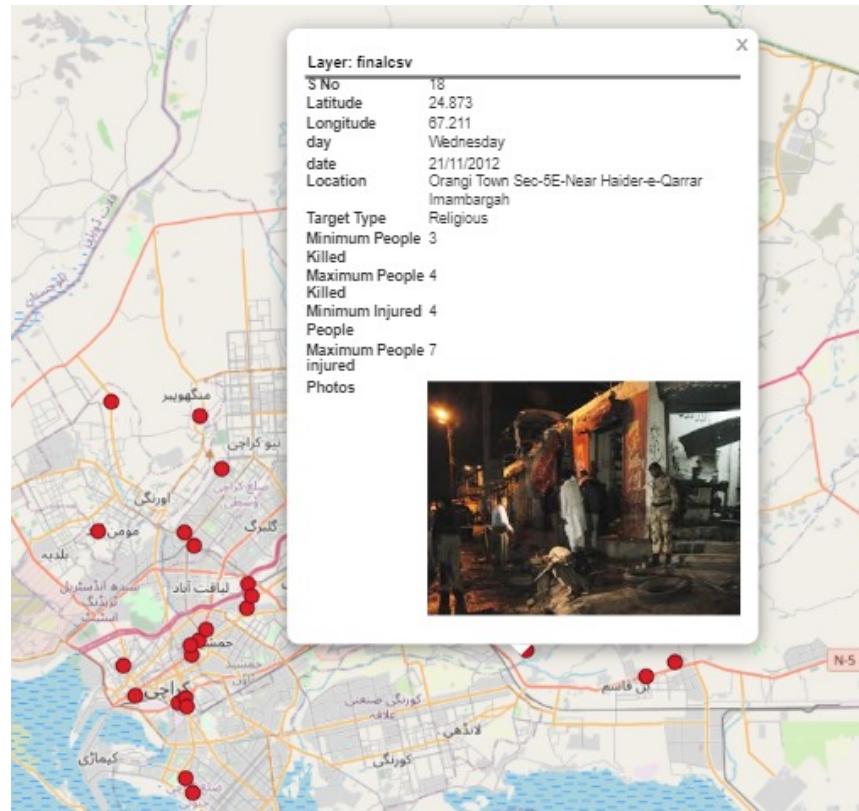
4.4.1 Description and Analysis

Figure 3 shows the districts of Pakistan affected by suicide bombings over the years. The major affected areas happen to be Peshawar, N. Waziristan, Quetta, and Karachi. The most suicide bombings from these 4 districts are observed in Peshawar district, ranging to over 60 suicide bomb attacks.

4.5 Story Map of Suicide Attacks Across Karachi



(a) Suicide Bombing Incidents Across Karachi



(b) Story Map Showing details of the suicide bom at Haider E Qarrar Imambar-gah in Karachi

Figure 4: Suicide Attacks Story Map, Karachi

4.5.1 Description and Analysis

The story map above shows the suicide attack incidents that have taken place all across the city of Karachi. Hovering above a pinpoint would display the information about the suicide attack, including the latitude and longitude coordinates, the name of the place, the maximum and minimum number of people injured and killed, the photo of the place bombed, etc.

5 Conclusion

5.1 Future Research

The current study offers vital insights into the spatial and temporal dynamics of suicide bombings across Pakistan. However, several areas require further exploration to enhance our understanding and develop more robust counter-terrorism strategies:

- **Specific Target Communities:** Future studies should investigate the specific communities targeted by these attacks. Understanding whether certain ethnic, religious, or social groups are disproportionately affected could provide insights into terrorist targeting behavior and help devise community-specific safety protocols.
- **Trends in Attack Frequency:** An in-depth analysis of the factors contributing to the rise and subsequent decline in attack frequency could provide valuable lessons in terrorism dynamics and preventive measures. This includes examining changes in local and international politics, counter-terrorism effectiveness, and socio-economic factors.
- **Long-Term Impacts:** Additional research could assess the long-term psychological and socio-economic impacts of these bombings on communities, aiding in the development of sustained rehabilitation and support programs.

5.2 Challenges Faced

The project encountered several challenges that shaped the research process:

- **Data Cleaning:** One of the significant challenges was cleaning and standardizing the large dataset obtained. Ensuring data integrity involved correcting inconsistencies, filling missing values, and standardizing entries, which was time-consuming but critical for accurate spatial analysis.
- **Software Stability:** As QGIS is a free software, it presented challenges with stability, frequently crashing during intensive processing tasks. This necessitated regular saving and cautious handling of large datasets to prevent data loss and disruptions in the workflow.

5.3 Lessons Learned

The completion of this project provided several valuable lessons:

- **Importance of Data Integrity:** The project reinforced the importance of thorough data cleaning and preparation. Accurate data is crucial for reliable analysis and, by extension, for developing effective policies and interventions.

- **Interdisciplinary Approaches:** Combining GIS with terrorism studies showed the power of interdisciplinary approaches in understanding complex issues like terrorism. This approach allowed for a more nuanced understanding of the geographical distribution and patterns of attacks.

Through this project, we have laid a foundation for further research and contributed to the collective understanding of terrorist activities in Pakistan. Continuing to build on this work will be crucial for policymakers, researchers, and security professionals aiming to mitigate the impacts of terrorism in Pakistan.

6 References

¹ Source: Pakistan travel advice

² Source: Insurgency in Khyber Pakhtunkhwa

² Source: Pakistan witnessed highest number of suicide attacks

Dataset Source: Pakistan Suicide Bombing Attacks