Web-Based Heat Vulnerability Index Toolkit for Local Governments

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SUMMARY

Urban heat vulnerability presents critical challenges in the context of climate change and urbanization, particularly for local governments seeking to implement effective mitigation strategies. To address these challenges, we developed a web-based data retrieval and analysis tool tailored for non-coding, non-GIS users. The platform enables the retrieval of key environmental parameters, including Land Surface Temperature (LST), Normalized Difference Built-up Index (NDBI), and Normalized Difference Vegetation Index (NDVI), derived from Earth observation satellite images. These datasets are accessible at fine-grained administrative levels, such as meshblock and Statistical Area 1 (SA1), and can be downloaded as raster files for further analysis.□□The primary objectives of this research were to:□□Develop a web application for retrieving LST and landcover indicators using the Google Earth Engine (GEE) cloud platform.□Create open-source tools for constructing heat sensitivity, heat adaptive capability indicators, and a composite Heat Vulnerability Index (HVI).□The HVI toolkit integrates Earth observation data with socio-economic and health-related indicators to provide a multi-dimensional framework for assessing urban heat vulnerability. By employing geospatial analysis techniques, the toolkit identifies and maps areas of high heat vulnerability, enabling targeted interventions at the Local Government Area (LGA) level.□□A key milestone of this project was the design and implementation of the system architecture for two Australian LGAs. This practical application demonstrated the tool's ability to produce spatially disaggregated heat vulnerability assessments, highlighting the interplay between environmental exposure and socio-economic sensitivity. The results validated the platform's effectiveness in supporting evidence-based planning for climate adaptation and urban resilience.□□In-depth knowledge of urban heat can be gained by modeling the relationships between environmental and socio-demographic factors. The index and indicators of heat serve as critical information for city planners and decision-makers, offering benchmarks and guidance for climate change mitigation planning and urban design.□□By providing an accessible

platform that integrates open-source technologies, Earth observation data, and socio-economic metrics, this research contributes to sustainable development efforts. The tool supports achieving Goal 11 (Sustainable Cities and Communities) of the United Nations' Sustainable Development Goals (SDG) by empowering stakeholders to make informed decisions, reduce heat vulnerability, and build resilient urban environments. This work underscores the transformative potential of web-based geospatial tools in addressing complex environmental challenges. It streamlines access to critical data, enabling comprehensive analysis and targeted mitigation strategies that advance urban resilience and sustainability.