

Spatialization of social science and public policy and application of GIS

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Abstract: Through spatialization and the application of geographic information system (GIS), social science and public policy making have further integrated data-driven methods, which has promoted the development of more comprehensive solutions to social problems. This paper discusses the application of spatialization and GIS in social science and public policy making, and emphasizes its key role in solving social problems and improving policies. By introducing spatial dimension into the process of research and policy making, researchers and policy makers can understand social problems more deeply and mine key information about groups and regions. In the field of social science, this method helps us to better understand the geographical distribution of human behavior and social phenomena, so as to make better policy recommendations. Governments and non-governmental organizations can also use GIS to accurately locate risks and needs, so as to provide social services and resources more effectively.

1. Introduction

Social science and public policy are important tools for understanding and shaping human society. With the continuous development of globalization, urbanization and technology, social scientists and policy makers are facing increasingly complex and diverse social challenges. In this context, the application of Geographic Information System (GIS) has become a powerful tool, which helps to better understand and solve social problems [1-2]. Spatialization and the application of GIS have emerged in social science and public policy making, providing a new dimension and depth for research and policy decision-making.

Spatialization and the application of GIS are helpful to the formulation of policies to solve complex social problems. Governments and non-governmental organizations can use geographic information systems to optimize resource allocation, plan emergency response, formulate land use policies, and better understand social inequality. By analyzing geographic data, policy makers can better predict future trends and formulate more effective policies to deal with these trends [3]. For example, the health department can use GIS to track the spread path of infectious diseases in order to better prepare for the outbreak of epidemic diseases. In addition, the application of GIS can also promote interdisciplinary cooperation in social science research and policy formulation [4]. Social scientists, geographers, environmental scientists and information technology experts can cooperate and use GIS to study and solve complex social problems. This interdisciplinary cooperation helps to provide comprehensive insight and more reliable data and decision support for policy making.

In this study, we will discuss the application of spatialization and GIS in social science and public policy, and how they have changed our understanding of social problems and the way of making policies. By deeply understanding the application of these tools, we can be better prepared to deal with changing social challenges and find more effective policy solutions. The research and application in this field will continue to bring new opportunities and innovations to social science and public policy formulation.

2. Spatialization and GIS application in social science

Social science, as a field of studying human social behavior and social organization, has been exploring the nature, distribution and causes of various social problems. However, with the rapid development of globalization, urbanization and science and technology, we find that social

phenomena are no longer just abstract concepts, but they have important expressions and connections in geographical space [5-6]. Therefore, spatialization and the application of GIS have emerged as a powerful tool in social science, which is helpful to better understand and solve social problems and provide more accurate and practical data for policy making.

2.1. Spatialization: Linking social phenomena and geographical location

Spatialization is the process of linking social phenomena with geographical location. This means correlating data with geographic coordinates to better understand the distribution, interrelationships, and influencing factors of these phenomena between different geographical regions [7]. Social scientists use spatialization to answer many key questions, such as:

Poverty distribution: By linking poverty rates with geographical location, researchers can identify poverty-stricken areas, which helps governments and non-governmental organizations provide more targeted assistance.

Health inequality: Understanding the differences in health indicators in different regions can help reveal the root causes of social health inequality and improve health policies.

Distribution of educational resources: Linking the geographical distribution of schools, libraries, and other educational resources with students' academic performance can help decision-makers better plan the allocation of educational resources.

2.2. GIS: A sharp tool for data visualization and spatial analysis

GIS is a technology and tool that can collect, manage, analyze and visualize geographic data. It provides powerful analytical ability for social scientists and has the following key applications:

Data visualization: GIS can visually present a large amount of data in the form of maps, charts and images, making it easier for researchers and policy makers to understand the data and discover geographical patterns.

Spatial analysis: GIS allows researchers to conduct spatial statistics and geographically weighted regression analysis to determine the correlation and trends in geographical space [8-9]. This is helpful to reveal the root causes and influencing factors of social phenomena.

Emergency response: Government departments use GIS to track natural disasters, epidemic spread and other emergencies, so as to plan emergency response and resource allocation more effectively.

Spatialization and GIS application have become indispensable tools for social science research and public policy formulation. They enable social scientists to study social phenomena more deeply, and policy makers to formulate policies more specifically to solve social problems. By integrating geographic data and spatial analysis, we can gain more comprehensive and accurate insight and provide strong support for social improvement. Therefore, it is very important to continue to develop and apply spatialization and GIS technology to better understand and improve our society.

3. Spatialization in public policy and GIS application

The formulation and implementation of public policies is a key process to solve social problems and improve public welfare. However, the formulation of effective policies requires a profound understanding of the nature, scope and geographical distribution of social problems. In this context, spatialization and the application of GIS have played an important role in the field of public policy, providing policy makers with more accurate data, visualization tools and analysis methods, and helping to optimize resource allocation and policy making.

3.1. Optimization of resource allocation

The core of a successful public policy is effective resource allocation. By applying GIS technology to resource allocation, governments and non-governmental organizations can better meet social needs, reduce waste and improve service efficiency.

The following are GIS applications in several resource allocation fields:

Infrastructure planning: the government can use GIS to determine the best location of

infrastructure projects to meet the needs of different regions, such as public transportation, medical facilities, schools, etc. [10].

Environmental protection: GIS can help the government monitor the geographical distribution of environmental problems, such as water resources management, land use planning and natural resources protection, so as to better protect the ecosystem.

Emergency response: When a disaster or emergency occurs, the government can use GIS to quickly determine the affected areas, coordinate rescue operations, and allocate resources to minimize losses.

3.2. Support for policy formulation

GIS not only contributes to resource allocation, but also provides strong support for policy formulation. Policymakers can use GIS to deeply understand social problems, predict future trends, evaluate policy effects and formulate more targeted policies.

The following are the key applications of GIS in policy making:

Analysis of social problems: Policymakers can use GIS to analyze the geographical distribution of social problems (such as unemployment, disease spread and crime) and help them better understand the root causes of the problems.

Policy evaluation: The government can use GIS to monitor the implementation effect of policies, such as education reform and medical service improvement. This helps to correct the problems in the policy in time.

Prediction and planning: The government can use GIS to predict future trends, such as population growth, urban expansion and environmental changes, so as to make long-term policy planning.

4. Specific case study

4.1. Application cases of GIS in sociology

Los Angeles Police Department (LAPD) is a successful case of applying GIS technology to analyze crime data. They use GIS to track the geographical location of criminal events, so as to better understand which areas have high-risk crime hotspots.



Figure 1 Crime hotspot map

LAPD collects a large amount of criminal data, including different types of criminal events, time stamps and geographical coordinates. Using GIS technology, they make crime data geographical

and make crime hotspot maps to identify crime high-incidence places (Figure 1). By analyzing crime hotspots, LAPD can take targeted measures, such as increasing the number of patrols and improving street lighting, to reduce criminal activities. The study also provides information for policy makers to improve urban planning and social policies, thus reducing the crime rate.

These case studies emphasize the importance of GIS technology in crime research. By associating geographic data with social factors, researchers and policy makers can better understand the geographical distribution and influencing factors of crime. This information is helpful to optimize the allocation of law enforcement resources, improve community safety and reduce crime rate. In addition, the application of GIS also provides more intelligent and targeted policy-making support for policy makers and helps to build a safer and sustainable society.

4.2. Application case of GIS in public policy

The application of GIS in public health and urban planning has become an important tool to improve urban health, disaster management, health planning and environmental protection. The following will introduce two application cases of GIS in public health and planning to show its key role in solving social problems and improving public welfare.

(1) Surveillance and control of epidemic spread

A city is threatened by the outbreak of infectious diseases, such as influenza or infectious diseases. The health department uses GIS technology to track the spread of the epidemic and assist in formulating coping strategies. The health department collects geographical information about the case, including the patient's address and the location of medical facilities. Using GIS, the health department will visualize these data as an epidemic map, showing the geographical hotspots and trends of case distribution (Figure 2).

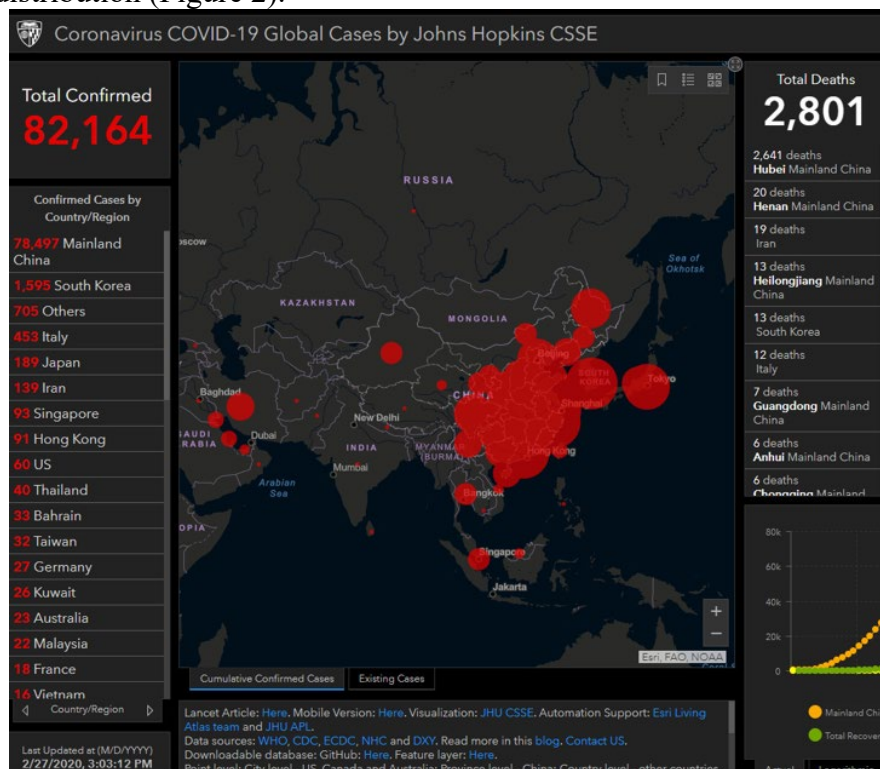


Figure 2 Tracking and counting epidemic situation and infection with GIS technology

Through the spatial analysis function of GIS, the health department can track the transmission path between the source of infection and cases and determine which areas are more susceptible to infection. Based on the analysis results, the health department can allocate resources more effectively, such as vaccines, drugs and medical personnel, to control the spread of the epidemic. This application of GIS enables the health department to respond to the outbreak of infectious diseases more quickly and pertinently, minimize the spread of the epidemic and protect public health.

(2) Urban planning and sustainable development

Facing the challenges of urbanization and population growth, a city needs to plan its future development, including infrastructure, residential areas, green spaces and transportation systems. Government agencies integrate various geographical data, including census, land use and environmental data. Using GIS software, urban planners can establish urban planning models to simulate the impact of different planning schemes on the future of the city.

Using the visualization function of GIS, planners can display planning schemes, help the public better understand planning decisions, and collect feedback. The government and urban planning departments can use GIS to analyze the advantages and disadvantages of different planning options, so as to formulate smarter planning policies and promote the sustainable development of cities (Figure 3).

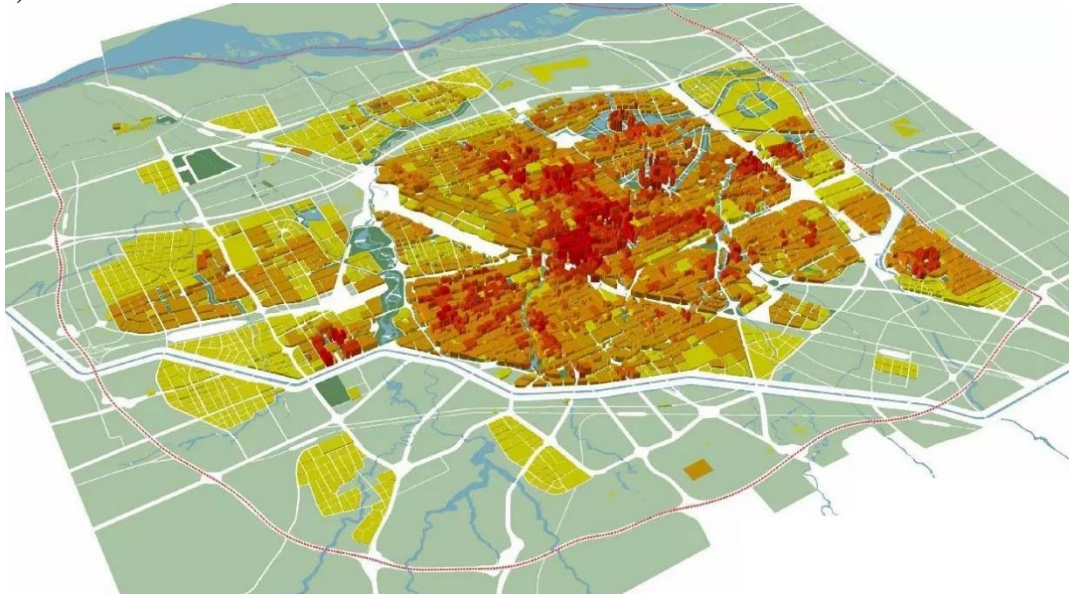


Figure 3 Using GIS for urban planning

This application of GIS is helpful for urban planners to better predict the future of the city and ensure that urban development conforms to environmental sustainability and residents' needs.

The application of GIS in public health and urban planning is helpful to improve the efficiency of urban management and planning, solve social problems more effectively, protect public health and improve urban sustainability. These case studies highlight the potential of GIS technology in solving social problems and making policies, and make important contributions to the sustainable development of cities and public welfare.

5. Conclusions

Spatialization and the application of GIS are of great significance in social science and public policy making. By introducing the spatial dimension into the research and policy-making process, we can understand social problems more deeply and mine key information about groups and regions. Spatialization and the application of GIS provide a powerful tool for social science and public policy, which helps us to better understand and solve social problems. By using these tools, we can formulate policies more accurately, allocate resources more effectively, and better meet the needs of society, thus creating a fairer and more sustainable society.

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