

ABDUL KALAM MUSTAQ

Climate Risk Researcher | Spatial Modeling, and Public Decision Support

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PROFESSIONAL SUMMARY

Climate risk researcher and geospatial data analyst who builds open, reproducible hazard datasets and stress-tests the models public decisions rest on. Developed a parcel-scale benchmark showing that the choice among four public New Jersey flood-hazard layers shifts regulatory and property-tax outcomes by billions of dollars, and shipped open-source exposure tools scoring all 3.5 million parcels in the state. Six years across statewide hazard datasets, municipal climate vulnerability assessments, and housing affordability, publishing the uncertainty alongside the result.

RESEARCH AND PUBLICATIONS

Parcel-Scale Benchmark of Federal and State Flood-Hazard Layers

2026

Working paper, four-county pilot; statewide extension in progress. Target venue: Natural Hazards (Springer).

- Designed and ran a pre-specified benchmark of four flood-hazard layers (FEMA Effective SFHA, FEMA National Flood Hazard Layer, and two NJDEP climate-adjusted flood elevation scenarios) across 671,494 parcels and \$312.7B of assessed value in four contrasting counties, drawn from New Jersey's 3.46 million parcel tax composite.
- Quantified disagreement with confusion matrices, Cohen's kappa, and value-weighted metrics: in tidal counties the state layer flags 19 to 24 percentage points more parcels at risk than FEMA's effective layer, worth \$11.3B of decision-flipping value in Atlantic County alone, while 7% to 34% of parcels flagged by one FEMA product go unflagged by the other.
- Established layer choice as a policy variable with measurable dollar consequences for flood-insurance enforcement, permitting, and municipal tax planning: fiscal-exposure rankings proved layer-fragile, with Kendall's tau as low as 0.191 between two defensible layers.
- Wrote the limitations into the paper rather than around them: commercial risk models stay outside the benchmark pending license, pilot results stay exploratory until OSF pre-registration is filed, and Sandy and Ida ground-truth validation is scoped, not implied.

AutoCarto-Agent: A Neuro-Symbolic Architecture for Autonomous Thematic Cartography

August 2026

Poster, International Symposium on Spatiotemporal Data Science (STDS), Virginia Tech.

- Built an open-source pipeline (Llama 3.1 70B, PySAL, GeoPandas) in which a language model proposes cartographic intent while a deterministic engine owns every statistical and geometric decision across six validation gates, each recorded in a machine-readable execution trace for reproducibility.
- Validated on 530 Atlanta census tracts joining ACS income and CDC PLACES asthma data; the system surfaced a significant income and health spatial cross-correlation it was never asked to look for, and corrected a skewed classification that lifted goodness-of-variance-fit from 0.77 to 0.86.

Governance Audit of New York City's Cloudburst Resilience Program

2025 to 2026

- Graduate research, Rutgers Bloustein School: analyzing interagency coordination, institutional barriers, and the gap between a funded municipal climate-adaptation program's design and what it delivers.

SELECTED CLIMATE RISK TOOLS (OPEN SOURCE)

NJ Parcel Flood Risk Dashboard

2026

Live: nj-parcel-flood.pages.dev | Source: github.com/abdul-kalam-m/nj-parcel-flood

- Built a statewide Python pipeline (DuckDB, GeoPandas, tippecanoe and PMTiles) scoring all 3,478,722 New Jersey parcels across 21 counties and 564 municipalities against current FEMA flood zones, NJDEP sea-level-rise layers, and tract-level NFIP claims, finding 19.31% of parcels and 25.86% of value exposed.
- Held the work to a published quality contract: 6 of 7 automated gates pass and the seventh, an 88.34% tax-record join rate, ships as a disclosed limitation rather than a quietly relaxed threshold. The heaviest stage runs in 1.89 hours against a 12-hour budget and is county-resumable throughout.
- Extended the same parcel core into a five-scenario planning dashboard (current flood, sea-level rise, Category 1 and 3 surge) scoring exposure, sensitivity, and consequence against CDC Social Vulnerability Index and NJDEP overburdened-community context; pipeline and statewide QA complete, deployment pending.

FloodOps: Multi-Municipality Coastal Flood Exposure Explorer

2026

Live: floodops-v2.ar-abdulkalam-mustaq.workers.dev | Source: github.com/abdul-kalam-m/floodops-v2

- Ingested Rutgers University's statewide coastal inundation product for 8 New Jersey municipalities across 21 water levels (0 to 20 ft above mean higher high water) to report which critical facilities and roads are exposed at each level, with per-town operations reports and CSV export.
- Kept the seam between the published hazard model and this project's own inference explicit: per-facility depth is computed only where a tidal datum offset can be verified (7 of 8 towns), and the methods page publishes the depth error budget and the rate at which the two models disagree.

PROFESSIONAL EXPERIENCE

Research GIS Specialist, New Jersey Climate Change Resource Center

Climate hazard vulnerability assessment and statewide hazard datasets

New Brunswick, NJ
March 2026 to Present

- Conducted build-out analyses for 7 municipalities under four flood inundation scenarios (FEMA 1%, FEMA 1% plus 3 ft, 2 ft, and 5 ft) supporting Climate Change Hazard Vulnerability Assessment reports, one of which Pennsville Township formally adopted and used to propose amendments to local land use and zoning policy; automating the workflow in Python (ArcPy) and ModelBuilder raised throughput 60%.
- Designed pipelines digitizing Hazard Mitigation Plans across all 21 New Jersey counties (ArcPy, NJ Geocoder, FME ETL), plus a Survey123 action tracker whose automated text extraction and validation cut manual data-entry errors 95% and raised geocoding accuracy to 100%.
- Authored the methodologies, metadata, and validation procedures behind these datasets to Center and University publication standards, and released the results as public web applications and dashboards municipal staff use directly.

Equitable Development Analyst Intern, Sojourner Consulting

Spatial and demographic analysis for community planning

Philadelphia, PA
May 2025 to Present

- Applied LEHD employment data to measure how post-pandemic remote work reshaped daytime population and worker distribution in Philadelphia's Chinatown, shaping business-district and equitable-development recommendations.
- Modeled neighborhood demographics with Census data for an Equitable Development Plan built on input from 70 or more residents across 6 sessions.
- Designed the surveys and focus groups behind that input, and presented spatial findings to residents and municipal decision-makers in non-technical terms.

Research and Development Analyst, Rutgers CLiME Lab

Housing affordability research and spatial data engineering

Newark, NJ
January 2025 to September 2025

- Engineered automated data pipelines (Python, Census APIs) that cut processing time 60%, enabling faster analytical turnaround across the state.
- Produced housing affordability findings covering 12 New Jersey cities for a multi-city research publication, presented to municipal planning officials.
- Mapped commuter patterns from LEHD origin-destination data and co-developed policy frameworks with faculty to support state and local decisions on housing equity.

Urban Designer and Policy Advisor, Sponge Collaborative

Climate resilience strategy, feasibility analysis, and implementation

Chennai, India
August 2021 to July 2024

- Co-authored a feasibility study finding a 42% net-present-value advantage for blue-green over gray infrastructure across 5-year and 25-year storms; it informed \$12M in state investment and was cited in national flood-resilience policy debate.
- Screened 1,000 candidate open spaces with suitability models weighting ecological, social, and financial criteria, and led a city-scale resilience strategy that helped secure \$9M from India's National Disaster Management Authority.
- Wrote a Sponge Parks handbook adopted by the Greater Chennai Corporation as a technical and policy reference, and ran capacity-building workshops for 30 or more municipal engineers and department heads.

TECHNICAL SKILLS

Scientific programming and data analysis: Python (GeoPandas, PySAL, shapely, rasterio, pandas, ArcPy), DuckDB, SQL, R, scikit-learn, XGBoost, Census and REST APIs, FME ETL

Statistical and spatial methods: confusion-matrix benchmarking, Cohen's kappa, Kendall's tau, spatial autocorrelation (Moran's I), value-weighted exposure analysis, composite index design, suitability and vulnerability modeling, and cost-benefit

Reproducibility and software practice: git and GitHub, pytest, Playwright and axe-core testing, continuous integration, data manifests with SHA-256 lineage, resumable pipelines, pre-registration protocols, ISO and FGDC metadata, open-source release

Climate and risk datasets: FEMA National Flood Hazard Layer and Effective SFHA, NJDEP climate-adjusted flood elevations, NOAA National Water Prediction Service inundation products, OpenFEMA NFIP claims, Census ACS, LEHD LODES, CDC SVI and PLACES

Geospatial platforms and delivery: QGIS, PostGIS, GDAL/OGR, MapLibre GL, PMTiles and tippecanoe, ArcGIS Pro, ArcGIS Online and Enterprise

Research communication: technical writing, methods and limitations documentation, policy briefs, public dashboards

EDUCATION

Dual Master of City and Regional Planning / Master of Public Informatics (MCRP-MPI)

Rutgers University, Bloustein School of Planning and Public Policy. Graduate Certificate in Geospatial Information Science and Technology, in progress.

Expected December 2026

Bachelor of Architecture, First Class

Anna University, School of Architecture and Planning, Chennai, India

May 2021

CERTIFICATIONS AND TRAINING

Transportation Data Science Program, National Student Data Corps (Columbia University and Northeast Big Data Innovation Hub), 2025. Licensed Architect, Council of Architecture, India (CA/2023/158480).