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Geo-database for Poor Families to Enhance Poverty Counter Efforts, Evidence from Jordan

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ABSTRACT

The primary objective of this paper is to explore the significance of geographically enabling information systems (with GIS) for human and social service organizations, using Al Al-Salt city center as a pilot study area, and supporting their core missions. GIS can support their business process and workflows. Previous studies have shown that efforts to address poverty were lacking an obvious and comprehensive spatial database. Additionally, the need to update data is crucial for this type of database. A spatial database shall add more clarity and understanding for agencies, associations, and institutions working in this field. On the other hand, conflicting efforts to reduce poverty by different agencies may gradually diminish when they use the same spatial database. Additionally, this will make the decision-making process much more straightforward. As a result, poverty planning could become more efficient. Academics have argued that social work requires mapping. This paper explains how geographic information systems (GIS) meet that need by creating a real Geodatabase for low-income families in Al Al-Salt city center as a pilot study area. The study utilizes a handheld GPS device and a written questionnaire to collect spatial and attribute data from 253 low-income families in Al Al-Salt city center. These families were identified from the National Aid Fund (NAF) database. Although NAF has a database, it needs to be updated and audited, and lacks the spatial locations of low-income families, which this research aims to provide. On the other hand, the NAf database is an Excel sheet containing written addresses of low-income families, rather than (X, Y) locations that are easily accessible for NAF employees and other agencies or individuals seeking to reach these impoverished families. The Geodatabase also offers additional capabilities related to map visualization and the creation of thematic maps. GIS is a vital element in the advancement of information technology (IT) within numerous human and social service programs. The findings demonstrated the potential for estimating and continuously monitoring poverty rates through the application of GIS techniques, thereby supplementing conventional methods of data collection and analysis.

Key words: GIS; Geodatabase; Al-Salt; Poverty alleviation; Mapping poverty.

INTRODUCTION

The World Bank characterizes poverty as a deficiency or scarcity, or the condition of lacking a specified quantity of material possessions or financial resources (World Bank, 2014). Absolute poverty, or destitution, pertains to the deprivation of fundamental human needs, which generally encompass food, water, sanitation, clothing, shelter, healthcare, and education. Relative poverty is defined within a contextual framework as economic disparity within the society or geographical area where

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individuals reside (World Bank, 2011). Poverty represents a highly intricate issue involving numerous socio-economic dimensions.

Poverty alleviation constitutes a fundamental objective and a significant concern for numerous international entities, including the United Nations and the World Bank. The World Bank approximate that in 2008, approximately 1.29 billion individuals were residing in conditions of absolute poverty. Among these, roughly 400 million individuals experiencing absolute poverty resided in India, while 173 million were in China. Concerning regional population percentages, sub-Saharan Africa, at 47%, exhibited the highest incidence of absolute poverty in 2008. Between 1990 and 2010, approximately 663 million people transitioned above the threshold of absolute poverty. Nevertheless, extreme poverty persists as a pervasive global issue, affecting all regions, including developed nations. UNICEF estimates that fifty percent of the world's children, equivalent to 1.1 billion individuals, live in poverty (World Bank, 2010).

Globally, over five hundred thousand social workers and human service professionals aid vulnerable and distressed populations daily. Their clients encompass foster children, elderly individuals, people with mental illnesses, the homeless, individuals with disabilities, and numerous others in need. These professionals deliver their services through a variety of programs operated within government agencies, non-profit organizations, private practices, and other entities. The demand for these programs has surged due to the ongoing global economic crisis and various demographic shifts.

As spatial determinants gain increasing importance in understanding poverty, the utilization of consistent Geodatasets in developing poverty alleviation strategies has become more critical (Henninger, 1998). The effectiveness of poverty reduction initiatives largely depends on the utilization of high-quality data to accurately assess the scope and nature of poverty, as well as to design and implement targeted strategies suited to specific contexts. Nevertheless, efforts to combat poverty frequently suffer from a lack of comprehensive and accessible spatial databases. Furthermore, regular updates to this data are vital to maintaining the database's accuracy and reliability (Hentschel et al., 1989). A spatial database can significantly enhance clarity and comprehension for agencies, organizations, and institutions engaged in this field, thereby reducing discrepancies in poverty alleviation efforts over time.

Moreover, the decision-making process becomes considerably more straightforward. Consequently, poverty reduction planning becomes more efficient. By harnessing the data management, analytical, and visualization capabilities of Geographic Information Systems (GIS), social workers and other human service professionals are better equipped to understand community needs, assess environmental factors—including access to services—deliver services more effectively, and identify instances of fraud and abuse (Tatem et al., 2014).

2 Literature Review

Few studies focus on the effectiveness of the Geodatabase in managing poverty efforts. Recently, new techniques such as GIS have been employed to highlight the spatial dimension of poverty. Urban areas, linked to poverty, have led to the growth of slums, especially in large metropolitan cities. Conversely, poverty first appeared in rural districts after the 19th-century Industrial Revolution in industrialized countries, but it remains widespread in developing nations, particularly in rural regions. Researchers have begun to examine the spatial distribution of low-income families to understand the root causes of poverty, as seen in the study by Al Kaddam & Al Habeas (2010). This study aimed to illuminate urban poverty in southern Jordan by analyzing the factors that influence the poverty levels of urban families, thereby gaining a better understanding of this issue. The study drew several conclusions, notably highlighting a significant link between economic factors and rising urban poverty, as well as the impact of government policies aimed at addressing this issue phenomenon. Another study, conducted by Al Sqoor (1989), focused on poverty regions and the spatial distribution of poverty under the supervision of the Ministry of Social Development.

Furthermore, Levernier, Partridge, and Richman (2000) explored the causes of regional variations in poverty across the United States. They conducted a cross-county analysis that considered spatial factors and how poverty levels differ regionally, aiming to identify the reasons behind these variations. Their analysis relies on poverty

maps of the US. Additionally, Shtayeh (2007) studied urban poverty and its effects on urban development in Nablus. Other research focuses on rural poverty, such as Benson, Chamberlin, and Rhinehart (2005), who investigated the spatial determinants influencing local rural poverty rates Malawi.

Additionally, spatial aspects outlined in the UNDP report (1999) on "Urban Settlements and Poverty," the UNDP (2005) "Human Development Report," and the World Bank report (2004) "Assessment of Poverty in the Hashemite Kingdom of Jordan" are evident. Conversely, Akinyemi (2009) focuses on utilizing spatial data for poverty reduction efforts. The article stresses that consistent spatial datasets are increasingly essential in developing effective poverty reduction strategies. Furthermore, successful programs rely on high-quality data to accurately identify poverty's nature and extent and to design suitable alleviation strategies. It also discusses the potential for sharing and updating geo-spatial poverty data at national and international levels, which supports poverty assessment, mapping, and the development of reduction applications. The survey reveals that the types of spatial data used to address poverty vary and depend on the specific measures of poverty employed by different programs. Lastly, the researcher notes that using spatial data is rapidly becoming the best practice in poverty assessment.

A poverty map, as delineated in Nawar, Abdel-Hameed's 2007 manuscript, constitutes a comprehensive visual representation of the spatial distribution of poverty and disparities within a specific region. It merges individual and household survey data with census information to estimate welfare indicators for small regions, like villages or hamlets (World Bank 2004). Advances in geographic information systems (GIS), databases, and computer-aided software have significantly contributed to the development of poverty maps, which present data through cartographic displays and overlay interfaces that enhance interpretability and comparison. Spatial analysis and benchmarking are also employed to examine the relationships between micro and macro data, considering their geographic locations. In the East End of London, the first poverty map, published in 1889 by Charles Booth, depicts Old Nichol, a notorious slum.

Fig 1 The oldest poverty map, 1889/London

A study by Davis, Benjamin, and Siano (2001) highlights the significance of using poverty maps for obtaining accurate and consistent data. Similarly, Feeney, Williamson, and Bishop (2002) emphasize the role of Spatial Data Infrastructure (SDI) in supporting decision-making related to poverty regions. Gauci and Steinmayer (2005) also point out that poverty maps are valuable tools for designing policies aimed at poverty reduction. Additionally, Aidoo and Govender (2006) stress the importance of the Geodatabase in efforts to combat poverty in Africa. Mistiaen, Özler, and Razafindravonona (2002) discussed mapping welfare in Madagascar, while Snel and Henninger (2002) focused on the spatial distribution of poor populations to facilitate community support and solution development. Later, Snel (2004) developed a poverty-conservation mapping application, asserting that mapping poverty can reduce the effort and cost of poverty alleviation.

3 Goals of the Study

This study primarily aims to demonstrate the importance of utilizing GIS technology in poverty alleviation by creating a Geodatabase for low-income families in the Slat city center region of Jordan as a pilot study. The creation of this spatial database shall unify the efforts of all institutions working in the field by distributing the spatial database through the available network. Updating data for National Aid Fund (NAF) Beneficiaries' families; this includes adding new families or removing others. Additionally, it means changing the attribute or spatial data for these families. In addition, analytical studies using this spatial database with GIS and other software will be more readily available and easier.

Finally, the study aims to distribute this kind of Geodatabase to all governorates of Jordan.

4 Study Methodology & Tools

The study will follow the applied methodology to achieve its goals, focusing on field surveys that include collecting spatial data using GPS devices and administering questionnaires to gather attributes of low-income families in the pilot study area. This will be followed by office work using Geographic Information System (GIS) software to build the Geodatabase with the latest version of ArcGIS 10.3.1 for analysis purposes.

4.1 Define Poor Families

The definition of poverty and the methods used to measure poor individuals are part of a long-standing debate in development economics (Chambers, R., 2006). It is crucial to define the concept of a 'poor family' in this study, as it is key to creating the low-income families Geodatabase. The Department of Statistics in Jordan surveyed poverty using a cluster sampling method in 2008 and 2010, in collaboration with USAID and the Ministry of Planning. According to the 2010 report, the poverty rate in Jordan is 14.4%, with an absolute poverty line of 813.7 JD per person annually and 68 JD per month. For a standard family of 5.4 individuals, this amounts to 4394 JD annually and 366 JD monthly. This study will rely on this absolute poverty line, as it is derived from a trusted scientific survey. The National Aid Fund (NAF) and other government and non-government agencies in Jordan also base their figures on these data. The NAF was established in 1986 (Law no 36) and operates as an autonomous institution under the Ministry of Social Development.

NAF has procedures to support Poor Families. Any poor family can fill out an application at the nearest NAF field office, followed by a face-to-face interview. Social workers visit applicants at their homes to verify the information provided and check submitted official documents. Additionally, NAF collaborates with other government and non-governmental organizations, such as the Social Security Corporation, the Department of Lands and Survey, and the Zakat Fund, to verify applicant information. NAF offers six programs, but this study focuses on the one providing recurrent financial aid, the largest in scope. The fund extends financial assistance to a diverse array of groups, including impoverished individuals, the elderly, divorced women, families caring for orphans (under 28 years old), households with disabled members, families of detainees, foster families, young women, Jordanian women married to non-Jordanians, humanitarian cases, abandoned women, individuals receiving aid or rehabilitation loans, families of seasonal workers, families of missing or absent fathers, and recipients of Handicapped Care Aid, along with other approved candidates. All recipients automatically qualify for health insurance coverage (National Aid Fund, 2011). The fund disburses monthly monetary transfers ranging from JD 40 to JD 180, contingent upon income, assets, and family circumstances. Eligibility requirements include citizenship, residency status, household income below the poverty threshold, and individual assessments of household members. The head of household is responsible for ensuring that children aged 7 to 12 attend school as mandated and must provide evidence within six months that all children receiving aid are adequately immunized.

Income-producing properties, arable land, or a vehicle (unless utilized by a disabled family member) are regarded as disqualifying factors. Any income generated by a family member will decrease the benefit by 25% of the income amount, up to the point where the benefit is eliminated.

According to NAF records (2014), a total of 89,411 families across Jordan benefit from the National Aid Fund's (NAF) monthly assistance, which costs approximately 7.152 million JD each month. About 225,753 individuals receive an average of 31.6 JD from the fund every month, according to NAF figures. The study followed the indicators and standards that NAF relies on. Additionally, it utilized auditing tools to verify the information provided by applicants through field visit surveys, meetings with staff, and questionnaires completed by each applicant. On the other hand, the study aims to identify volunteers and charitable associations working in the district to help any low-income families not registered with NAF attributes. It is intended that once the Geodatabase is completed and published, it will be

easy for volunteers or other agencies to identify and assist new families in need.

4.2 The Procedures:

1-Field work: A well-trained team consists of five social workers and a team leader specialized in GIS and GPS techniques worked to complete the survey for the whole region of Al-Salt city center to specify the spatial and attribute data of all NAF beneficiary families in this region. Fieldwork took about 10 days, considering that the poverty-stricken family's number at least 235. Every trip is calculated based on 25 family points using GPS-enabled devices and questionnaire sheets.

2-Office work: Using ArcGIS software 10.3 to transfer the collected data immediately from the field by coordinating between social workers and the team leader. They build the Geo-spatial database considering its accuracy and consistency. Requested that this step contain:

A- Creation of shape files needed with an accreted spatial reference (UTM). Point layer for NAF Beneficiary families (x, y); point layer for landmarks; raster layer for satellite maps; polygon layer for administrative divisions...Etc.

B- Digitizing the spatial data for all layers; the point coordinates, the address, the pictures, etc.

C- Filling the attribute data from questionnaire sheets.

D- Audit the spatial and attribute data and be sure of its accuracy

E- Create layers from shapefiles.

3-Analytical work: using (GIS technique and other software. This step contains:

A- Symbolize the attributes in the layers by proper symbols.

B- Classification of attributes mainly based on family criteria, depending on fields such as: Income; Cause of Poverty; place of residence; family size; family kind, etc.

C- Create graphs, tables, and reports.

4 Prospect Work: Publishing Geodatabase

The study aims to publish its work on a website or a GIS server after being applied to all governorates of Jordan. NAF could be the host of the server because the data needs to be updated continuously, given that NAF is a governmental authority with the necessary abilities, employees, and authorities to control the server's contents and security. It needs to be updated with the latest data, as well as have links with other related institutions and agencies.

5 Outcomes and results

Scientific outcomes

1- Proving the importance of Geodatabase for poverty alleviation.

2- Production of spatial and attribute database for the low-income families suffers from Poverty in Al-Salt city center region as shown in Fig. 2.

3- Conducting analytical studies of the current and future poverty situation in this region can be done efficiently using this Geodatabase.

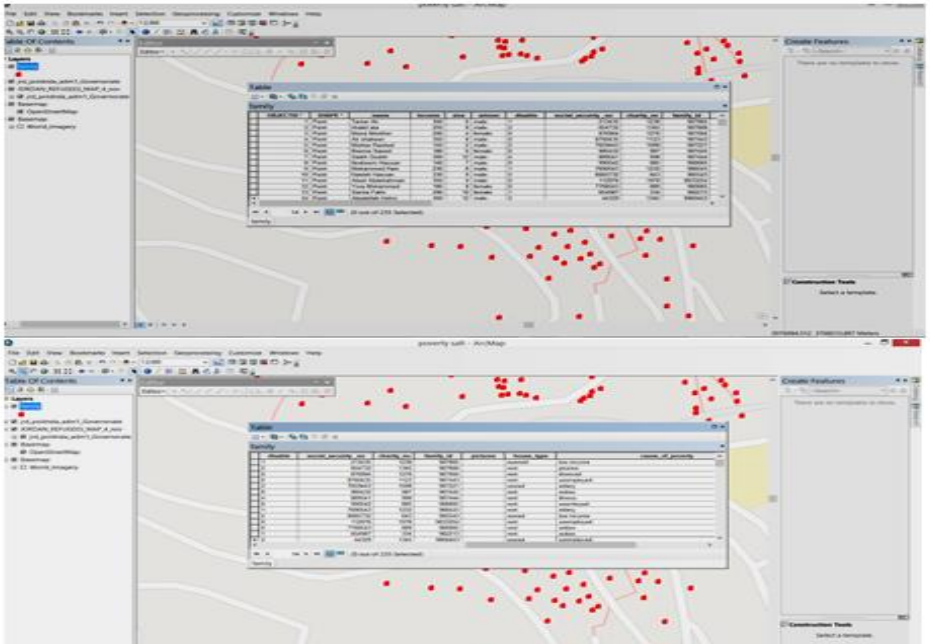

Figure.2: The spatial and attribute data base of Al-Salt City center by ArcGIS 10.3.1

Applicable outcomes

It is expected that all agencies and institutions, including those from the private, public sector, and NGOs, can easily and consistently utilize this Geodatabase of low-income families in Al-Salt city center (Fig. 3). This Geo-Geodatabase can eliminate any conflicts of effort. Every Family suffering from poverty shall receive its human rights to development through projects and programs aimed at poverty alleviation. In addition, these benefits, which occurred at Al-Salt city center, will encourage other districts to implement the same procedure.

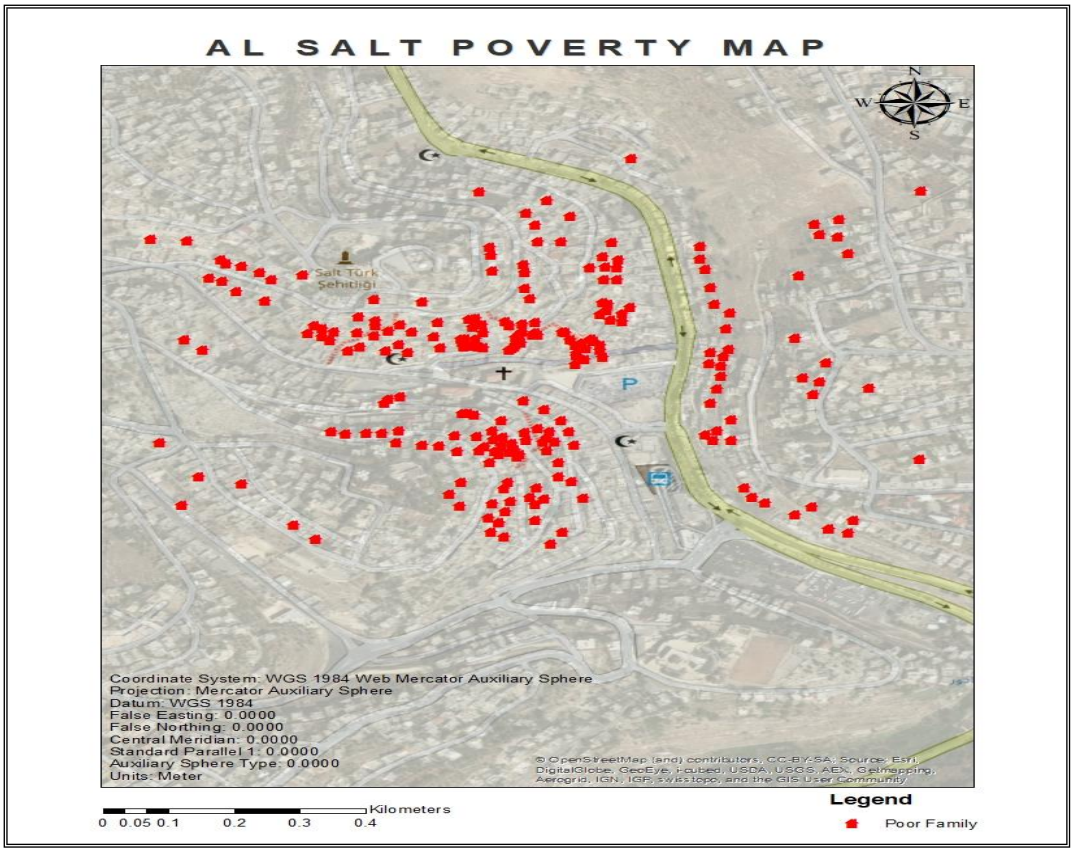

Figure3. Poverty map of Al-Salt city center by using ArcGIS 10.3.1 to identify poor families.

Development outcomes

1. Reaching NAF beneficiary families in the Al-Salt city center region at this stage and all low-income families in all governorates of Jordan in the final stage to enhance poverty alleviation efforts in Jordan. The primary objective is to reduce poverty rates and enhance the quality of life for Jordanians.
2. Increase coordination between all agencies and Institutions working in the field of poverty to reduce poverty rates in Jordan, improve the quality of poverty projects, and reduce the time and cost required for such projects.

6 Recommendations

The study recommends intensively publishing the final Geodatabase for the whole governorates of Jordan on a website or GIS server, as well as a mobile application, once applied to all governorates of Jordan. NAF could be the host of the server since it is an authorized governmental body. The data needs to be updated continuously, as well as having links with other related institutions and agencies. NAF can add and remove beneficiary families straightforwardly. Furthermore, NAF can update the attribute and spatial data of beneficiary families constantly. The website host will control the updates. Publishing shall make it easier to reach low-income families, which were previously difficult to reach, and this Geodatabase will facilitate this by sharing the same data from different agencies. The aid money shall appear and be updated directly in the attribute of the NAF beneficiary families. Other national agencies, such as the Zakat Fund, Hashemite Development Fund, Tekyat Um Ali, Charity associations, NGOs, and international agencies, can also have a link to the Geodatabase for creating.

The study suggests activating a secure e-payment method on this website. It can be related directly to the bank accounts of NAF beneficiary families. The name of the low-income Family may not appear on the public website for security reasons.

Furthermore, individuals, NGOs, and local associations wanted to help poor families can easily communicate with agencies working in the field or with NAF beneficiary families directly through the website. Additionally, they can visit the low-income Family using their (X, Y) coordinates in the Geodatabase directly.

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قاعدة بيانات مكانية للأسر الفقيرة لتعزيز جهود مكافحة الفقر ، دليل من الأردن

رانية جعفر قطيشات

الملخص

الهدف الرئيسي من هذه الورقة موجه بشكل أساسي نحو منظمات الخدمة البشرية والاجتماعية التي تدرك أهمية نظم المعلومات الجغرافية لدعم مهامها الأساسية مع أخذ مركز مدينة السلط كمنطقة دراسة رائدة. أكدت الدراسات السابقة أن جهود مكافحة الفقر تفتقر إلى قاعدة بيانات مكانية واضحة وشاملة. إلى جانب ذلك، فإن الحاجة إلى تحديث البيانات أمر بالغ الأهمية لهذا النوع من قواعد البيانات. يجب أن تضيف قاعدة البيانات المكانية المزيد من الوضوح والفهم للوكالات والجمعيات والمؤسسات العاملة في هذا المجال. من ناحية أخرى، قد يتلاشى تدريجياً التناقض الذي حدث في جهود الحد من الفقر من الموسسات بسبب استخدامها بيانات مختلفة ومتناقضة. علاوة على ذلك، ستكون عملية صنع القرار أسهل بكثير. ومن جهة اخرى، يمكن أن يكون تخطيط الفقر أكثر كفاءة. لقد أكد الأكاديميون أن العمل الاجتماعي يحتاج إلى بيانات مكانية وخرائط. تصف هذه الورقة كيف تملأ نظم المعلومات الجغرافية هذه الوصفة من خلال إنشاء قاعدة بيانات جغرافية حقيقية للعائلات الفقيرة في مركز مدينة السلط كمنطقة دراسة رائدة. استخدمت الدراسة أجهزة GPS التي تم التعامل معها واستبيانًا مكتوبًا لجمع البيانات المكانية والسمات لـ 253 عائلة فقيرة في وسط مدينة السلط. تم التعرف على هذه العائلات من قاعدة بيانات صندوق المعونة الوطنية (NAF) . لدى NAF قاعدة بيانات، تحتاج قاعدة البيانات هذه إلى التحديث والتدقيق وتفتقر إلى الموقع المكاني للأسر الفقيرة التي حاول هذا البحث تحقيقها. من ناحية أخرى، فإن قاعدة بيانات NAF تفتقر الى البعد المكاني للاسر الفقيرة مما يصعب الوصول إليه من موظفي NAF وأي وكالات أو أفراد آخرين يحاولون الوصول إلى هذه العائلات الفقيرة. تمتلك قاعدة البيانات الجغرافية أيضًا إمكانات أخرى تتعلق بتحليل البيانات وإنشاء الخرائط الموضوعية، حيث يعد نظام المعلومات الجغرافي مكونًا رئيسيًا في تحديث تكنولوجيا المعلومات (IT) للعديد من برامج الخدمة البشرية والاجتماعية. أوضحت النتائج إمكانية تقدير معدلات الفقر ومراقبتها باستمرار باستخدام تقنيات نظم المعلومات الجغرافية لدعم الأساليب التقليدية لجمع البيانات وتحليلها.

الكلمات الدالة: نظم المعلومات الجغرافية، قاعدة البيانات المكانية، السلط، التخفيف من حدة الفقر، رسم خرائط الفقر.

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