A case study to collect the covid-19 data in India using ESRI collector app

Final Project

Submitted by

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December 13th 2020

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Abstract

ESRI mobile Collector application helps to gather the geographical filed data using a mobile device which can later be exported into ArcMap for further analysis. This application allows to gather data from various sources that are working collaboratively. The covid-19 database is collected using the ESRI mobile collector app. This application allows to input the data regarding covid-19 which includes if a person has ever tested positive, recovery state, present health condition, if recovered willing to donate plasma, of if in serious health condition if there is any need of plasma, which is further exported to ArcMap for future study.

Rationale

As we all know the Collector app is powerful tool to input information from various locations by ‘n’ number of people. It is also an easy way of gathering information and later can be plotted on ArcMap for any further analysis. The data can be collected from any location around the world and can be plotted on ArcMap. This app is used to collect the data from India. At this present situation during the pandemic many villages have minimum or no health facilities in India. People who are in severe health conditions and those who need plasma donors were unable to reach and find the willing donors in many cities. Also, people who has recovered from COVID are willing to donate the plasma are the need of the hour. This app is developed to fulfill the purpose of finding the plasma donors. The application will help to bring together the people who are willing to donate the plasma and who are in an emergency in the need of plasma. This project will help to gather above mentioned information in India and will plot these locations on ArcMap to obtain the cities where there are people willing to donate the plasma donors.

Background

Using the mobile app to collect the health conditions regarding a pandemic has gained popularity since many years. Geographic Information System technology helps to understand, respond to and ultimately improve human health. Mainly top eliminate the disease for the infectious disease risks it is important to identify the target foci of the transmission areas to understand the factors which contribute to the disease persistence (Stanton 2017). Research was also done in regard to the elimination of certain disease by finding the root cause using geospatial tools (Clements et al., 2013). Many studies have used the Global Positioning System (GPS) technology to develop maps of disease infection (Rebollo et al., 2015), identifying the hotspots of transmission (Abedi et al., 2016), and target control measures (Lozano et al., 2008). Mobile data collection apps allow one to collect and process data out in field, in office or any other location which is a powerful ability to reach any community where they are. During the pandemic esri has set up many programs in many countries to map the disease spread, number of cases, number of recoveries throughout the world. Convalescent plasma therapy is an experimental treatment that some doctors are using for people with severe coronavirus disease 2019 (COVID-19). This information is gathered from the individuals who are willing to donate plasma. Along with this as an added resource to the existing information my app will provide the details of individuals who recovered from covid-19 and are willing to donate plasma and also individuals who are willing to donate in future. This information is a need of the hour particularly in developing countries like India with enormous population.

Objectives

The main objective of the research is to gather the information from individuals at different locations in India in regard to the covid-19. There are many maps and lot of information regarding

the number of cases and number of recoveries in different districts and different states in India. Minimum or no information was gathered in regard to the donation of the plasma. To fill this gap my app will gather the real time information from the individuals which provide details on some of the questions which include but not limited to : Have you tested covid-19 positive? Have you recovered from covid-19? How many days it has been from the recovery? What is your blood group? Are you eligible to donate plasma? Are you willing to donate plasma in future? All these questions are answered through the app and are also considered as useful information.

The collected data from the collector map is exported to ArcMap and maps are created to highlight the locations where the individuals are eligible for plasma donation and also highlight the people that are willing to donate in future.

Social Benefits

The focus of the research project is to create a methodology which provides the important information during the pandemics. This allow to use the information for the people who need plasma donors and also give the information who are willing to donate plasma. The app allows to input data from different locations even rural areas in India as the only thing required to input the data is internet. So, the collecting information and using the available information will be an easy access. This way the app will help to gather information from many parts of the locations. This will also, help to create a huge database with minimal effort. The project will help to track the information to create a database which is useful during this pandemic. Also, in many locations due to lack of these information during the emergency cases many lives were lost. If there is a real emergence this real time information can be used to contact the individuals who are willing to donate the plasma which will save a life.

Methods

Study area for the project is few locations in India. The study is considered as a case study to obtain real time information through a mobile app from different parts of India. As the main purpose of the app is to gather information from different sources and from different locations a case study will be run to gather the real time information from different individuals regarding the plasma donations and plasma requirements. The data will be obtained from my friends in India who are at different locations. I was expecting to obtain most of the data from South India but will also have a few data will be collected from North India.

Firstly a mobile collector app is created in order to identify the donors. Several domains are created based on several number of questions. Each domain is categorized as binary answers, coded entries, text entries, integers etc. Some of the questions which included are: Location (Rural/Urban) Have you tested covid-19 positive? (Yes/No) Have you recovered from covid-19? (Yes/No), What is your blood group? (Text) Are you eligible to donate plasma? (Yes/No) Are you willing to donate plasma in future? (Yes/No). Domains are created as shown in Figure 1.

After the domains are saved a new feature class is created under the Mycollector_coviddata.gdb geodatabase with name “covidinfo” and feature type as point. In the new feature class tab geographic co-ordinates is set to WGS 1984 Web Mercator (auxiliary sphere). Later the field names are entered and linked to the previously created domains as shown in Figure 2.

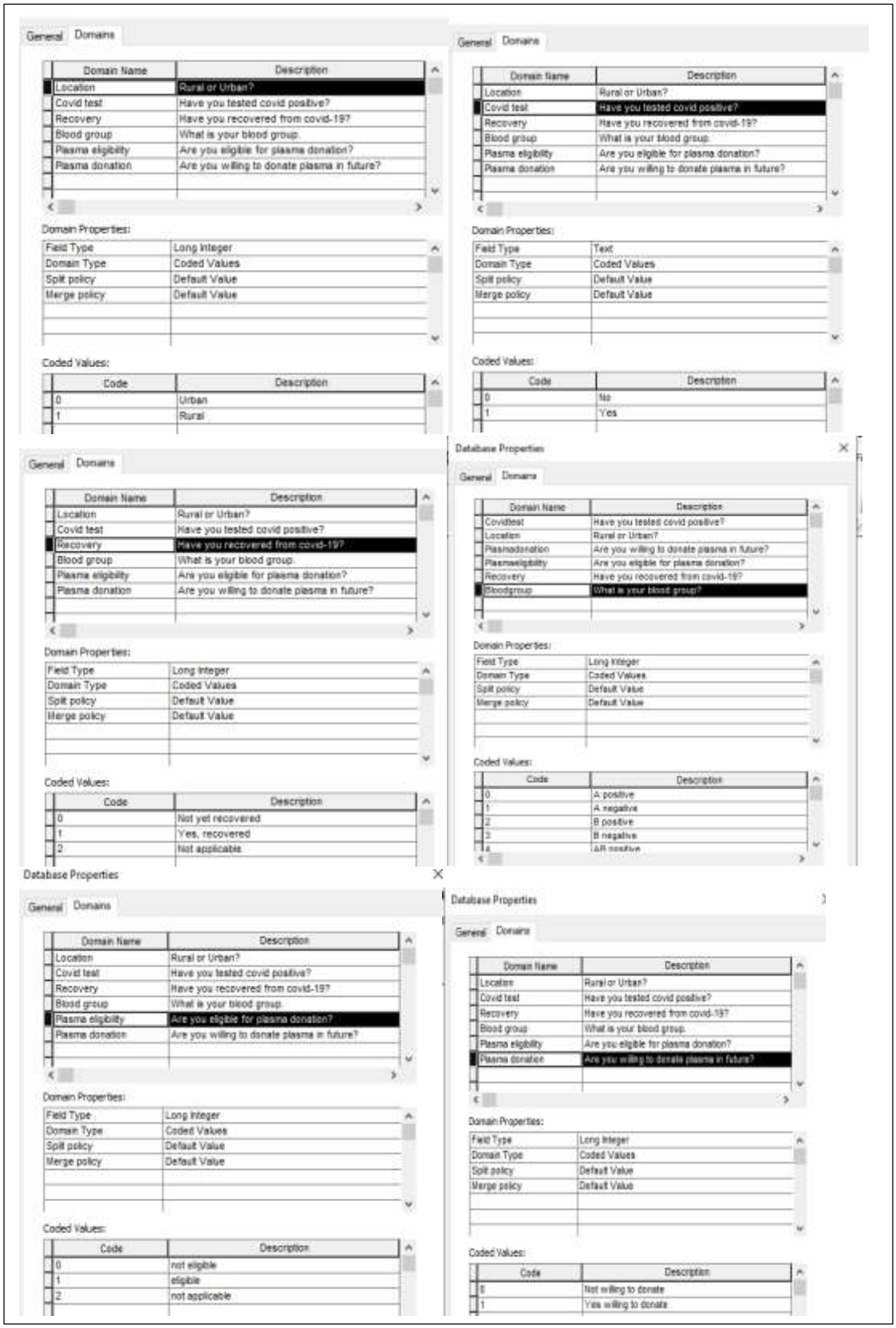

Figure 1: Different domains created in Arc Map.

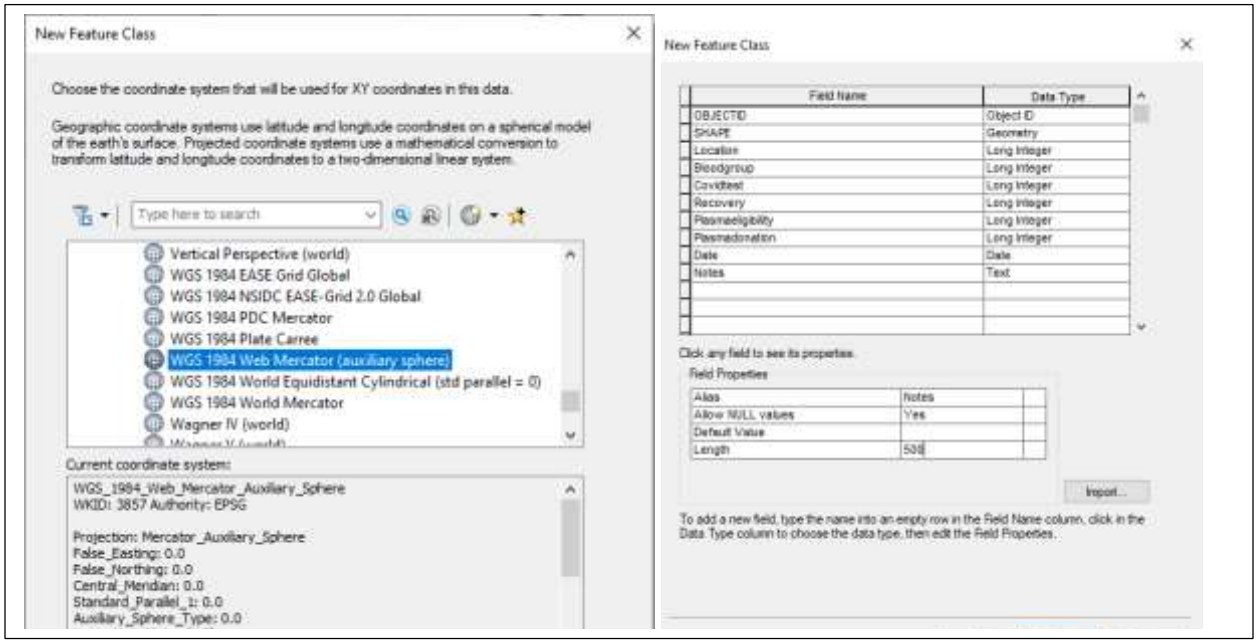

Figure2: Showing the projected coordinate system set for the feature class (left) and linking the field name with domains (right).

Once the feature class is created it automatically shown in the Arcmap table if contents. Also, to allow the attahcements I selected Create attahcemnts and to enable edits "enable editor tracking" was selected. . A symbology was set under categories, unique values for field "location" to differentiate the rural and urban locations as shown in Figure 3.

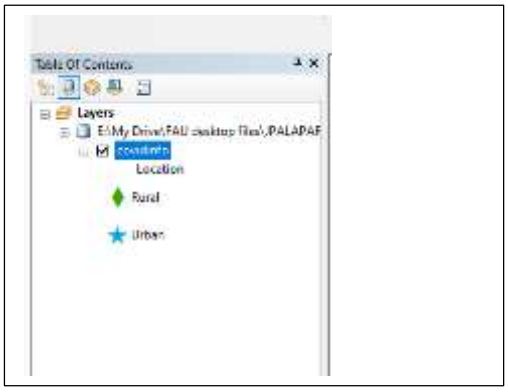

Figure 3: Symbology for filed "location" differentiating the rural and urban points.

The app details were shared with my friends and family in India who populated the app with the above mentioned domains. Total 118 entries from India were obtained using the collector app. The data obtained in the app is exported to Arc Map for further analysis (Figure 4).

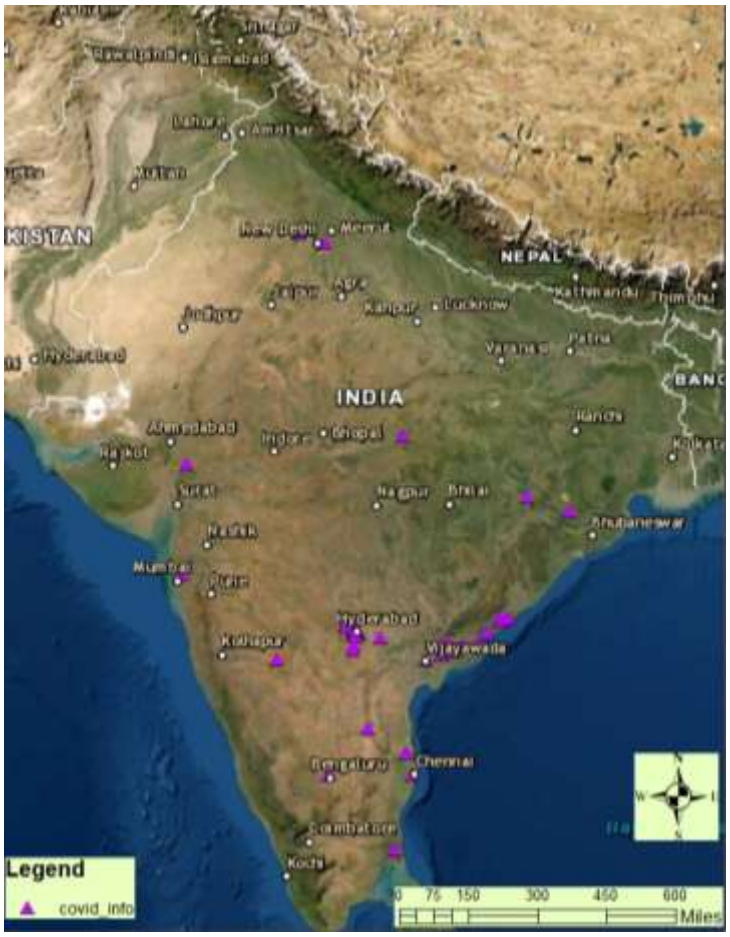

Figure 4: Covid data collected from India using collector app, map showing 118 points.

The data obtained was analyzed by running the hotspot analysis to find out the statistical significant hotspot and cold spots for the available data points. using the Getis -Ord Gi*statistic tool. This tool calculates the Getis-Ord Gi* statistic for each feature in a dataset. The resultant z-scores and p-values indicates where features with either high or low values cluster spatially. Therefore, this tool can be used to identify statistically significant spatial clusters of high values (hot spots) and low values (cold spots). The tool creates a new Output Feature Class with a z-score, p-value, and confidence level bin (GiZscores) using the model. The model was built by creating a new tool in Arc Map tool box. The model was run using some tools like integrate, collect events, and HotSpot Analysis (Getis-Ord Gi*) as shown in figure 5.

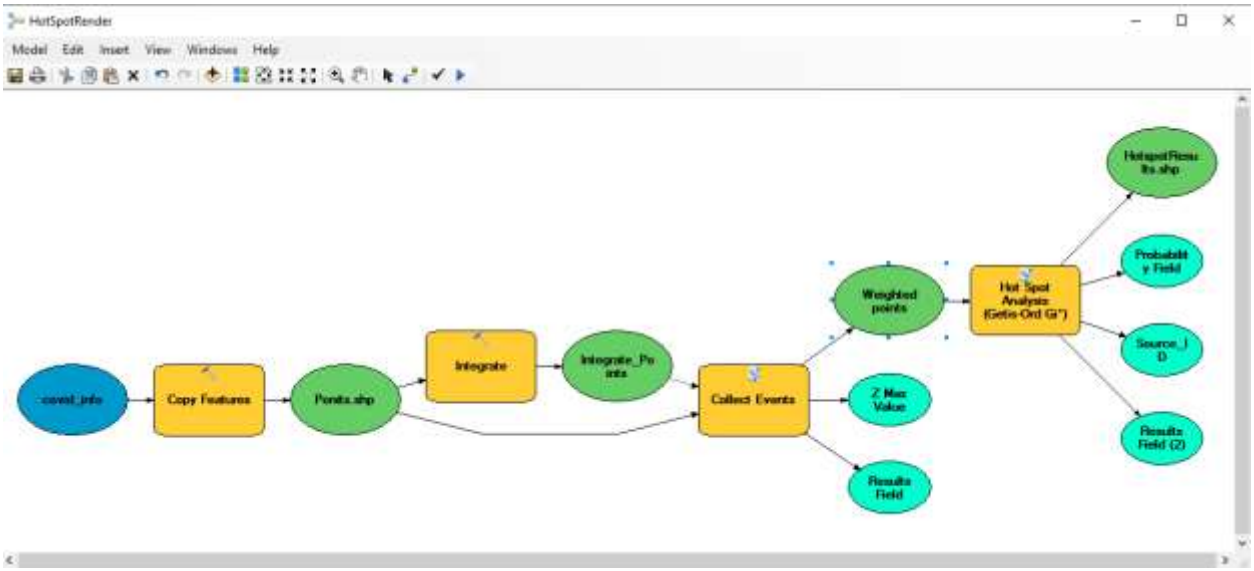

Figure 5: Model to build to run the hotspot analysis.

Later, the data was separated based on the people who are willing to donate plasma in future and who are actually eligible and also willing to donate the plasma. Total 53 individuals are willing to donate the plasma in future and 6 individuals are willing to donate and also eligible to donate the plasma. The buffer of 50 Km around these points is created separately using the buffer tool. Later the hospital shape file of Andhra Pradesh and Telangana states was added and integrated only hospitals that were within the buffer zone of the donors using the intersect tool.

RESULTS

The maps obtained from the hotspot analysis are shown in Figure 6. The analysis showing the GiZscores from high negative to high positive values. High positive GiZscores indicating that the Southern parts of India has high statistically significant clustering of covid data information compared to the other areas.

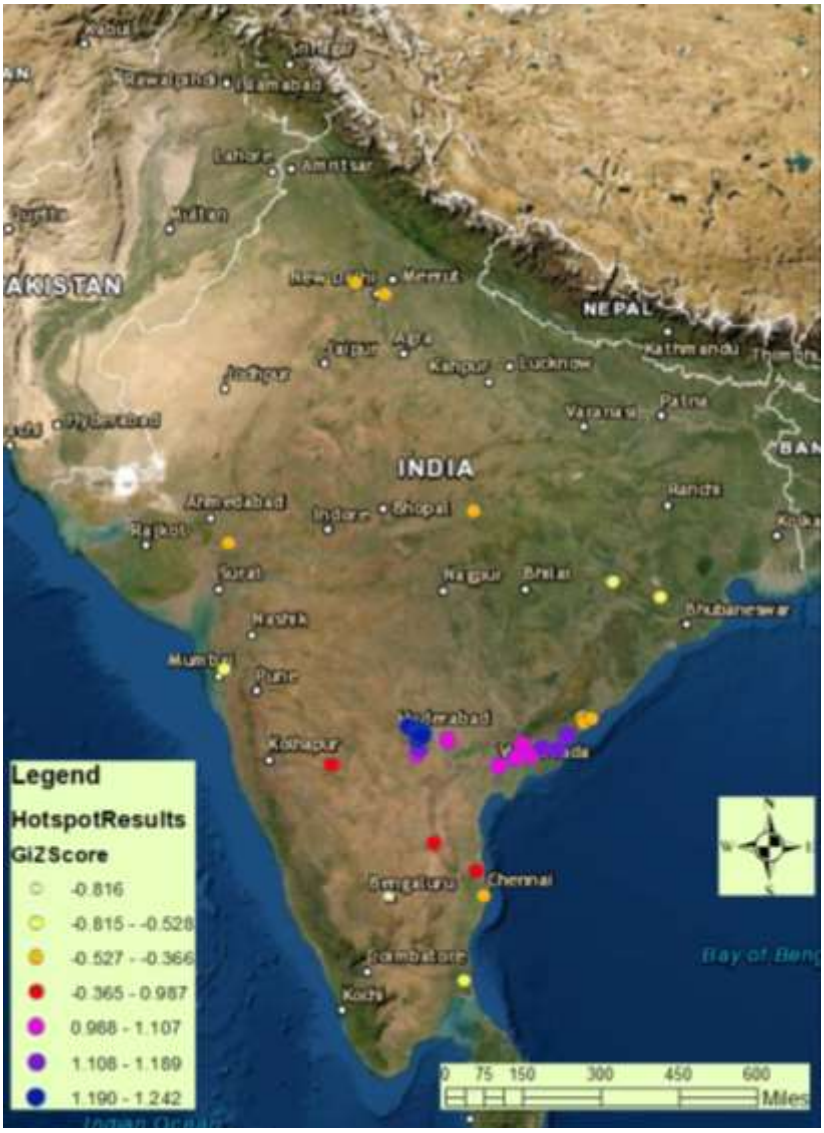

Figure 6: Hotspot analysis results showing GiZscores for the covid data.

The individuals who are willing to donate in future and who are eligible to donate and who are willing to donate are selected using the selection by attribute field. The resulted map is shown in Figure 7 showing the states of Andhra Pradesh, Telangana, Tamil Nadu, Karnataka in the south and Maharashtra, Madhya Pradesh, and New Delhi in central and North India have people who are willing to donate plasma in future total of 53 individuals. But the individuals who are willing to donate and are eligible for donation are in Telangana, Andhra Pradesh and Odisha with total of 6 individuals.

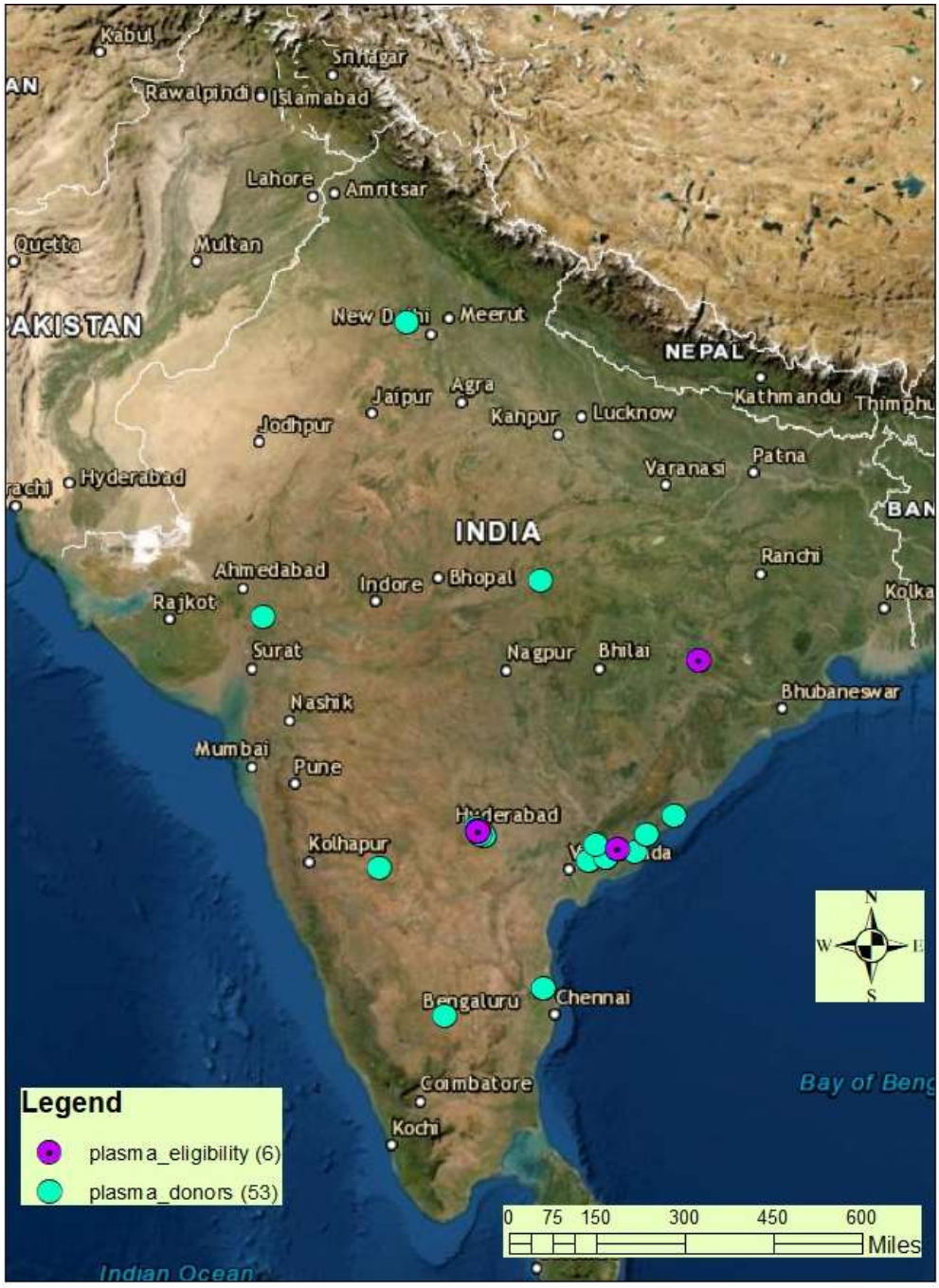

Figure 7: Plasma donors and Plasma eligible individuals in India.

The buffer was created around these point data. The buffer around 50 Km of these points was created using the buffer tool as shown the Figure 8.

Figure 8: Buffer around 50 Km radius around the plasma donors' locations.

The hospitals close and are within the 50 Km near the donors in Andhra Pradesh and Telangana was obtained using intersect tool by interesting the buffer around the plasma donor point data and the hospitals data.

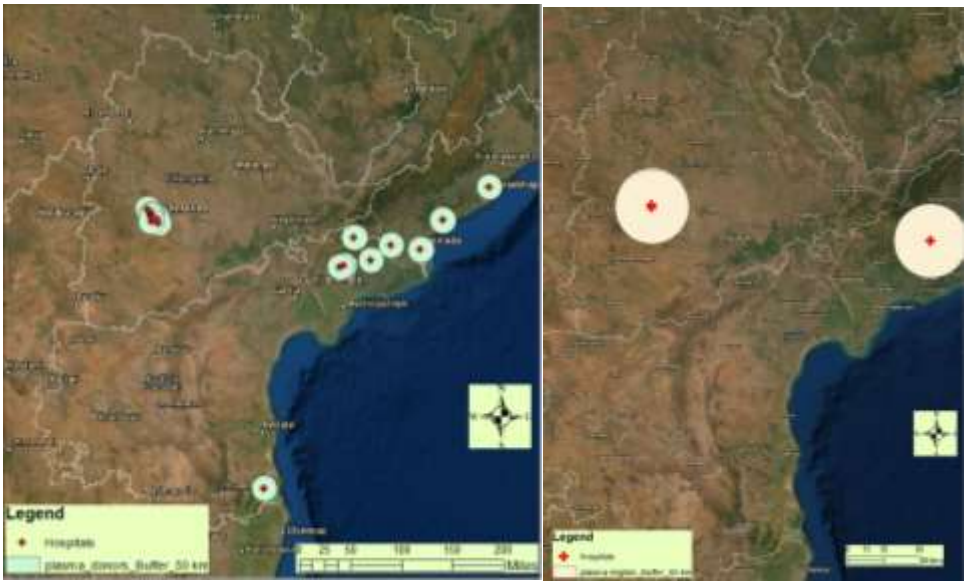

Figure 9: Hospitals around 50 Km radius of the plasma donors (left) and eligible donors (right) .

CONCLUSIONS AND DISCUSSIONS

The project has used the collector app to obtain the covid information regard to the available plasma donors in Indian sub-continent. The data was filled using information obtained from the collector app. The hot spot analysis shows the highest amount of data available in the South East states of the country. The amount of the donors available in the country are mostly in the south states like Andhra Pradesh, Telangana, Tamil Nadu, and Karnataka and remaining sates in the North and central parts of the country which include Maharashtra, Madhya Pradesh, and New Delhi that have people who are willing to donate plasma in future total of 53 individuals. But the individuals who are willing to donate and are eligible for donation are in Telangana, Andhra Pradesh and Odisha with total of 6 individuals. 32 hospitals within the 50 Km radius of the donors were found using the intersect tool in both Andhra Pradesh and Telangana. 6hospitals were found within the plasma eligible donors.

The case study shows the possibility of obtaining the information in the most rural villages in the India sub-continent. A few analyses are hot spot analysis done through the country would be more informative if the data is spread all over the study are and also have a data for a period of time. The other analysis including creating the buffer of 50 Km around the locations with individuals who are willing to donate the plasma is useful information in the present situation. In countries like India it is hard to get information in the peak time with the limited resources this data is helpful to provide the important information about the individuals who are willing to donate the plasma. The project also focused on the hospitals within the 50 Km radius that can get this information of this data. The app could be more informative if created other domains like who need plasma, recovery information in-depth as the recovery plays a major role in the eligibility of plasma. Also, the research on the plasma being donated for the severe covid patients need more light on it in upcoming days.

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