Internet Maps in the Context of Community Right-to-Know versus Public Safety

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As the human race learns to critically evaluate its actions within the earth's environment more closely, the public demands more knowledge about their personal living environments. Maps provide a clear means of showing the spatial relationships between people and the environment and making this information available in the form of maps through the Internet allows large numbers of people to make decisions about what is around them and how it might affect them. In this study, governmental rules are examined that concern mapping hazardous chemical materials and making those maps accessible to the public. The social issue to consider is what specific information to present and what interaction and analysis tools a cartographer provides to the public. As with all types of maps, the purpose of the map must be addressed. For an Internet map, any sinister intent of the user must also be considered. Issues of public safety must be evaluated when dealing with sensitive information. Public safety officials view knowledge about the location of hazardous chemical materials as both a public benefit and risk. This study will show how current governmental rules can dictate the development of an Internet map regarding hazardous chemicals and that Internet mapping methods can be used that lead to public awareness without increasing the risk to the public of possible terrorist attacks.

INTRODUCTION

In *Elements of Cartography*, Robinson et. al.,(1995) state that maps fulfill two important functions:

1. They serve as a storage medium for information which humanity needs.
2. They provide a picture of the world to help us understand the spatial patterns, relationships, and complexity of the environment in which we live.

In this new age of Internet mapping, presenting maps through the World Wide Web (WWW) provides new possibilities for storing information for humanity and providing a clear picture of the world to help us understand spatial patterns. In this context, Internet mapping can be considered a new paradigm in cartographic research – a paradigm that is at present poorly formed with little consensus on its main theoretical underpinnings and principle research themes (see Peterson 1997, Crampton 1999). While the new medium can make maps available to millions of people, the information that they depict may be considered too empowering to individuals with malicious intent. The purpose of this paper is to show how a set of laws intended to help the people of the United States can have a significant effect on the design and functionality of the maps available through the Internet, maps that are designed to provide environmental awareness.

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Hazardous Chemical Mapping

One aspect of environmental policy in the United States is educating the public about environmental issues within their local community. Environ-

mental laws now emphasize the need for public awareness. The rationale for this need is that a citizenry informed about environmental issues will lead to a healthier environment.

Under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) information about the location of chemicals stored in the community is available to the public. EPCRA provides the names and addresses of all the companies and individuals that store hazardous chemicals. Traditionally this information would be given to an individual in a tabular form and it was up to the individual to determine the spatial location of the hazardous chemicals. The spatial interaction between hazardous chemicals and the public is important in understanding and improving environmental conditions in a local community. Internet maps can be very beneficial in satisfying the public's right-to-know and help individuals make informed and independent decisions about hazardous chemicals in their community.

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If a state or county agency were to satisfy the public's right-to-know through an online Internet mapping application, the resulting map must not violate the Chemical Safety Information Site Security and Fuels Regulatory Relief Act of 1999 (CSISSFRRA). The interrelationship between EPCRA and CSISSFRRA control what hazardous chemical mapping content and functionality a cartographer can include in an Internet mapping site. Before one tries to understand these Federal Acts and their effect on Internet map design, a brief review of the hazardous chemical mapping literature will show the evolution of ideas that lead to these Internet map use issues.

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In 1994 Dymon reviewed the use of maps in the hazardous chemical management practice stipulated under the 1980 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and a later amendment by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Title three of SARA (SARA III) is the Emergency Planning and Communities Right-to-Know Act (EPCRA). In brief, EPCRA says that states are responsible for creating emergency response plans. Under EPCRA each state has a state emergency response commission (SERC). These state commissions identify and put into place local emergency planning committees (LEPC). The LEPC's have the responsibility for designing and distributing local emergency plans. Part of this emergency planning process is tracking hazardous chemicals stored and used by industrial companies and individuals. In addition to tracking hazardous chemicals in the community, the LEPC does risk assessment plans and facilitates the organization of emergency responses during hazardous events. The information used in this planning process is gathered from local industrial facilities that use large amounts of hazardous chemicals. This hazardous chemical data can be stored and analyzed by the Computer Aided Management of Emergency Operations (CAMEO) software system. CAMEO was created originally by the National Oceanographic and Aeronautic Agency (NOAA) and later updated by NOAA and the EPA. The initial intent of CAMEO was to support the EPCRA planning mission (Monmonier 1999).

Monmonier (1999) discussed how the State of New York's Emergency Information System (EIS) uses automated mapping algorithms that combine the data collected by the LEPC, and dispersion models such as Areal Location and Hazardous Atmospheres (ALOHA) and Complex Hazardous Release Models (CHARM). These models calculate the spatial extent of the risk to humans that a chemical release would create (Figure 1). The automated mapping technology is intended to aid in the allocation of resources in the event of a hazardous chemical emergency.

Both Dymon (1994) and Monmonier (1999) discuss how maps play a key role in the management of hazardous chemical events. In this role, maps are private tools to be used by the LEPC and emergency response personnel. The focus of the study is on what can and should the public know about hazardous chemicals before chemical emergencies.

"By allowing the public to know what types of hazardous chemicals are in their local environment, the community can make informed decisions . . ."

The central issue is the balance between the public's right-to-know and public safety. As suggested above, the public is entitled by law to know what types of hazardous chemicals are being used in their community. By allowing the public to know what types of hazardous chemicals are in their local environment, the community can make informed decisions regarding planning, zoning and environmental policies. Communities can also protect themselves from unwanted hazardous chemicals.

The second issue that must counterbalance the communities' right-to-know is the Chemical Safety Information and Site Security and Fuel Regulatory Relief Act of 1999. In short, by allowing all information to be available to the public, some in the community are given information that can be used to plan and carry out terrorist acts.

Chemical Safety Information and Site Security and Fuel Regulatory Relief Act of 1999

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A new source of information being gathered and distributed by the Environmental Protection Agency (EPA) is the Risk Management Plan (RMP). The RMP is mandated by the Clean Air Act (CAA) under section 112 (r). The RMP must be submitted to the EPA by industrial facilities that handle large quantities of hazardous chemicals. The initial phase of the RMP*Info program is the creation of a national database containing all the information for the EPA Risk Management Plan Form (EPA 1999).

Several sections of the RMP document are for Off-Site Consequence Analysis (OCA). The OCA information shows how a company plans to handle the worst case scenario for chemical accidents, alternative releases, flammables, and flammable alternative releases. The EPA sees OCA data

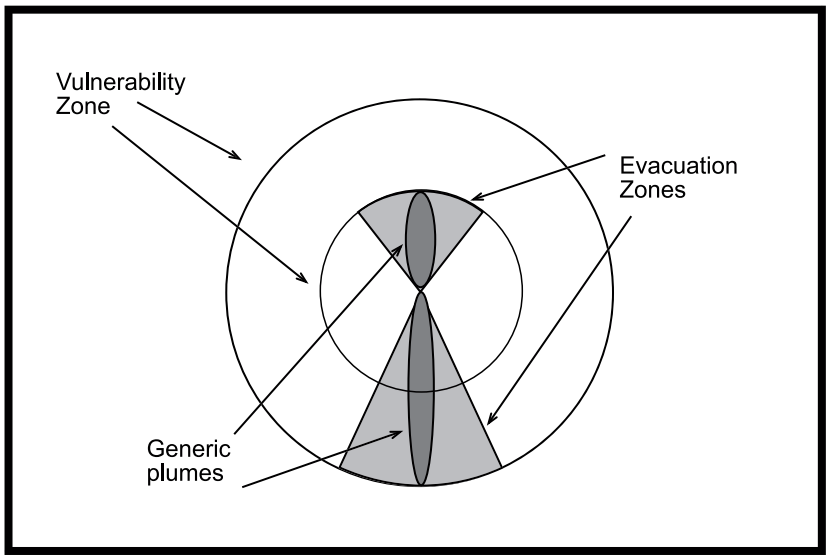

Figure 1. An example of graphic information restricted from Internet distribution by the Environmental Protection Agency. The graphic was first published in Cartographies of Danger *- Monmonier 1997). In Monmonier's (1997) book, this graphic illustrated how local emergency management staff could visualize danger zones during a hazardous chemical release.*

as important for community awareness but also useful for possible terrorist activities.

With accurate OCA data, local emergency management groups and concerned citizens can make improved decisions before and during hazardous chemical events. Dymon (1994) and Monmonier (1999) illustrate some mapping activities that aid local emergency management groups and local citizens to visualize and understand the risk and chemical events in their local environment. Providing access to this data falls in line with the purpose of EPCRA, however, the EPA is concerned about the intent of individuals given access to this information. The EPA and the Department of Justice have determined that terrorists could use this planning information to identify and target sites with the greatest potential for damage to the public. Governments and individuals have long used maps to plan hostile actions so it is not unexpected that an Internet map depicting hazardous chemical site information could aid in selecting the target for a terrorist act.

". . . the EPA is in the process of establishing 50 map-reading rooms across the United States."

The EPA and DOJ have determined four methods of distributing RMP data that will be a means of limiting access to the information by terrorists. First the EPA is in the process of establishing 50 map-reading rooms across the United States. The purpose of these map-reading rooms is to provide access to sensitive RMP documents in paper form. Individuals are limited to ten chemical sites per month and all the chemical sites within their community. Visitors to the map reading room are not allowed to mechanically copy the information but are allowed to take notes on the RMP data.

Secondly, enhanced access to local RMP data may be available by SERC and LEPC. A state SERC and/or local LEPC can establish a read-only map-reading room similar to the federal map reading rooms. These enhanced local access rooms will only provide RMP information to people living in or working within its geographic region. Individuals can only view RMP information of the local area. If an individual wants to view RMP documents from outside the local region, they must go to a federal map-reading room.

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A third method of communicating information to the public under CSISSFRRA is the Vulnerable Zone Indicator System (VZIS). The VZIS system was started for public use in October of 2000. The intent of the VZIS system is to inform the public whether a specific address falls in a vulnerable zone. A vulnerable zone is the area falling inside the worst case or alternative release scenarios from RMP facilities. Vulnerable zone calculations and some of the data used to calculate vulnerable zones are part of the OCA data that CSISSFRRA is attempting to control. CSISS-FRRA allows an exception for distributing OCA over the Internet for this particular method. Individuals will be able to use this restricted OCA information to determine what RMP facilities are affecting the queried address. The EPA, SERC, or LEPC fulfilling the request will provide the inquirer with names of the chemical facilities affecting the address and refer them to the RMP*Info for more information. The request can be submitted and returned via electronic mail or other means.

"The potential benefit to public awareness of the new information gathered under CSISSFRRA is apparent."

The last way that the EPA is providing RMP information to the public is through the RMP*Info World Wide Web site. The RMP*Info site provides all the information from the RMPs to the public. RMP*Info gives online access to RMP information except restricted OCA data. Table 1 lists the information that are allowed and restricted for Internet distribution.

The potential benefit to public awareness of the new information gathered under CSISSFRRA is apparent. The United States government, however, has attempted to restrict the use of this information for terrorist acts. The following example is meant to show how an Internet map can

meet the needs of public awareness without putting the public at a greater risk for terrorist acts.

In the context of the Internet Map example for Greene County, Missouri, LEPC (Figure 2), the following issues must be considered. First, some specific factual information can, and some can not be distributed over the Internet (Table 1). In addition to this factual information, this legislation makes it illegal to provide the interaction tools to derive the worst case scenario. Both Dymon (1994) and Monmonier (1999) show how cartography and GIS can quickly calculate OCA information for the use of emergency response planning. Under the new CSISSFRRA, some interactive Internet map functions appear to be a violation of the law.

Internet Map Design Process for Hazardous Chemical Mapping

The specific intent here is to describe when Internet mapping is controlled and limited based on CSISSFRRA. When setting out to make this Internet map of hazardous chemicals in Greene County, Missouri, the preliminary was to make an Internet map with as much information and as many analysis functions as possible available to the public without violating the CSISSFRRA. Figure 3 shows the steps in the process of making the Internet map. Once the primary idea was established, the design and implementation of an Internet map began.

Sources of Sensitive Hazardous Chemical Data

The data collected for the project came from sources that do not violate the intent of the CSISSFRRA law. Table 2 provides a list of the different data

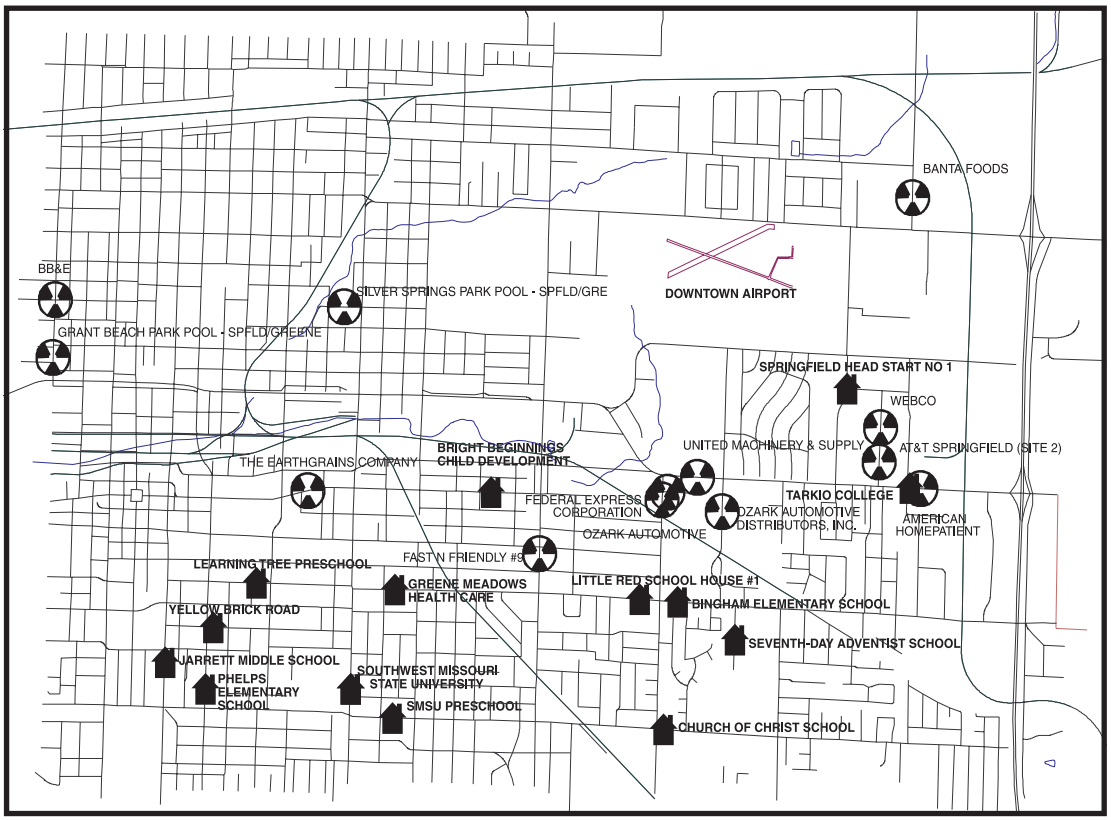

Figure 2. An illustration showing a hazardous chemical map. The map is generated from an Internet map file.

and interactive functions considered and/or used on the Greene County LEPC Internet map. The majority of the hazardous chemical information for the Internet map came from the Greene County LEPC. The Greene County LEPC stores hazardous chemical data in the CAMEO software. It is important to remember that this information was collected under the EPCRA and not CSISSFRRA. The locations of the hazardous chemical sites are recorded by address.

In addition to the hazardous chemical information, demographic information such as population densities and race characteristics were gathered. The Greene County LEPC also maintains an address database for populated places. This was the first issue of concern regarding the CSISSFRRA. One of the RMP items not allowed for Internet disclosures are public receptors. Public receptors and populated places are conceptually the same thing. Because the populated places came from a source outside of the RMP OCA data, they were added to the geographic database. If the only available source of the information was the RMP and it was protected by the CSISSFRRA, then that data was excluded from the geographic database.

Internet Map Functionality

In addition to the map content, the CSISSFRRA also restricts the tools to derive specific information. The issue the government is concerned about is public safety from terrorist acts. The primary functions that were restricted were ones that could be used to calculate damage totals. An example would be a set of functions that calculated the maximum number of people that could be killed if a specific site were bombed. The incorporation of modeling functions similar to ALOHA and CHARM was considered illegal. One specific function that was considered but not implemented for legal reasons was proximity and spread of hazardous chemicals (Monmonier 1997). However, many Internet map functions were added such as hypertext, zoom, panning, identify, and variable theme display, since they were considered legal.

Conclusions

Over the past 15 years hazardous chemical mapping has been used for planning and preparedness. The proactive use of maps in the industry and for emergency responsiveness has led to safer and more environmentally responsive activities. Mapping has provided the public with a better awareness of the spatial location of stored hazardous chemicals in the community. The United States government has mandated that information be provided to the public under EPCRA.

The hazardous chemical community has identified the Internet as a tool that will improve public awareness and preparedness. Yet the government also sees the Internet as a risk to public safety. Providing detailed data about hazardous chemical sites along with spatial analytical tools can aid individuals in planning terrorist acts. Because of this concern, the CSISSFRRA final ruling was implemented to restrict some OCA data from easy access. One of the specific restrictions was placed on the Internet distribution of data. By restricting Internet transfer of data, the government has limited the message and functionality of a hazardous chemical map on the Internet.

With careful consideration of CSISSFRRA and EPCRA, cartographers can make an Internet map that provides the public with information about hazardous chemicals. The example in this study shows that an Internet

Information Not Allowed on the Internet

- Chemical name
- Scenario
- Quantity released
- Release rate
- Distance to endpoint
- Estimated residential population within distance to endpoint
- Public receptors within distance to endpoint
- Environmental receptors within distance to endpoint
- Graphic information

Information Allowed on the Internet

- Percent weight of chemical (if in a mixture)
- Physical state
- Model used
- Release duration
- Wind speed
- Atmospheric stability class (A-F)
- Topography
- Passive mitigation considered
- Active mitigation considered
- Endpoint use

See Risk Management Plans document for the EPA Form 8700-25.

Table 1. Off-site Consequence Analysis Information from Risk Management Plan

"The hazardous chemical community has identified the Internet as a tool that will improve public awareness and preparedness."

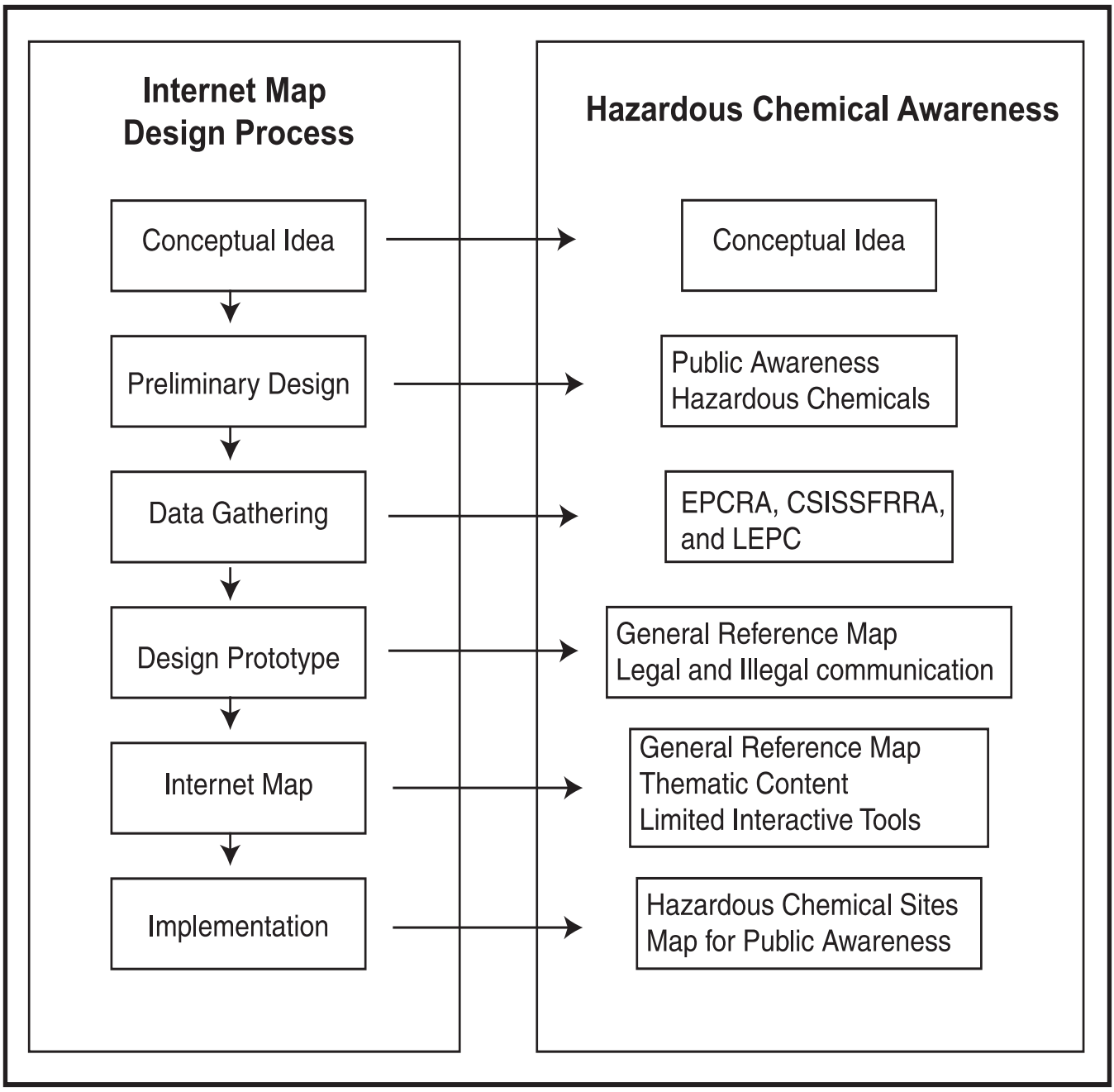

Figure 3. The conceptual process for making an Internet map is illustrated. In this process, issues regarding hazardous chemical mapping are highlighted.

map in the spirit of community-right-to-know can be designed without violating CSISSFRRA. At present, it is not clear whether this restriction on information and its subsequent effect on cartographic communication will provide the desired benefit.

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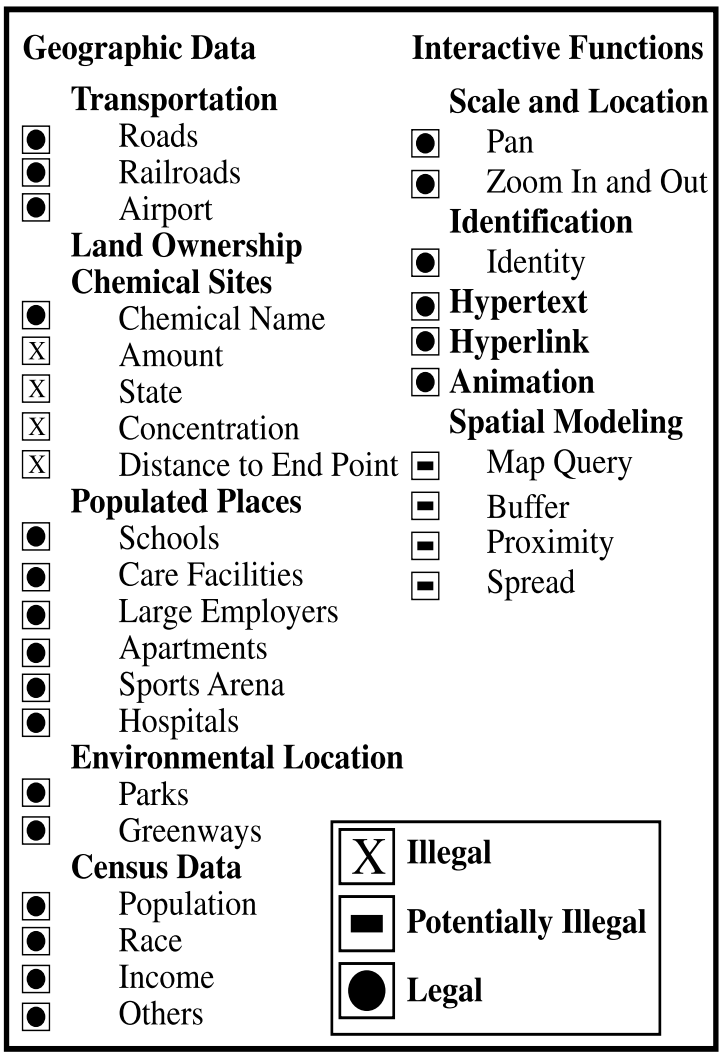

Table 2. Geographic Data and Interactive Functions Considered for Internet Map.

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