IIT BOMBAY FOSSEE GEOSPATIAL MAPATHON

"THE QUANTUM MAPATHON: MAPPING TODAY, INNOVATING TOMORROW"

ABOUT US

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Aiming to revolutionize industries through our forward-thinking solutions

ABSTRACT

- CANCER REMAINS ONE OF THE MOST PRESSING PUBLIC HEALTH CHALLENGES IN INDIA, ESPECIALLY IN DENSE URBAN CENTERS LIKE CHENNAI. WHILE RESEARCH AND TREATMENT CONTINUE TO ADVANCE, EQUITABLE ACCESS TO SPECIALIZED CANCER CARE IS STILL LIMITED FOR MANY POPULATIONS, PARTICULARLY THOSE FROM PERIPHERAL AND RURAL REGIONS. THIS PROJECT AIMS TO BRIDGE THAT ACCESS GAP THROUGH GEOSPATIAL MAPPING OF CHENNAI'S CANCER RESEARCH INFRASTRUCTURE.
- USING OPEN-SOURCE GIS TOOLS SUCH AS QGIS AND AUTHORITATIVE DATASETS FROM ISRO'S BHUVAN PORTAL, WE SPATIALLY MAPPED EIGHT MAJOR CANCER CENTERS ACROSS CHENNAI. BUFFER ZONE ANALYSIS, ROAD NETWORK ACCESSIBILITY, AND POPULATION OVERLAYS WERE PERFORMED TO IDENTIFY UNDERSERVED ZONES AND OPTIMIZE HEALTHCARE PLANNING. THROUGH HEATMAPS AND TRAVEL-TIME SIMULATIONS, THE PROJECT REVEALS CRUCIAL SPATIAL DISPARITIES IN CANCER CARE DELIVERY.
- BEYOND CONVENTIONAL MAPPING, THIS PROJECT EXPLORES THE FUTURE INTEGRATION OF QUANTUM COMPUTING TO ENHANCE CANCER RESEARCH. BY COMBINING GEOSPATIAL INTELLIGENCE WITH EMERGING TECHNOLOGIES, THE STUDY LAYS A FOUNDATION FOR SMARTER, FASTER, AND MORE PERSONALIZED PUBLIC HEALTH INTERVENTIONS.
- OUR FINAL OUTPUTS SUPPORT INFORMED DECISION-MAKING, PATIENT NAVIGATION, AND DATA-DRIVEN POLICY FOR ONCOLOGY INFRASTRUCTURE — TRANSFORMING MAPS INTO ACTIONABLE HEALTHCARE TOOLS.

📖 INTRODUCTION

- CANCER IS A SERIOUS HEALTH PROBLEM IN INDIA, AND CITIES LIKE CHENNAI HAVE MANY PEOPLE WHO NEED REGULAR AND ADVANCED TREATMENT. WHILE SOME HOSPITALS OFFER GOOD CARE, NOT EVERYONE CAN REACH THEM EASILY — ESPECIALLY PEOPLE LIVING FAR FROM THE CITY CENTER.
- ONE BIG ISSUE IS THAT WE DON'T OFTEN LOOK AT *WHERE* THESE HOSPITALS ARE AND *HOW EASY IT IS TO GET TO THEM*. THIS IS WHERE **GEOSPATIAL MAPPING** (GIS) BECOMES USEFUL. BY USING MAPS AND LOCATION DATA, WE CAN SEE WHICH AREAS ARE WELL-COVERED BY CANCER HOSPITALS AND WHICH AREAS NEED MORE SUPPORT.
- IN THIS PROJECT, WE USED GIS TOOLS TO MAP CANCER HOSPITALS IN CHENNAI AND CHECK HOW ACCESSIBLE THEY ARE TO THE PUBLIC. WE LOOKED AT ROADS, DISTANCES, AND POPULATION TO FIND OUT WHICH PLACES HAVE GOOD ACCESS AND WHICH DO NOT.
- WE ALSO LINKED THIS IDEA TO THE **FUTURE OF CANCER RESEARCH USING QUANTUM COMPUTING**. WHILE MAPPING HELPS US UNDERSTAND TODAY'S PROBLEMS, QUANTUM COMPUTING CAN HELP SOLVE COMPLEX MEDICAL QUESTIONS FASTER IN THE FUTURE — LIKE HOW CANCER SPREADS OR WHICH TREATMENTS WORK BEST.
- OUR PROJECT BRINGS TOGETHER MAPPING AND FUTURE TECHNOLOGY TO HELP PLAN BETTER HEALTHCARE FOR EVERYONE.

ABOUT THE MAP

- THIS PROJECT FOCUSES ON CREATING A **GEOSPATIAL MAP** OF MAJOR CANCER HOSPITALS AND RESEARCH CENTERS IN **CHENNAI, TAMIL NADU**. THE GOAL IS TO SHOW THEIR LOCATIONS CLEARLY AND UNDERSTAND HOW EASILY PEOPLE FROM DIFFERENT PARTS OF THE CITY CAN REACH THEM.
- WE SELECTED **EIGHT MAJOR CANCER HOSPITALS**, INCLUDING BOTH PUBLIC AND PRIVATE CENTERS. THESE WERE GEOCODED USING GOOGLE MAPS AND PLACED ACCURATELY ON THE MAP. THE HOSPITALS INCLUDE:
- CANCER INSTITUTE (WIA), ADYAR
- GOVERNMENT ROYAPETTAH HOSPITAL – CANCER WING
- DR. RAI MEMORIAL MEDICAL CENTRE, ALWARPET
- CANCER RESEARCH AND RELIEF TRUST, KILPAUK
- APOLLO CANCER CENTRE, TEYNAMPET
- MIOT INTERNATIONAL HOSPITAL, MANAPAKKAM
- SRI RAMACHANDRA MEDICAL CENTRE, PORUR
- FORTIS MALAR HOSPITAL, ADYAR

THIS MAP IS NOT JUST A LIST OF HOSPITAL LOCATIONS. IT IS DESIGNED TO HELP ANSWER REAL .

QUESTIONS LIKE:

- **WHICH AREAS HAVE THE MOST CANCER CENTERS?**
- **WHICH PARTS OF THE CITY ARE FAR AWAY FROM TREATMENT?**
- **WHERE SHOULD NEW HOSPITALS BE BUILT?**

🧠 PAGE 5: VISION & INNOVATION — THE QUANTUM APPROACH

- WHILE GIS HELPS US UNDERSTAND THE CURRENT SITUATION OF CANCER CARE IN CHENNAI, WE ALSO LOOKED AT THE **FUTURE OF MEDICAL RESEARCH** — ESPECIALLY THE ROLE OF **QUANTUM COMPUTING** IN SOLVING COMPLEX HEALTH PROBLEMS.
- QUANTUM COMPUTING IS A POWERFUL NEW TECHNOLOGY THAT CAN PROCESS LARGE AND COMPLEX DATASETS MUCH FASTER THAN CLASSICAL COMPUTERS. IN THE CONTEXT OF CANCER, IT CAN BE USED FOR:
- ANALYZING HUGE AMOUNTS OF GENETIC DATA,
- SIMULATING HOW CANCER CELLS BEHAVE,
- FINDING THE BEST DRUG COMBINATIONS FOR TREATMENT, AND
- PREDICTING HOW CANCER MAY SPREAD IN DIFFERENT ENVIRONMENTS.

SOME LEADING RESEARCH CENTERS ALREADY EXPLORING THIS INCLUDE:

- UNIVERSITY OF TORONTO, CANADA
- HARVARD UNIVERSITY, USA
- HARTREE CENTRE, UK
- MEDICINES DISCOVERY CATAPULT, ENGLAND

OUR PROJECT SETS THE FOUNDATION FOR THIS FUTURE BY CREATING A **LOCATION-BASED DATASET** THAT CAN ONE DAY BE CONNECTED WITH QUANTUM-POWERED HEALTH ANALYTICS — MAKING CANCER CARE **FASTER, SMARTER, AND MORE EFFECTIVE**.

GIS METHODOLOGY

- FOR THIS PROJECT, WE USED **QGIS**, AN OPEN-SOURCE MAPPING SOFTWARE, TO LOCATE AND MARK MAJOR CANCER HOSPITALS IN **CHENNAI**. THE AIM WAS TO CREATE A SIMPLE BUT CLEAR GEOSPATIAL MAP THAT CAN HELP IDENTIFY WHERE CANCER RESEARCH AND TREATMENT FACILITIES ARE LOCATED IN THE CITY.

🔷 **STEPS FOLLOWED:**

- **SELECTING HOSPITALS**
  WE CHOSE **EIGHT WELL-KNOWN CANCER CENTERS** IN CHENNAI, INCLUDING BOTH PUBLIC AND PRIVATE HOSPITALS.
- **COLLECTING COORDINATES**
  USING **GOOGLE MAPS**, WE FOUND THE EXACT LATITUDE AND LONGITUDE OF EACH HOSPITAL.
- **ADDING POINTS IN QGIS**
  WE OPENED QGIS AND CREATED A NEW LAYER WHERE EACH HOSPITAL WAS ADDED AS A POINT USING ITS COORDINATES.
- **NAMING AND STYLING**
  EACH POINT WAS LABELED WITH THE HOSPITAL'S NAME, AND WE USED DIFFERENT COLORS OR ICONS TO MAKE THE MAP CLEAR AND EASY TO READ.

GIS METHODOLOGY

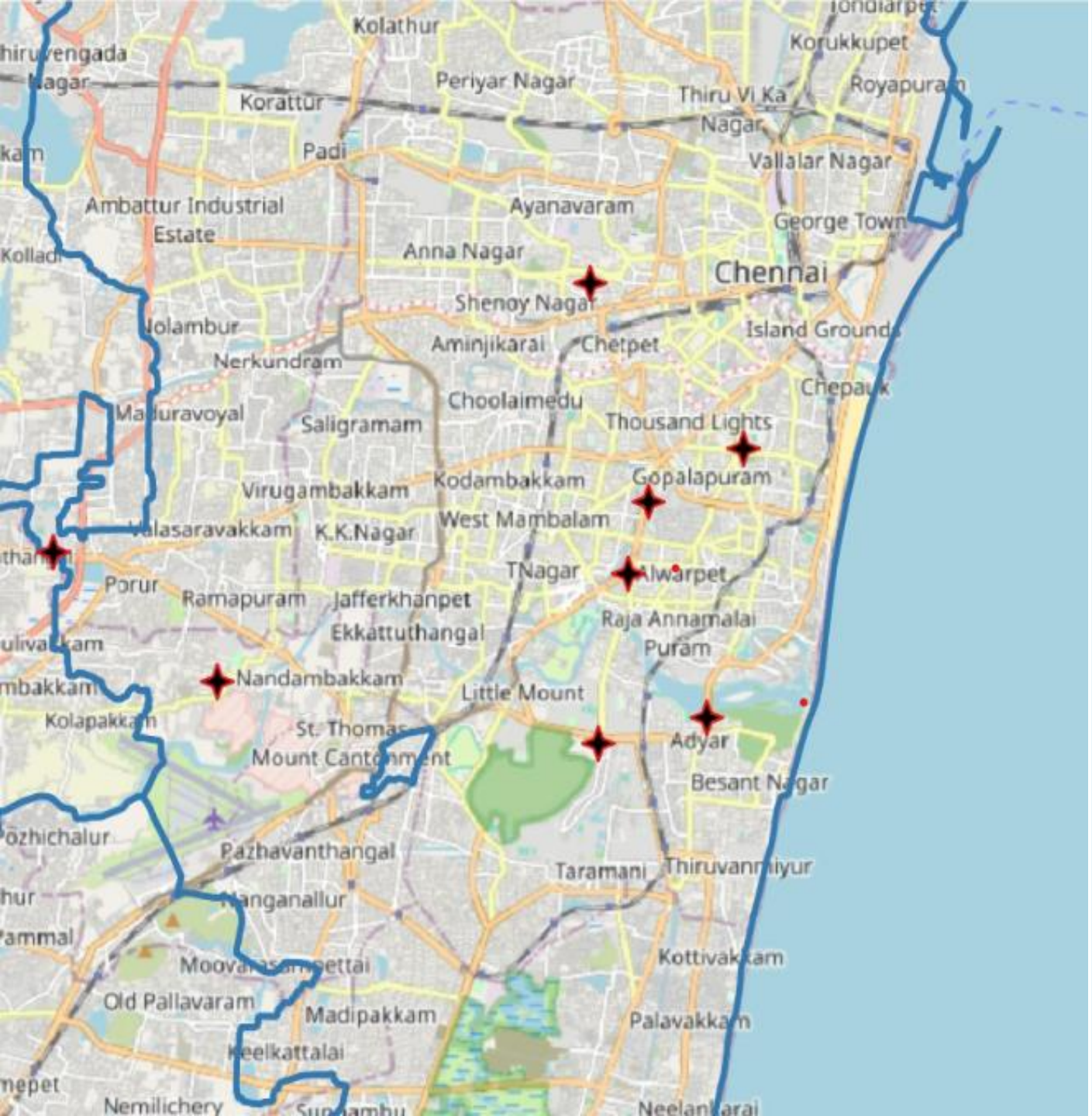
- **Base Map and Boundaries**
  We added a **Chennai city boundary shapefile** from ISRO Bhuvan or an open-source map to show the city limits.
- **Map Layout**
  We designed the layout by adding a **legend**, **north arrow**, and **scale bar**, to make the map professional and informative.
- **Final Output**
  The map shows all eight hospital locations placed accurately within Chennai. This gives a clear visual idea of how cancer treatment centers are spread across the city.

📝 **Notes**

We focused mainly on **location mapping** in this project. While we did not include buffer zones or advanced GIS analysis, this map is still useful as a base for further work. It can be built upon in the future by adding:

·Travel distance data
·Patient population layers
·Buffer zones or accessibility maps

This is a **starting point** for using GIS in public health planning — simple, clear, and open for future upgrades.

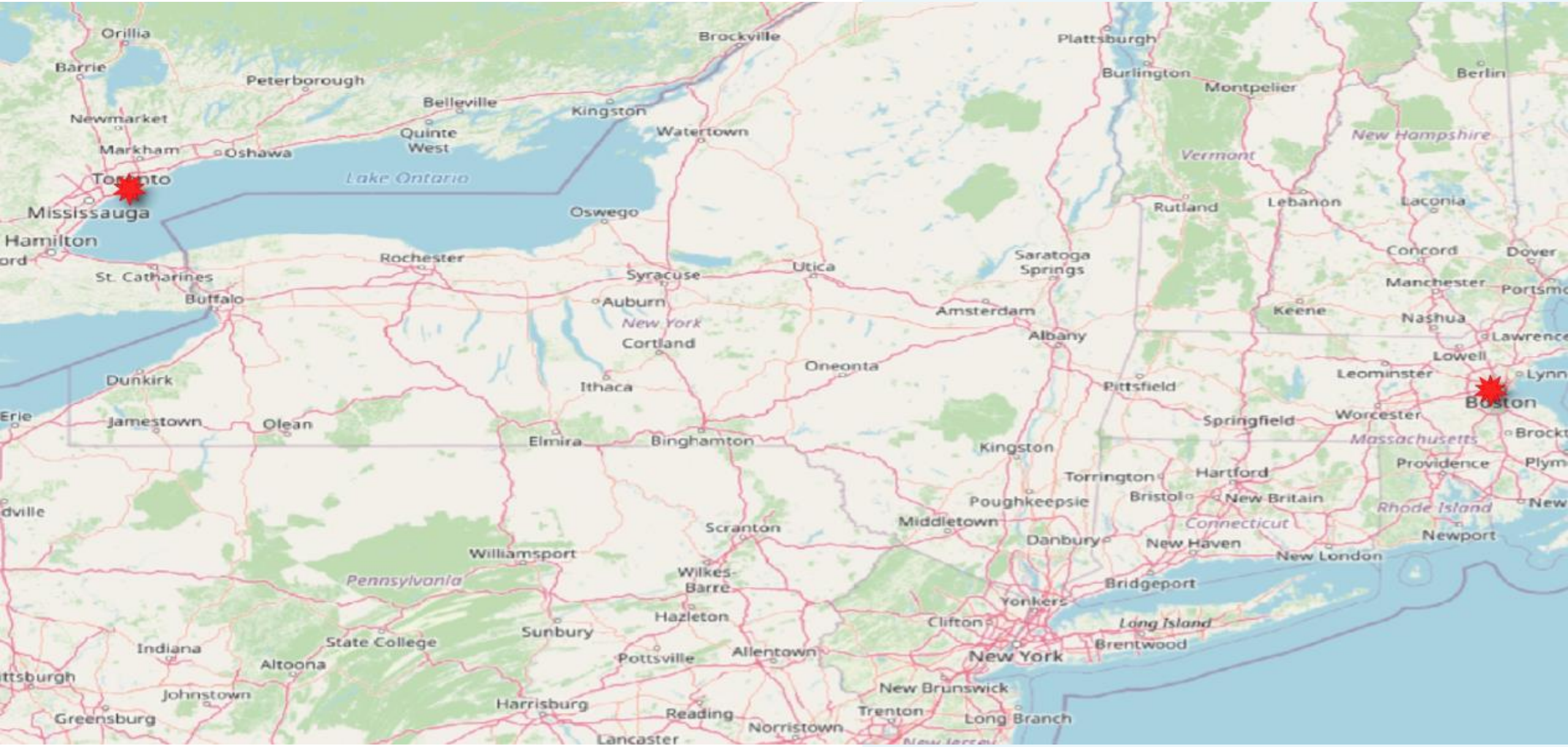


Map Outputs

LEADING CANCER RESEARCH CENTER IN CHENNAI

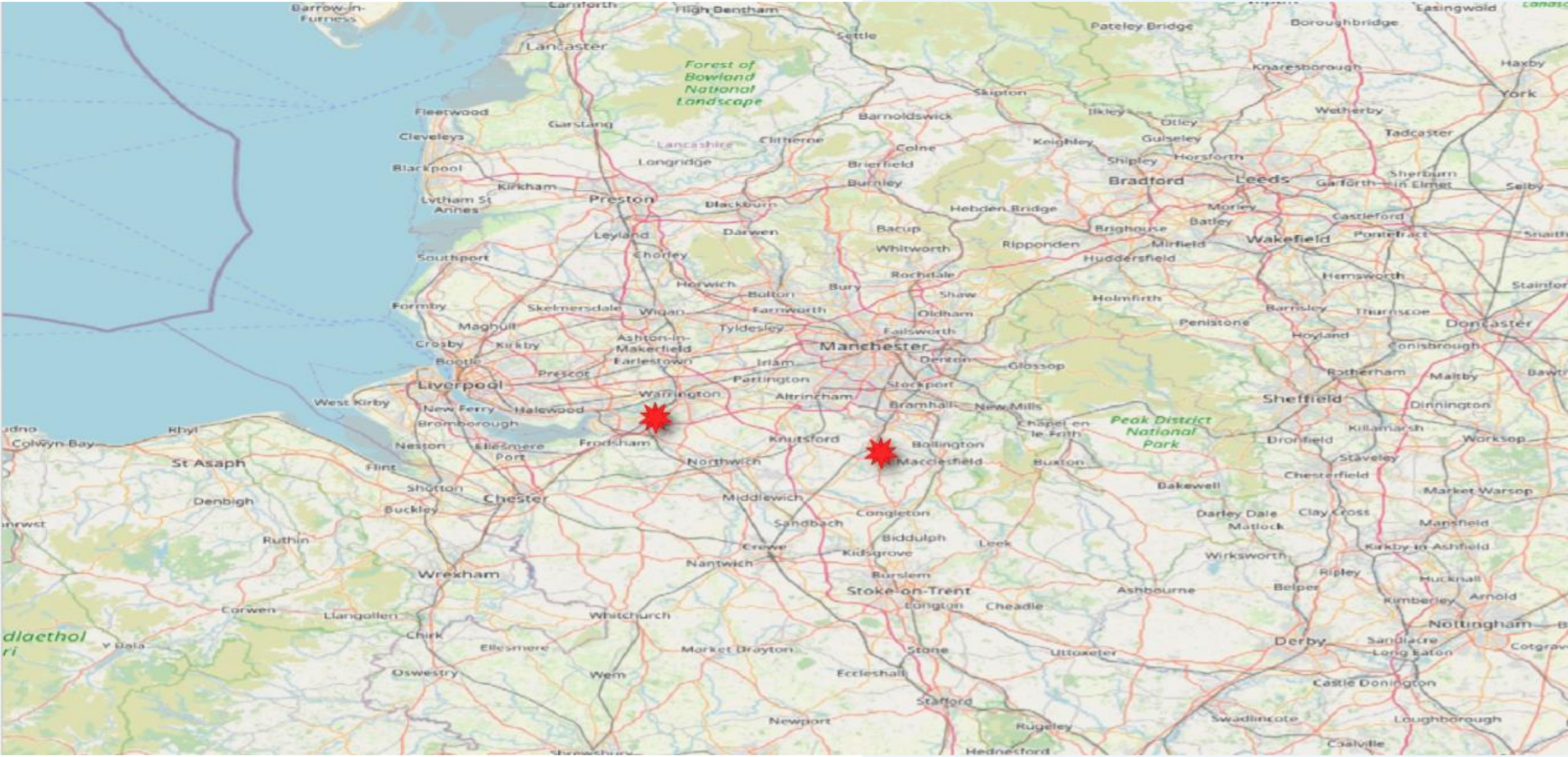
- Cancer Institute (WIA),Adyar.
- Government Royapettah Hospital Cancer Wing, Royapettah.
- Dr. Rai Memorial Medical Centre,Alwarpet.
- Cancer Research and Relief Trust,Kilpauk.
- Apollo Cancer Centre,Teynapet.
- MIOT International Hospital,Manapakam.
- Sri Ramachandra Medical Centre,Porur.
- Fortis Malar Hospital,Adyar.

Map Outputs: LEADING CANCER RESEARCH USING QUANTUM COMPUTING IN WORLD



- University of Toronto 27 King's College Cir, Toronto, ON M5S 1A1, Canada
- Harvard University Massachusetts Hall, Cambridge, MA 02138, United States

🗺 Map Outputs: LEADING CANCER RESEARCH USING QUANTUM COMPUTING IN WORLD



- ➢ The Hartree Centre STFC LaboratorySci-Tech Daresbury Warrington, Warrington WA4 4AD, United Kingdom
- ➢ Medicines Discovery Catapult (MDC),Alderley Park,England

ANALYSIS & INSIGHTS

- BY MAPPING THE EIGHT MAJOR CANCER HOSPITALS IN CHENNAI, WE WERE ABLE TO SEE HOW THESE IMPORTANT HEALTHCARE CENTERS ARE DISTRIBUTED ACROSS THE CITY. SOME USEFUL INSIGHTS INCLUDE:
- **MOST HOSPITALS ARE LOCATED IN THE SOUTHERN AND CENTRAL PARTS** OF CHENNAI, SUCH AS ADYAR, ALWARPET, TEYNAMPET, AND PORUR.
- AREAS LIKE **NORTH CHENNAI AND OUTER SUBURBS** (E.G., AVADI, AMBATTUR) HAVE FEWER OR NO MAJOR CANCER HOSPITALS.
- THIS MAP HIGHLIGHTS AN **UNEVEN DISTRIBUTION** OF CANCER CARE FACILITIES, WHICH MAY AFFECT PEOPLE LIVING FARTHER AWAY FROM THE CITY CENTER.
- EVEN THOUGH OUR MAP IS BASIC, IT GIVES A **CLEAR VISUAL IDEA** OF HOW HEALTHCARE ACCESS IS CONNECTED TO GEOGRAPHY. THIS IS IMPORTANT BECAUSE PATIENTS IN UNDERSERVED AREAS MAY FACE **LONG TRAVEL TIMES** AND **DELAYED TREATMENT**.
- THIS SIMPLE MAPPING CAN BE A FIRST STEP FOR MORE ADVANCED GIS ANALYSIS AND FUTURE PLANNING.

🚀 APPLICATIONS & FUTURE SCOPE

📌 How This Map Can Be Used

- **Government** can use it to plan new cancer hospitals in underserved areas.
- **Patients** can easily find major cancer centers in Chennai.
- **Researchers** can combine this with health and population data for deeper insights.
- **NGOs** can focus awareness and support efforts in areas with limited access.

🔮 Future Scope

- Add **buffer zones** and **travel distance layers** in future versions.
- Include **population density** to highlight high-need areas.
- Use this map as a base for **quantum-powered cancer research**, where spatial data is combined with genetics and predictive modeling.

This project is a starting point for smarter, location-based planning in cancer care.

TOOLS USED

💻 SOFTWARE

- **QGIS (VERSION 3.32)** – OPEN-SOURCE GIS SOFTWARE USED TO CREATE AND EDIT THE MAP.

🌐 DATA SOURCES

- **GOOGLE MAPS** – TO GET ACCURATE COORDINATES OF CANCER HOSPITALS.
- **OPENSTREETMAP (VIA QUICKQSM PLUGIN)** – TO ADD ROAD NETWORKS.
- **ISRO BHUVAN PORTAL** – FOR CITY BOUNDARY SHAPEFILES AND BASE MAP DATA.

🔌 PLUGINS USED

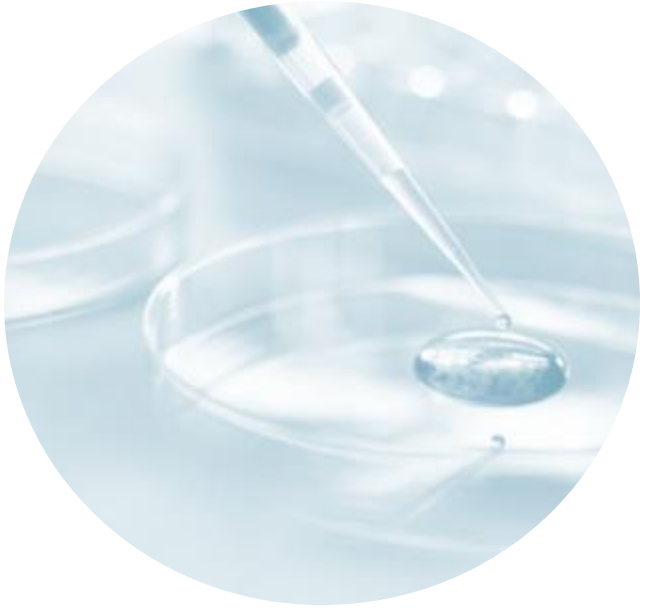
- **QUICKOSM** – TO DOWNLOAD ROADS FROM OPENSTREETMAP.
- THIS SIMPLE TOOLSET WAS ENOUGH TO MARK THE HOSPITAL LOCATIONS AND DESIGN A CLEAN, INFORMATIVE MAP FOR THIS PROJECT.

✅ CONCLUSION

- THIS PROJECT FOCUSED ON MAPPING MAJOR CANCER HOSPITALS IN CHENNAI USING GIS TOOLS. EVEN WITH A BASIC SETUP, WE COULD CLEARLY SEE THAT **MOST HOSPITALS ARE LOCATED IN CENTRAL AND SOUTHERN PARTS** OF THE CITY, WHILE **NORTHERN AND OUTER AREAS HAVE FEWER FACILITIES**.
- THIS KIND OF MAPPING HELPS US UNDERSTAND **WHO HAS EASY ACCESS TO CARE AND WHO DOESN'T**, AND IT CAN GUIDE DECISIONS ABOUT WHERE NEW HOSPITALS ARE NEEDED.
- WE ALSO SHARED A **FUTURE VISION** OF COMBINING GEOSPATIAL DATA WITH **QUANTUM COMPUTING**, WHICH COULD HELP MAKE CANCER RESEARCH FASTER, SMARTER, AND MORE PERSONALIZED.
- IN SHORT, OUR MAP IS A SMALL BUT POWERFUL STEP TOWARD USING TECHNOLOGY TO BUILD A MORE CONNECTED AND FAIR HEALTHCARE SYSTEM.

REFERENCES

- **QGIS – A FREE AND OPEN SOURCE GEOGRAPHIC INFORMATION SYSTEM**
  HTTPS://QGIS.ORG
- **ISRO BHUVAN PORTAL – INDIAN GEO-PLATFORM OF ISRO**
  HTTPS://BHUVAN.NRSC.GOV.IN
- **GOOGLE MAPS – LOCATION DATA FOR HOSPITALS**
  HTTPS://MAPS.GOOGLE.COM
- **OPENSTREETMAP – ROAD AND CITY MAP DATA**
  HTTPS://WWW.OPENSTREETMAP.ORG
- **HARVARD UNIVERSITY – QUANTUM COMPUTING IN CANCER RESEARCH**
  HTTPS://WWW.HARVARD.EDU



THANK YOU