ENVIRONMENTAL JUSTICE SERVED BY POWERFUL S-PLUS AND S+SPATIAL DATA ANALYSIS TOOL RESEARCH

Business Challenge

Environmental justice seeks to ensure that no population is forced to shoulder a disproportionate burden of the negative human health and environmental impacts of pollution or other environmental hazards.

The movement emerged in the early 1980's in response to large demonstrations opposing the location of a PCB-landfill site in a predominantly black community in Warren County, North Carolina. Continued research and public attention raised concerns of the fairness and protection afforded under existing environmental programs. Today, the White House and EPA considers environmental justice to be a high priority to the extent that the Environmental Protection Agency has created an Office of Environmental Justice. Popular culture reflects the public's growing interest in these issues with movies such as "Civil Action."

Frank M. Howell, professor of sociology at Mississippi State University, and John K. Thomas, professor of rural sociology, at Texas A&M University have addressed real-world environmental justice issues with a practical solution by developing an analytical methodology termed "socio-environmental visualization" (SEV). From courtrooms to research facilities, the SEV model has the potential to bring modern scientific statistical analysis to researchers, policy-makers and business decision-makers internationally.

The challenge facing researchers, the legal community, and civic action groups is that inductive procedures alone, such as those provided by maps through GIS, lend themselves to subjective interpretations. "That's where spatial statistics comes in, putting numbers back on the map," says Howell.

SEV methodology also relies on scientific data visualization allowing the researcher to better understand the functional forms of the relationships among variables used in the investigations of environmental inequity. A practical problem is to be able to field the SEV methodology on a common computer platform with near real-time execution so that questions can be answered as research takes place, rather than wait for data-translation from one program to another to be conducted.

Business Solution

The SEV model relies on scientific data visualization and comprehensive data analysis of environmental and sociological variables. The researchers are utilizing EPA environmental monitoring data along with Census Bureau information to create a "proof of performance" for their environmental justice paradigm. After two years of preliminary research, the methodology appears to be a powerful evaluation tool providing analyses with greater statistical confidence than before. The SEV methodology relies on three software packages - ArcView® for GIS, S-PLUS® and S+SpatialStats® - to implement the tools of GIS, scientific data analysis, and spatial statistics into an integrated "real-time" methodology, all on one computing platform.

"We selected S-PLUS because it was the package of choice for modern statisticians that includes the most current statistical models," says Howell. "S-PLUS allowed us to stay within a familiar environment when moving ArcView GIS tabular data back-and-forth for analysis." Moreover, the ability to perform spatial statistical analyses on the data from an ArcView coverage provided the researchers with productivity gains over other software packages which are not integrated into one platform. The software also provided the researchers with a powerful data analysis tool that could provide publication-quality graphics.

"S+SpatialStats provided several benefits to our research. We could read data in and out of the packages without having to import or export data. The module included the most modern spatial statistical models available. And, results could be viewed in ArcView where new variables could be added to enhance the model's productivity," says Howell. Designed specifically for the exploration and modeling of spatially correlated data, S+SpatialStats allowed

researchers to easily access leading statistical models for analyzing geostatistical data, lattice data and spatial point patterns. SEV methodology promises to bring greater scientific credibility to the environmental justice work performed by researchers, the legal community and civic action groups.

Benefits

- Spatial Correlation and Regression
- Point Pattern Analysis
- Exploratory Data Analysis
- Predictive Modeling
- Research Application
- Environmental Research
- Geography

Business Tools

- S-PLUS for WINDOWS
- S+SpatialStats
- ArcView For GIS
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Source: Insightful Corp., 2007