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# Chapter 11: Geo-spatial data and its applications in identifying community revitalization opportunities

## 11.1. Introduction

The purpose of this chapter is to summarize, analyze, and demonstrate the use of geo-spatial data in the identification of community revitalization opportunities. While the data sample used in this study is from a collection of various sources, the focus of the analysis will concentrate on public domain data available for any locality. Although many investors speculate in real estate and property markets based literally on gut feelings, the analysis of investment properties should be based on solid data as much as possible. Nevertheless, while property investment using geo-spatial data is a demanding task, the availability of data has become copious and perhaps overly complex. Therefore, investors should attempt to understand and use such data to make informed decisions.

Previous research has focused on the use of limited private datasets to identify successful commercial land uses in areas ripe for redevelopment or development. The exclusion of public data, while arguably justified because even 20 years ago very few municipalities had public data available for investors and developers, required that geographers and other interested parties have access to very specific vendors for the types of data useful for that research. Thanks to the Internet, public data, and conversions of shape files for arcane data collection systems into key data in database form by service providers have come a long way. However, only a few municipalities – mostly in metropolitan areas – have standardized and made such data available to anyone on the web.

### 11.1.1. Overview of the Document Structure

With the beginning of the 21st century, the growth of urban areas is resulting in environmental, social, and economic problems due to increased traffic, air and water

pollution, overload of public transportation infrastructures, decrease the quality of life and the loss of safety. The concentration of governmental attention in the urban areas with the highest revenue worsens the life conditions not only of the population from these regions, but also maintains the decreases in quality of life for the populations of poor and/or deprived communities. The process of bolstering underprivileged communities with the creation of projects that can propitiate the development of communities in defects is known as Community Based Development. The region of study of the current project includes an area of low traffic adjacent to a metropolitan sewer, between two deprived communities in Fortaleza, the fifth biggest city in Brazil. This metro and the nearby slum areas have matured rapidly and hardly due to the inefficient control of property use and the lack of land regulation. Proper economic and social programs can quickly transform these irregular housing conditions into a stable and growing middle class neighborhood.

The process of recuperation of urban areas with problems results in the social, economic, and physical improvement of empty or even degraded terrain within the affected region, through the augmentation of immediate employment and the creation of a significant impact on the local economy. It is stressed that Community Based Development should work with groups of stakeholders to generate results within a short time period, providing financial security and prospection, and added value to the market. There is a demand for different methodologies of spatial data treatment to help governments, promoting businesses and non-governmental institutions to identify areas where the implementation of these projects is more necessary and urgent. The Brazilian Institute of Geography and Statistics has published data including information identified in the section "urban centers," housing class "3," headings "1st per. population" and "dens. absolute." It is important to register that the date of the data is important, since it is treated as a discrete spatial field.

## 11.2. Understanding Geo-Spatial Data

The purposes of this technical note include defining the concept of geo-spatial data and geo-spatial analysis; illustrating different kinds of geo-spatial variables and the concept of geospatial multilayered modeling, as well as the significance of geo-spatial analysis in identifying community revitalization opportunities. Geo-spatial technologies are used worldwide to make significant decisions that affect the future of our communities. Such uses include mapping crime locations to aid in more efficient deployment of law enforcement resources and identifying locations of poverty to prioritize social welfare programs. It supports modeling of air quality, public infrastructure, and land tenure issues in studies; evaluation of local economic development programs; and development of affordable housing. Its decision-support tools are particularly useful in gauging the

economic impact of sports stadiums and festivals, identifying opportunities and effective targets of investment in community-building efforts, and tracking potential contamination from hazardous waste and brownfield sites.

While members of non-scientific communities have been exposed to maps offering insights into the economic, environmental, and social well-being of their communities for centuries, recent technological advancements allow for the mapping of complex interrelated data in ways inconceivable only a short while ago. For scholars grounded in a non-GIS discipline, these tools open exciting new prospects for pushing the frontiers of knowledge. The purpose of this technical note is to provide an overview of the capabilities of geographic information systems technology that would be valuable to members of a wide variety of social science disciplines who wish to apply geo-spatial techniques in their research. Their research questions have been informed by maps more than they realize, and the development of these other tools has been greatly advanced both by people who think spatially and by people who have applied GIS techniques.

### 11.2.1. Definition and Types of Geo-Spatial Data

Geo-spatial data is a form of data whose acquisition processes are based on the convergence of geographic/spatial location, increasingly available reliable data sources and new forms of data collection and recording. The applications of this data are considerable and increasing, driven by governmental surveillance, business intelligence, environmental concerns, public health, land use development, crowd management, security, and crisis management applications. The structure of spatial data is like a French loaf: a collection of layers, like slices, with shape geometry characteristics but also non-spatial attributes. Geo-spatial analysis is designed for applications where decisions or policies may need to be taken, and where the implications of a static geographic distribution of variables are of interest. Geographic Information System is a tool, among others, that facilitates geo-spatial data management, analysis, and presentation.

The use of spatial data and geospatial technology has increased greatly in recent years. Over time, the cost has been substantially reduced and the increased accuracy, availability, and accessibility of geographic data have produced huge opportunities for businesses, individuals, and governments, offering enormous social and economic benefits. There is a growing recognition that effective management, analysis, and visualization of geography-related information are powerful elements in the effort to revitalize communities. Indeed, modern community development, land use planning, growth management, and increasingly large governmental and private industry undertakings depend largely on geography and GIS to provide decision-making tools for widespread applications. The quantity and quality of spatial data utilized in the decision-

making process have a profound impact, which links to all stages of the decision-making process, including the goals and the analysis tools. The practical objective is to identify the geospatial nature of spatial data and the latest concerns of how to enrich our decision-making approaches and tools in the face of today's circumstances of complex, uncertain, and limiting conditions.

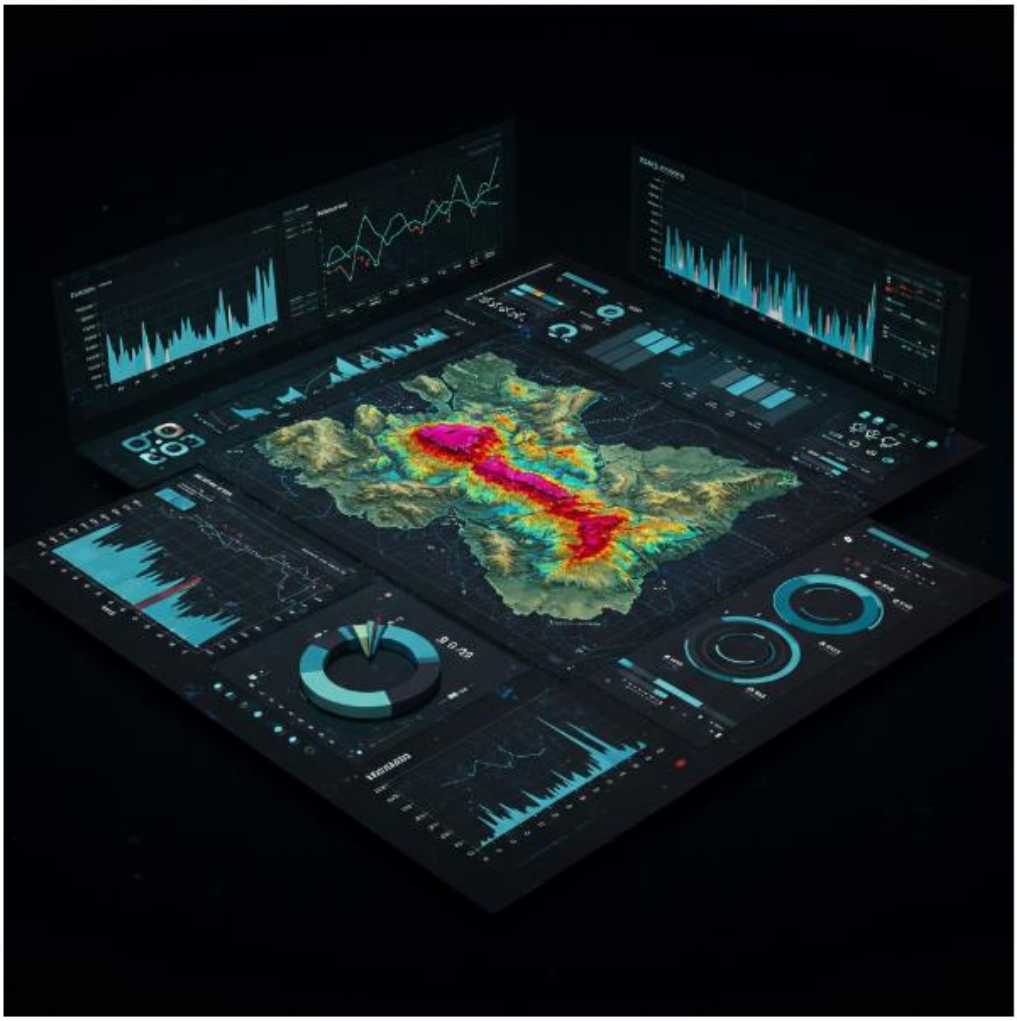

Fig 11 . 1 : Geospatial Data

### 11.2.2. Sources of Geo-Spatial Data

Geo-spatial data can come from a number of sources, including national, state, or local data agencies; local non-profits that operate a database of their own; or from companies that work all over the world. Sources of information published or otherwise publicly

available are often known as public-domain geo-spatial data. Any organization or individual can use this data in their own research or operations free of charge. Examples of such data frequently used jointly in research and applications include extensive annual and decennial data collection programs or annual demographic and land use surveys. Registers of fired and laid-off employees and periodic real property assessment rolls are examples of data made publicly available at the state level.

Data that have been assembled and maintained by private businesses, academia, and scientific organizations are sometimes the result of public grants or funds and may be referred to as 'fee-based' geo-spatial data because the originators of such data require a payment through a value-added reseller, an online store, or by other means for providing access. Many organizations engage in this type of activity, some of which have worldwide operations that encompass portions of the U.S.; compiles complaints filed with the Better Business Bureau and sells the whole lot as a 'streaming data' product. While proprietary or confidential data involving clients' financial or proprietary corporate data are strictly guarded and not shared or openly disclosed, other types of fee-based data—typically depicting facts of public interest but frequently requiring a payment from their original sources, with an associated license stating the terms under which the data may be used—may include knowledge of a sensor network that provides continuous live traffic information.

### 11.2.3. Data Collection Techniques

The primary data collection techniques could be divided into traveling surveys, aerial surveys, and information measurement surveys. We argue that different data sources have different data dissemination effects in identifying building use or land use information. First, ground truth data are considered the best data source, as they may provide the most detailed information. Second, a set of common attributes can be generated from remote sensing data or characteristics. These data are straightforward and quick to collect. Geographic information systems are also widely used for identifying land use information, but they have some limitations. Moreover, geographic information systems are discrete spatial data, which are not smooth, so interpolation techniques must be used to find the corresponding x and y coordinates of a sample without the attribute information. On the other hand, since the measured variables of the conditions of a property may be discrete in space, most of the results are mixed spatial models, and there is a lack of hierarchical partitioning models.

From a macro point of view to a micro point of view, geographic knowledge is structured like a pyramid. At the bottom are elemental geographic data, usually in point form and not in very large quantities, representing an observable feature of the real geographic world. At the peak of the pyramid, several other levels may need to be passed until you

reach the domain of geographical knowledge required for a planning problem. In conclusion, a firm is a subdivided classification of commercial land use. Different building uses have different types of performance. Therefore, accurate classification of building use information will be helpful in improving the performance of the forecasting model. Attributes about the conditions of properties, surrounding businesses, local populations, and buildings can be used to classify building use, building area, and building age information. Information about the land use of surrounding neighbors, points of interest, and local traffic information can be used to classify land use.

### 11.3. The Role of Geo-Spatial Data in Community Development

The fields of remote sensing and geographical information systems (GIS) provide a valuable tool for community development by enhancing the data mining and analysis capability of the built environment. The growth of publicly available geospatial data sources, as well as mobile and World Wide Web-based technologies for data distribution, has made available various types of free or low-cost data that can be useful and are easily accessible. These types of data have enhanced the types of statistical techniques, as many types of integration of the data, as well as serving as a second dimension correlation with other spatially referenced data. For community development professionals trying to understand different dimensions of a multifaceted, complex community, access to relevant, current, and spatial, as well as non-spatial, data is critical for proper interpretation of issues, actions, and outcome evaluation. The built environment and activity demographics have been demonstrated to be important and are important independent determinants of travel behavior and potentially walkability, diversity, residential stability, social capital, and safety.

Substantial research has demonstrated that places that foster community relationships are reliable predictors of the preservation and development of many positive community attributes; however, the evolution of the built environment may lead communities to lose touch with their historical assets over time. Urban design has been proposed to facilitate opportunities for community interaction by supporting the occurrence of daily life activities, as well as by providing areas where people can meet each other. City, business, and community leaders have recognized the importance of engaging the creativity and resources of people in the planning, revitalization, and management of their communities. The national dialogue on discovering community is focused on the revitalization of downtowns, people's connection to place, and the relationship among the market-town-school pattern of non-metropolitan areas. Additionally, the smart growth movement seeks to locally address the accumulation of public infrastructure and make associated public policy adjustments to promote community livability. Despite the numerous policies being proposed, the relationships between the built environment,

lifetime opportunities, and community revitalization have rarely been empirically addressed in a spatial dimension and are underrepresented in the literature.

### 11.3.1. Analyzing Community Needs

For example, linking geo-spatial data with other data sets can significantly enhance our understanding of community needs and priorities. Overlaying a neighborhood eviction dataset with geo-spatial data on rental properties provided additional spatial context of areas with a potential higher risk of eviction. The use of census tract numbers along with property addresses can provide insight on the most appropriate policy responses based on affordable housing investment at the neighborhood level. When identifying opportunities for private sector investment within urban markets, partnerships between community-based organizations and geographers also help identify outdoor environmental revitalization initiatives within communities that not only enhance the region aesthetically but also offer significant social benefits to the area. Geo-spatial questions may evolve throughout the growing season, and remote sensing activities are most easily correlated to specific inquiry-based learning opportunities.

Neighborhood-based communities often lack capacity, data access, and skills to analyze relevant information for data-driven decision-making processes to determine and prioritize criteria for high-impact intervention programs to address community needs, particularly in the built environment. Community analysis at a neighborhood level inherently requires geo-spatial data work in order to provide vital social and demographic community-based data relevant to local decision-making, such as food access for which types of property uses and for whom. Additionally, racial and economic production displacement triggers other development changes that place pressure on social and historic places. Providing data support to communities requires offering easy access to relevant data for direct community outreach, capacity building, and strategic planning to ensure data utilization during any phase of the community decision-making process, delivering information, explaining concepts, or detailing processes or systems.

### 11.3.2. Mapping Socio Economic Indicators

Many scholars use geo-spatial data to study socio-economic issues related to neighborhoods and communities (Chava, 2022; Komaragiri & Edward, 2022). Geo-spatial data allows one to visualize the spatial distribution of various phenomena over the geographic space, such as the location of business establishments and the distribution of employment opportunities. This data can give us not only a general sense of inequalities across neighborhoods but also help researchers better understand bottlenecks toward the revitalization of distressed areas and how they vary across

different cities. For this purpose, geo-spatial data can be linked to economic and demographic attributes of these neighborhoods, such as employment and housing conditions, social connections, and public programs.

The accessibility of high-quality and open-source geo-spatial data provides major stakeholders with more opportunities to leverage its collective resources to address socioeconomic issues in distressed communities. In this project, we propose an innovative framework for identifying community revitalization opportunities that combines advanced statistical methods with the most recent geo-spatial tools. Furthermore, in order to test the effectiveness of these methods in community revitalization, we conduct a series of qualitative case studies, focusing on the cities of Chicago and Peoria. More specifically, Community Area Profiles data and Government Finance Data Collection data are used to model various essential socioeconomic indicators, and predictive models are applied to predict these indicators within the Chicago metropolitan area. In addition, the proximity and density of various neighborhood amenities are collected, and the spatially varying relationship between these indicators and potential commercial opportunities is analyzed.

### 11.3.3. Identifying Key Stakeholders

One of the goals of this study was to elongate traditional stakeholder groups. To achieve this, a new stakeholder model has been proposed that takes all important community stakeholders into account. The advantage of using this model is that it assists in identifying which of these groups may oppose new spatial solutions. The model suggests that geographical information about stakeholders can be divided into four categories: those who support, favor, and benefit from the spatial solution; those who dislike and oppose the spatial solution and also lose from it; those who like and admire the solution and gain from it within the community; and those who silently celebrate success and enjoy the benefits of a revitalized community, yet do not want to be prominently identified with the process. In conclusion, it is vital to identify key stakeholders and determine which of these four categories they fall into. Community representatives should ensure that community goals and policies related to revitalization are followed. Additional goals also include re-educating non-professionals with priorities for revitalization, increasing resident awareness, and changing resident attitudes. Redefining community or neighborhood infrastructure displays a clear path toward revitalization. The city uses its urban land bank to address specific needs related to bringing property back into neighborhood service. The city acquires property by forfeiture for nonpayment of taxes. Vacant and abandoned properties pose a problem that traditionally has fallen between professional solution attempts and community disrespect for the dilapidated state of the houses.

## 11.4. Technological Tools for Geo-Spatial Analysis

The technological tools employed to collate and filter geo-spatial data, combined with GIS capacity as a data model, facilitate the end-users' organizational capabilities to formulate specific questions that can make an impact, expressed in various on-the-ground contexts, while balancing quality data in an actionable timeframe. At the same time, these technological tools allow socio-economic researchers to holistically approach the various demand and supply drivers of community revitalization in a framework that mitigates the potential for researchers to impose their own preconceived notions to frame solutions based solely on their experiences, at the behest of the community entity's dynamic needs. Sourcing data is an important prerequisite in any GIS project. In this phase, data acquisition goals should be closely examined, and the accuracy and completeness of each data component should be clearly articulated. Cartographers should consider user requirements and task-specific design criteria when integrating and deriving functional relationships between component GIS databases to serve user application requirements. Specialist tools, such as digitizers, CD-ROMs, or menu-driven GIS software, as well as mapping and digitizing techniques, will provide these data components at the required level of accuracy and completeness (Annapareddy & Seenu, 2023; Kalisetty & Lakkarasu, 2024; Kannan et al., 2024).

A range of tools, including Global Positioning System (GPS), Geographic Information Systems (GIS), attribute development tools, and database systems, could be used to assist in the development process. Brief descriptions of these technological tools and their applications follow. The Global Positioning System (GPS) provides information on point locations at a high accuracy level with the integration of previously collected digital cartographic and attribute information of the entity's geographic region, along with dynamic real-time locational information. GPS technology allows precision location-based tracking of certain features in the region over time. The information assimilated using GPS components is particularly useful in tasks such as route planning, network reconstruction, design of sustainability layout, land use, and presenting visitors with a detailed close-up data arrangement that overlays on large-scale maps or enables them to locate the nearest facilities.

### 11.4.1. Geographic Information Systems (GIS)

Geographic Information Systems (GIS) refer to spatial and attribute data and software for management, analysis, and visual representation (Sambasiva Rao et al., 2024; Sriram & Seenu, 2023). GIS not only provides storage and display of spatial data and attribute data that is related to a theoretical place, but it also has spatial analysis ability for geographic statistics and spatial analysis models. When you use digital methods to represent, measure, operate, and analyze geographic information, you could use a

computer and other hardware and software to operate the spatial data and attribute data that is related to spatial and attribute information. We use data input, updating and maintenance, interface and operation, data and spatial analysis ability, and data export and application, which would present as five elements. Furthermore, GIS is not necessary for the use of complete spatial data. More important is a complete description of spatial identity and accuracy. These descriptions may rely on information and study of matters because the qualities of real things share a relationship with time and space. In other words, in contrast with traditional information management, GIS notices that there is a data linkage problem between different data with time and space.

In the professional aspect, GIS involves data, hardware, software, people, skills, and organization. The methods and skills are important, but a series of matter descriptions and other support are also necessary, while complete data access is the most important thing. Computer science, data collecting technology, desktop graphic subsystem technology, and databases would involve qualities of functional hardware. In the comprehensive package of the above-mentioned functional hardware, GIS is established on the principles of geography and of things and can reveal the complexity in interaction with time and space. The implementation and application of GIS would derive from this package. After understanding the remarkable attributes of time and space, you can then classify and isolate the space and the objects.

### 11.4.2. Remote Sensing Technologies

The discipline of remote sensing focuses on studying surfaces of the Earth from a distance, through the scanning, recording, and analysis of emitted or reflected radiations (Sambasiva Rao et al., 2024; Sriram & Seenu, 2023). Scanning includes the recorded information of the reflected radiation, such as distance and angle through devices called sensors. Remote sensing has a long and broad application to the task of studying Earth's resources. An overall increase in the amount of remote sensing data being made available is helping users to extend the scope and invigorate the practicality of these applications. A major advantage of remote sensing is the global significance of surface information effectively beyond the scope of ground-based surveys. In particular, large areas are suited to remote sensing-derived surveys. Digital Elevation Models (DEMs), which are 3D representations of the Earth's surface as seen by sensor systems, can be obtained from stereo pairs, while 2D representations that show objects as seen by a single sensor system are aerial or satellite images. Habitat and biodiversity modeling, disaster assessment, and environmental monitoring are just a few examples of successful applications of remote sensing-derived information. Contemporary remote sensing research looks at the functions of remote sensing in the world today and its contribution to understanding the biosphere, lithosphere, hydrosphere, and cryosphere. Research areas include remote

sensing and the state of the Earth, remote sensing and the hydrological cycle, remote sensing and the Earth's surface radiation budget, remote sensing and the atmosphere, remote sensing and the oceans, remote sensing for integrated studies of geographical elements, and remote sensing and GIS. Further research includes topics such as advances in remote sensing and data processing, innovative remote sensing applications, remote sensing in land survey, satellite image analysis, spatial analysis, remote sensing in geology, vegetation, and archaeology, remote sensing of urban areas, remote sensing and GIS applications, and the most recent developments in photogrammetry, remote sensing, and laser scanning.

### 11.4.3. Data Visualization Tools

In the past, the majority of real estate data was in the form of semi-numeric tables. Real estate experts have used technology to develop various analytical modeling tools to assist in their decision-making process. As the computing power of personal computers becomes more advanced, the complexity and clarity of the visualization of data have also become more useful. The use of this visualization has extended to fields such as finance, marketing, and business in general. Currently, the development of visualization techniques has enabled real estate experts to easily visualize and present large amounts of data through graphic methods, presenting spatial data in an easier-to-understand way. This allows not only real estate professionals to better understand the current spatial data, but it also allows stakeholders and decision-makers to better understand the space and make informed decisions. Furthermore, visualization methods can also discover hidden spatial patterns in the data and help all stakeholders to actively identify and further study potential spatial problems and underlying causes. Over the past ten years, the technology for visualization has become very powerful. The push for visualization has been achieved by increasing data sizes and the natural difficulty in extracting useful knowledge from these large datasets. The community of geographic information systems developers has produced some very powerful visualization tools that are both flexible and user-friendly.

Geographic information system software has become more convenient to use, costs are coming down, and more people are becoming familiar with its utility. In the past, development analyses were made by looking at crude delineations of areas drawn on maps. As time goes on, more sophisticated visualizations have been suggested. Color-coded maps were drawn to delineate areas by different characteristics. Now, geospatial analysts have excellent access to visualization techniques. These range from the descriptive uses of the color-shaded area maps of the past to overlaying statistical results to 3-D mouse-driven visualizations. Nevertheless, the knowledge these visualizations can bring is only as good as the capabilities of the mapping tool that is used. Moreover,

all the visualization is still driven by human insight and does not evolve with the use of an algorithm. The new visualization tools being developed now take current geographic information system technology and supplement them. These new tools are complementing GIS work and are currently augmenting their toolset. Their use will only increase in the future. Since we can use visualization to display data in an understandable and informative way for all stakeholders, it is vital for these spatial tools to do their best.

## 11.5. Case Studies of Successful Community Revitalization

The following two case studies are highlighted in this section: Delridge Neighborhoods Development Association in Seattle, Washington, and Urban Strategies, Inc. in Los Angeles, California. Both examples showcase how new investment was brought into their targeted community, creating new opportunities for existing businesses and new ones alike. Those with community stakes engaged in redeveloping areas received necessary support. Housing for those at all income levels was built. Solutions to some of the most challenging social problems were also advanced. Geo-spatial data plays a significant role in aiding these positive community-focused changes.

Delridge Neighborhood Development Association is a public-private partnership that has invested over $40 million in infrastructure and project funding in their community targeted for improvements. Programs and services span affordable housing, economic development, open space/natural area projects, and a range of arts and culture programs. Since 1996, the area's demographics have changed: homeownership has increased, and educational opportunities have been expanded. Over 265 youth are actively engaged in technology, audio recording, dance, and studio projects each year. A charter high school has formed and is in its second year of operation. Conclusion: The decision was made to target the Delridge Rainier Vista Pilot. This was done by first conducting in-depth research using GIS and each dataset. With so many clusters of data points, the list was broad but gave the ability to narrow the data down. Then, contact was made with the multiple fund managers.

### 11.5.1. Urban Renewal Projects

In this section, urban renewal projects and methods were discussed to find out how GS data could provide help for the planning and decision-making of these types of projects. London, Shanghai, Atlanta, Ottawa, and Brussels are several cities among the hundreds of cities all over the world that have submitted their urban renewal data. These projects are all based on 2D. However, functional area data are 3D in most cases. Such industries include urban planning, real estate construction, smart cities, and digital twins. Because the vertical dimension is of great significance in the practical application of building 3D,

it extended from the traditional 2D building GIS to a new 3D model, and the 3D building model is a typical and important issue in GIS.

This paper will use the data with the third dimension to carry on the research and the foundation. 2D original shapefile data will be transformed into 3D data. The most basic unit of urban space is the building. Most of the space in the city is hidden inside the building. The building's shapefile data we can already obtain has the third dimension of height, which is meaningful as the base plane data. With the participation of a large number of professional volunteers, the physical space of the 3D map is presented to users in the form of 3DBM. Its quality and quantity are determined by the ground truth and the volunteers. Based on the analysis framework of dimensionality and monitoring processes, we can see from the start to the end product of the 3DBM of the particular areas.

### 11.5.2. Rural Development Initiatives

There are broad and diverse space and time dimensions to the domain of rural development. Potential community-based research application opportunities for geospatial data include agricultural production, structural and economic changes in rural communities, economic and employment patterns, income distribution, the dependence of non-metropolitan and rural areas on government transfer payments, demographic structure, retirement migration flows and patterns, vacation and seasonal home development, health care, and rural area handicaps, basic and nonprofit services, regional variation in tax structures and tax capacity, and data for community and regional economic development strategic plans. Public and private decisions concerning rural economic development are facilitated by location-specific information about: i) differences in rural communities' resource endowments, ii) rural residents' preferences and constraints, and iii) the rural community and regional market processes that transmit benefits to, and costs from economic development.

Geospatial data has opened the door to a new and exciting tool for the characterization of location and analysis. Community and regional planners and administrators have innumerable location-specific agricultural, socioeconomic, and demographic databases to draw on in crafting rural development policy responses. From how these data can be integrated into automated mapping and facility management systems. Places include large and small towns, cities, fringe, and rural parts of standard metropolitan statistical areas and non-metro counties. Sub-regional economic development patterns are accessible with minimal user instructions. Local data management and systems viewpoints. Computer data terminals provide the ability to locate, review, and update which places are growing. Growth is not just about population; we examine employment characteristics to determine which places are important growth engines. Aggregation

levels are important because measurement or misclassification problems routinely occur. The use of age, sex, and spatial data provides verification procedures so that different observations linked by key data items and locations can be checked to see if data match or if a re-entry error was committed.

Fig 11 . 2 : urban renewal opportunities by combining 3D building information

### 11.5.3. Public Space Enhancements

Enhancement of public spaces is often a major focus in community revitalization efforts. Such spaces can take many forms: parks, plazas, gardens, streets, and waterfronts, to name just a few. Walkability, perceived safety, sense of place, and attractiveness are key elements in assessing the quality of public urban spaces. Geospatial tools can offer valuable support to evaluate such quality and identify potential sites to supply missing elements. Geographic data layers of socio-demographics, past development patterns, land use, and location of facilities could be applied to evaluate walkability, perceived public safety quality, and access to multimodal transportation in the neighborhood. The

quality of public space could be measured by the use of different data sources. Besides the demographic and economic data that can forecast the potential usage of the space, location data that records the actual or previous usage of the space could be further screened by identified use patterns. Also, built environment features and human perception about the quality of space could be recorded or determined with geospatial data sources. Sprawling neighborhoods should create and maintain attractive, safe, and fun "Third Places" for everyone, especially for communal and social purposes that come with no obligation to purchase anything. These places are essential for the vitality and healthy functioning of our communities. Geospatial information could be used to identify the coverage of public and community uses, the quality of public space, user preferences, and accessibility. First, the formation and locations of established and proposed facilities, amenities, and public spaces used for recreational purposes, which support people spending time outside their homes with no minimum expense to use, should be documented by using geospatial data layers. Creation of a positive perception, active programming, and setting the environment to attract social interactions and establish physical or virtual networks should also be considered. Second, demographic and economic characteristics could be used to indicate the potential demand and existing usage of the facilities and third places in the neighborhood. Information such as household income, level of education, number of children, obtained from existing point data of residents or schools where children are estimated to gather, could be used to decide what types of facilities and amenities residents expect and support. Third, land use and real estate data could be used to evaluate current vacancy rates, land use mix, and land use intensity in the neighborhood. Changes in the values of these dimensions may be related to the conditions and vitality of public space. Moreover, property attributes, such as the distance to mass transit, could also assess the pedestrian flow of public space. Finally, location-based social data and crowdsourced data could be used to quantitatively assess the quality of third places in terms of attractiveness, active use, and other social interactions.

## 11.6. Challenges in Utilizing Geo-Spatial Data

There are several challenges in utilizing geospatial data for identifying community revitalization opportunities. Geospatial data is often provided at the first level of SIC codes, and it is not always possible to pinpoint which business it represents. For geospatial data, there is a lack of uniformity of addresses. The same building could have different street addresses in different databases. This kind of data cannot be readily used in township and community planning systems since the data would not easily match with the address systems used in communities or larger regional planning efforts. There is a lack of accessible and integrated data on firms, economic, and poverty indicators at local

levels. Even if such data is available, it poses challenges to be geocoded and made amenable to linking to geospatial information.

While economic data is delivered primarily at the county level and can be requested to be displayed on county maps, local communities often require data to be displayed with state and regional data as part of regional or state development plans. Geospatial data is available mostly in simple and standalone formats. It is important to develop tools to integrate these datasets into a cohesive framework and to allow analyses and policy development in a comprehensive manner. Finally, publishing the spatial data requires professional expertise and can be challenging to produce and manage the contents in a spatial data warehouse.

### 11.6.1. Data Privacy Concerns

The available data from social media platforms provide an understanding of human activities and the context. However, data from social media also present some serious privacy concerns. The danger of people's data being used with malintent, such as criminal surveillance by criminals seeking residents' absence in vacant properties, can also be noted. Malintent can also involve targeting vacant properties for burglary, using youth's tweets about cameras or bike theft, and reports of major disturbances which affect the community, principles of government, and fire department efforts. Additionally, data from social media can never fully represent the diverse population of large geographic areas. Therefore, privacy issues should be evaluated when using community revitalization data from social media.

Publicly available user-generated GIS social media data from different platforms have recently become popular among community revitalization scholars for extracting meaningful place-based knowledge. This data can include people who check in on location-based social networking sites or people who upload geotagged photos on photo-sharing websites. This data can also include volunteered geographical information from GIS for participatory urban spatial planning. Dynamic monitoring of the real world and region-based spatial-temporal analytics offer new opportunities for collecting and analyzing GIS social media data to observe human activities and place-based knowledge. Such data is considered useful for understanding human activities.

### 11.6.2. Technical Limitations

The limitations of using this method are incorporated in its assumptions. First, it was assumed that the visual proximity of a property from its two surroundings of commercial and public property areas would significantly impact the reduction or increase in the

market value. In reality, this may not be the case, given that many additional features and other factors can influence the way this market responds. Future research will reflect these factors, providing richer information and testing broader relevant factors on property valuation. Second, all neighbors are assumed to belong to exactly one of the two chosen groups. This approach was similarly discussed in a comparative method used for scaling the cultural alignment of location, in which the counties were assigned to a coalitional affiliation or showed a unique or dual identity or a multisided coalition of agreement. This and some other issues indicate that the method might be better adapted to the directed network, for instance.

Some other technical limitations should also be considered in our study. The method has been adapted to define a group of nearly planar nodes, whatever the measurement of their height. Therefore, the definition, which is arbitrarily split into an upper and a lower threshold, gives a different partition. We accepted this condition to generalize the method.

### 11.6.3. Interpreting Data Accurately

Interpreting geospatial data accurately is of paramount importance to any analysis. In general, remote sensing information indicates the presence of some attribute (such as vegetation). What an object is or what the attribute represents may not always be clear. Description and assessment of the scene being viewed are just as important as the information itself. For example, a class from an unsupervised classification algorithm may represent areas categorized as agriculture. However, whether those areas are wet or dry, growing vegetables, or if forest clearing for agriculture is occurring is still left unclear. This information may or may not be truly representative of the actual area being measured. Interpretation guidance is also being used more often now through the development of digital globe and very high-resolution information. Crowdsourcing and volunteered geographic information, which yield information of specific interest rather than general attributes, are becoming more common. These are activities in which individuals and organizations collaboratively create, validate, and use geospatial data. Independent sources can also be used to validate accuracy; however, the issue of who determines their accuracy then arises.

The geospatial data community needs to have an open mind with respect to sources of information. Information can come from new and likely unknowing sources, and the scientific community will benefit from these data. Interpreting the resulting information, making sure your conclusions are appropriate, and basing your information on a new project to acquire data that is needed is essential. Talk with experts in the field you are exploring. Pull data together where possible from remote sources. Be critical as well; even data from a source includes errors. Then collaboration and cooperation need to

occur with the broader community so these errors can be corrected or so data can be thought about in a different light.

## 11.7. Future Trends in Geo-Spatial Data Utilization

1 Introduction This chapter reviews key findings from previous studies. It has been noted that there is a clear utilitarian interest and purpose in the generation of geo-spatial data. However, interest alone is insufficient to encourage mass data generation and sharing in this context. There is a need for commensurate returns and benefits for the data shared and utilitarian purposes to encourage widespread data sharing and utilization. The growth and demand for geo-spatial and location-based services will mean an increasing requirement for both privately and publicly generated geo-spatial data. The generation of such data also raises important questions of data governance, control, and data custodianship. The growth and interest in participative citizen science forms of investigation and data generation mean that there is a wider and more diverse range of interest in geo-spatial data.

2 Key Trends and Drivers for the Future in Geo-Spatial and Location-Based Data The future is uncertain, but certain contending features emerge in the growth and interest in geo-spatial and location-based data. These include: The increasing demand and requirement for such data and services, driven by the adoption of broadband or wireless media technologies, mobile devices, and their supporting location technologies and protocols. Further drive and demand will come from the reliance and necessity placed on those location technologies to remain resilient and robust during times of mass casualty or attack. The drive and demand will also be propelled by interest in infrastructure, the environment, and in support of scientific research and outcomes. The growth and increasing usage of location-based sensor services and location-based services found in applications. The growth in these specialist niche services tends to focus on context-based and data mining usages. Examples of such specialist niches can be found in location-based social networks, games, or location-based tourist guides. The drive and interest are predicated on the capability of developing an appreciation of location-related information and being able to ask questions and query information spatially. The widening embrace and deployment of spatial data infrastructures and services to include environmental, scientific, and citizen-generated environmental data. These emerging data generation areas show a rich and varied interest in spatial data themes and questions. The utilitarian and implicit or explicit cost of geographic data production and supply via the applications and services. Economic questions aside, the sheer volume of geo-spatial data demand and production increases the interest in scalability, latency, and efficiency of data supply.

### 11.7.1. Integration with Big Data

Integration with big data is expected to strengthen the value proposition of geo-spatial data even further. Most government and private sector data sets are generated using geo-spatial parameters in the first instance, and in recent years, the processing, analysis, and insights generation are becoming more integrated. At the same time, we see in almost all stakeholder sectors an ability and inclination to analyze extremely large data sets. Investment in solutions that combine the infrastructure to handle all aspects of big data, and in particular, the insights from big geographic questions, should in the foreseeable future result in the harvesting of profitable gains. The basis of using geo-spatial data as an analysis tool is the generation, storage, and analysis of data. In the first instance, big data can be leveraged to assess current and historical positions and to generate patterns that will assist future targeted research and intervention projects. Often, the existing infrastructure to support common elements such as SDI is sized around the levels of inputs needed, for example, for supporting alternative shifts in emerging land reform policies or in migration and health research. Responses are also often limited to the outcomes of this sized SDI platform. However, given access to global and geographic data and the ability to analyze it, it becomes possible to also work backwards into a specific geographic target research output. This should allow the explored results to become more implementable.

### 11.7.2. Advancements in AI and Machine Learning

Advancements in AI and machine learning have made it possible to collect, analyze, evaluate, and display new levels of geo-spatial data and to answer strategic community revitalization questions. Most importantly, we can identify and propose solutions at the moment that matters. Maximizing the potential of geo-spatial data continues to challenge less hurried, more traditional urban planning professionals and their community advisor counterparts.

We directly engage artificial intelligence and machine learning in our efforts to answer the same broad strategic questions, offering an ongoing and evolving library of specific insights based on established data and proposed interventions. As practitioners, we have become ever more conscious, or what we on the team sometimes call "defensively resilient," by making applications that grew from anticipated longer-term geo-spatial data applications and from adapting their use-case applications as those libraries of defensible evidence increased through an ongoing, very much shared infrastructure of shared evidence of evolving successes and dismay inside and outside the community development sector.

### 11.7.3. Community Engagement and Participation

The potential for community engagement and participation using geo-spatial data cannot be underestimated. A research partnership was initiated to gather data from over 300,000 mortgage records in order to make a case for affordable home ownership programs in low- and moderate-income neighborhoods. The translation of this geo-spatial research into maps of affordable home ownership has been a powerful new means of organizing members. The maps themselves have become tools for proactive targeting of neighborhoods for new organizing drives and as a backdrop and supporting documentation for community presentations, actions, and dialogues with local stakeholders.

Conversely, the use of geo-spatial data does not need to be a data-intensive collection exercise. Even when data is scarce, a vision of effective strategies is embedded in the lived experience of the residents. There are many examples of participatory forms of community engagement from informal problem-solving efforts, to formal Block Watch programs, to a variety of GIS applications, that link residents with government to identify issues and to seek solutions for neighborhood improvement. Geo-spatial data has another crucial use in supporting community development.

## 11.8. Policy Implications and Recommendations

Currently in this country, there are numerous reports being researched and issued by prestigious groups. Almost all of them, of special importance to our gathered audience, are centered on the problems of the poor and of blighted, deteriorating areas. But each one is only a mere enumeration of the problems, an almost endless list of valuable suggestions, with precious little said about how to attack the problems or where to begin. It is time to put all of this wealth of revolutionary data to work. This will be the primary subject of interest for this presentation. Data useful for the solution of many of the problems of our times is now available for all the urban areas in our country. It consists of a special type of enumeration and classification that gives us a firm basis for judging the state of our nation's deteriorating urban population and its physical surroundings. Such data is not only essential for allocation and policy decisions at the regional and local levels, but must be made useful to the decision-making process for local actors as well.

Officials have expressed a need many times for assistance in interpreting and applying this information to the alleviation of some of the less soluble and more complicated problems encountered in their tasks. This data cannot provide solutions to many of these problems, for it is primarily a statistical count of a multitude of facts relating to our challenged urban quality of life. As an example, it is easy to indicate which urban areas

contain a certain kind and size of problem, but selection of the optimal policy for a specific problem may be more difficult. By way of this information, however, one can quickly focus attention on those areas that have serious and immediate problems. Such information is required for evaluation of policy strategies, including discussion of specific problems encountered in the planning, implementation, or monitoring of such policies. However, much of the data summarized in these reports does provide the input necessary to the development of procedures, identification of options, and assessment of strategies, as well as evaluation of the implementation of such strategies to alleviate these problems.

### 11.8.1. Supporting Data-Driven Decision Making

Urban decision-making processes are currently being miniaturized because of the growing availability of complex data, particularly in the area of geospatial data. Geospatial data includes a unique geographical location for each object and describes the expression of various geographies. Due to new geospatial and location-based technologies and applications, the depth of geospatial data has rapidly improved in recent years. With the growth of both structured and semi-structured geospatial and location-aware data, new geospatial data ecosystems are emerging, including governments, private companies, and non-profit organizations. In the field of urban studies or public administration, this data is indeed recognized not only for rapid urbanization but for broader community development, growth monitoring, and planning for future urban improvements and infrastructure.

Geospatial data has started to affect urban communities for a variety of purposes: detection of events, risk prevention, monitoring resource use, protection of natural resources, and city revitalizations, among others. In community revitalizations, general processes applied to enhance deteriorated communities and infrastructure integrate social, public, and environmental problems to encourage long-term sustainability of community achievements. Large incentives or opportunities for urban revitalization initiatives, in particular, are often associated with great challenges. Because of the severe economic and social conditions and the difficulty of compiling geospatial data and recognizing signs, the most important challenge of all is how to effectively direct or encourage regeneration support. Digital tools are a strong choice for this goal. With the use of advanced tools for visualization, management, and analysis, particular data sets can be processed to generate measurement results. In practical applications, enhanced planning of regeneration was promoted by this improvement. As a result, decisions can be optimized or consumer demands can be realized along with economic growth.

### 11.8.2. Encouraging Collaborative Approaches

Over the last fifty years, a number of alternative approaches have been developed to encourage and stimulate renewal without dispossession. They largely prioritize mobilizing the community's resources, human and natural, to provide services and to help bring about personal and community change processes. In most inner-city neighborhoods, almost nothing happens without professional intervention of some kind, usually offered by local government or neighborhood organizations. The providers usually maintain their professional control over the situation and have professional assumptions about what is good for the clientele. In contrast, practitioners who use community development approaches usually subordinate their expertise to the residents' needs and are the agents of local residents.

Looking at the history of U.S. inner-city renewal attempts, a question arises as to how the internal efficacy for such renewal can be sustained. If the public record is largely a list of failed projects, why would we wish to continue to repeat these trials? If these efforts have prompted massive amounts of disenchantment, why is there not greater disengagement from the process or of the population? How can citizens remain engaged in that process without losing their capacity to form the basis of civil society? Many citizens have developed the capability to take charge of their personal and community renewing efforts and are starting to generate large numbers of successes in many communities.

### 11.8.3. Funding and Resources for Geo-Spatial Projects

Geographic information systems have become an important research area in social sciences since acquiring, transforming, storing, analyzing, and sharing geographic data requires advanced and expensive technologies and a well-prepared infrastructure. Economic analysis of geographic data is a comprehensive method that includes data collection, data management, data analysis, decision-making, and data sharing; in other words, geographic information systems.

When considered from this aspect, economic analysis of geographic information data includes two main areas: funding of geospatial activities by private, public, and non-governmental stakeholders and the ways to utilize geospatial data for economic activities. Recently, a number of important trends have been observed regarding the funding of geospatial activities. Most of these trends are related to the modernization efforts carried out by national and sub-national governments, regional classification processes increasing in the European Union at a global level, and the spread of internet access.

In earlier times, the biggest problem regarding the financing of geographic information systems was that the costs of data production are high while the related benefits are dispersed. This mainly arises from the disconnection between the financing of data production activities and the financial performance of industries using data. These problems are more critical for basic near-Earth observational data revealing geographical diversity and changes. However, the organization, analysis, and distribution of more detailed and field-specific data are easier and cheaper. For example, as an important subgroup of geospatial data, cadastral data can be commodified. In other words, the institutional framework and the stakeholder relations managing the financing of geospatial activities limit certain policies from changing by affecting the decisions of local governments.

## 11.9. Conclusion

In the United States, the pro-urban philosophy of the 1990s and 2000s has led to policies favoring urban living and city economic development through residential and industrial revitalization. This momentum has been utilized by big businesses to their own advantage, reinforcing social inequality by excluding African-American workers from high-paying jobs and developers from reaping substantial profits from the changing urban environment. African-American workers are still encumbered with higher levels of unemployment and poverty and are still out-migrating from cities fleeing the economic disparity created by the negative impacts of de-industrialization. In addition, the people-using district attracts numerous patrons to share in enjoyment of the urban amenities; surprisingly, many of these patrons find that they are able to locate living wage jobs within the district where urban revitalization, like a form of gentrification, is viewed as the wave of the future.

Data confirm that, despite increases in home median value, population attrition/stability/fluctuation, crime rates, and mobility options, coalitions catalyzing revitalization of the people-using districts were able to utilize targeted community development strategies and appropriate social leverage in advancing job pathways for residents; the research however finds that not all residents were able to access wage-earning opportunities equally. People-using populations in East Harlem, Harlem, and Washington Heights are predominantly Hispanic and African-American and more likely than other New York City’s residents to be foreign-born, young, and not having completed high school study; between 1990 and 2000, these big business districts experienced a population decline caused mainly by reduced birth rates due to reduced fertility rates; all three districts are characterized as having a population aging in place.

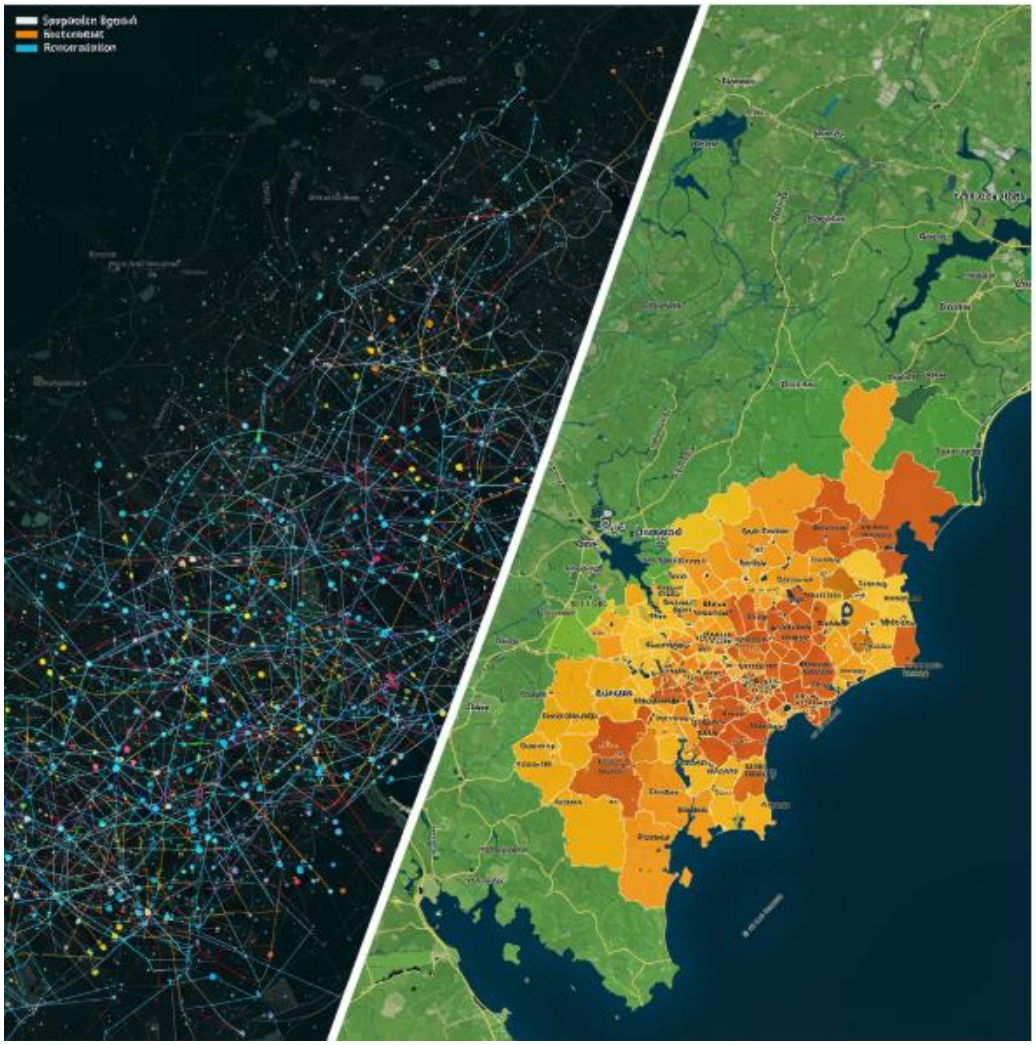

Fig 11 . 3 : Graph Representation of Spatial Data (left) and region map

11.9.1. Key Takeaways and Future Directions

This article explores the connection between physical artifacts, homeland security, and contemporary cultural geography through a case study on the Republic of Trinidad and Tobago. Political conflicts have substantially altered the historical landscape of Trinidad and Tobago. The idea of the State of Israel and Trinidad and Tobago's relationship with the territories of the Palestinian People is a contemporary issue tied to the emerging Muslim diaspora from the Indian subcontinent and the Arab world. Today these artifacts are embodied in the cultural geography of Trinidad and Tobago. This article utilizes geospatial data and applications to uniquely identify artists, cultural institutions, and urban revitalization opportunities present in a Caribbean landscape.

The article departs from thinking about physical artifacts, spatial patterns and traditions, and the means of managing encounters between societies with a common ideological struggle. A preeminent issue is the goal of post-conflict society. Trinidad and Tobago is a small, plural society in the Caribbean Community, which is a conscious multi-lingual, multi-religion/multicultural framework based on institutions, practices, languages and symbol systems adapted to the society's cultural context and administered by elite agents who make short-term policy decisions. The history of Trinidad and Tobago considers matters of diversity and conflict. From the historical cross-references, a mixture of populations, in particular, a multicultural society in the post-colonial era, has favored some over others. The art world is increasingly present in society through a sophisticated range of artists and art. Many of us can observe tangible and cultural facets of a legitimate encounter among populations.

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