

6-14-2008

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Recommended Citation

DiBiase, David; Harvey, Francis; and Wright, Dawn, "Case study: Low-level Radioactive Waste siting map" (2008). *Ethics in Science and Engineering National Clearinghouse*. 281.

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Case study: Low-level Radioactive Waste siting map

Version 0.1 • June 14, 2008

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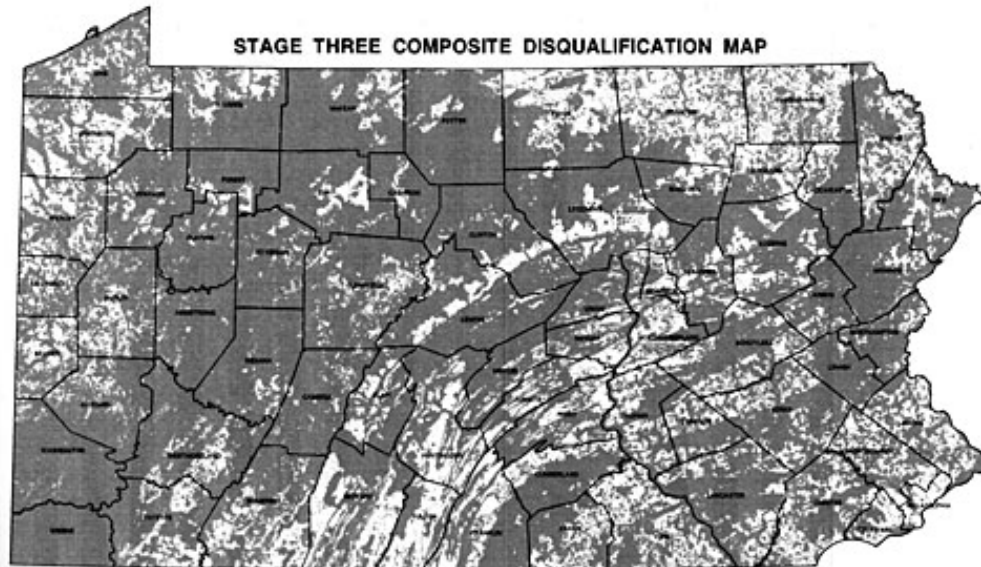
Reviewers: Michael Davis (Center for the Study of Ethics in the Professions, Illinois Institute of Technology), Chuck Huff (Department of Psychology, St. Olaf College), and Matthew Keefer (Division of Educational Psychology, University of Missouri-St. Louis).

This work was supported by National Science Foundation grant # GEO-0734888. See below for terms of use.

Case (for presentation to students)

The Pennsylvania Department of Environmental Protection (DEP) hires a contractor to identify potential sites for a 500-acre storage facility for low-level radioactive waste (LLRW). In collaboration with the DEP the contractor assembles a statewide GIS database that includes the geographic distributions of pertinent geological, hydrological and land use criteria. The contractor proposes to use overlay analysis to disqualify unsuitable areas. For example, areas characterized by any combination of permeable bedrock, excessive slope, or proximity to key water resources or protected lands (among other factors) will be deemed unsuitable.

The project involves three stages of screening for unsuitable areas: statewide, regional, and local. Each stage involves data fusion and analysis at larger map scales and greater detail. Public hearings are held at each stage to afford residents opportunities to ask questions about which areas have been disqualified, which are still in consideration, and why. The contractor produces reports for the hearings that explain the screening process and illustrate the geographic distributions of pertinent criteria and disqualified areas. By stage 3, three quarters of the state's land area are disqualified. The state agency hopes that communities in areas not yet disqualified will volunteer to host the facility in return for financial incentives. Most residents who attend the hearings, however, are determined to keep the proposed facilities as far as possible from their backyards.



Areas (in gray) disqualified as potential sites for a low level radioactive waste storage facility. Disqualified areas depicted on a small scale map (original 1:1,500,000) mask small suitable areas large enough to contain the 500-acre facility (Chem-Nuclear Systems, Inc., 1994).

A GIS analyst employed by the contractor is assigned by her supervisor to produce a statewide map showing areas disqualified after stage 3. A requirement is that the map be reproducible by black-and-white xerography (photocopy), and that it fit on a 11" x 17" page so that it can be folded into a page-size (8.5" x 11") report. The GIS analyst calculates that 1:1,500,000 is the maximum map scale at which the entire state can be shown on an 11" x 17" page. At this scale, some "islands" of potentially suitable areas surrounded by disqualified areas but large enough to contain a 500-acre facility will be too small to see. When the analyst explains this to her supervisor, he suggests that she include on the map a disclaimer stating that "it is possible that small areas of sufficient size for the LLRW disposal facility site may exist within regions that appear disqualified on the map. The detailed information for these small areas is retained within the GIS even though they are not visually illustrated."

References

- Chem-Nuclear Systems, Inc. (1994a). *Pennsylvania low-level radioactive waste disposal facility site screening interim report, stage three -- local disqualification*. Harrisburg PA.
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- Chem-Nuclear Systems Inc. (1996). *Community partnering plan: Pennsylvania low-level radioactive waste disposal facility*. S80-PL-021, Rev. 0.
- DiBiase, David (2008). *Nature of geographic information*, Chapter 9: Integrating geographic data. Retrieved 14 June 2008 from <http://natureofgeoinfo.org>
- Monmonier, M. (1995). *Drawing the line: Tales of maps and carto-controversy*. New York: Henry Holt.
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Resources for teachers

Suggested discussion points

1. Which of the GISCI Rules of Conduct pertain to this case?
2. What obligations does the GIS analyst have society, to employers and funders, to colleagues and the profession, and to individuals in society?
3. Does the supervisor's suggestion fulfill the GIS analyst's obligations?
4. Should the GIS analyst produce the small-scale state map with the disclaimer as instructed?
5. What practical alternative solutions might the analyst suggest?

Relevant GISCI Rule of Conduct

Section II, Number 1: "All data shall have appropriate metadata documentation sufficient to meet the minimum standard as stated here. All data to be published for general public consumption shall note: 1) source(s) of data or at least from whom you obtained the data, 2) date(s) collection/aggregation of data or at least the date you obtained the data, 3) projection, and 4) author/compiler's contact information or other contact information."

Epilogue

Unfortunately for the contractor, alert residents recognized the shortcomings of the small-scale map, and newspapers published reports accusing the out-of-state company of providing inaccurate documents. Subsequent maps were produced at a scale large enough to discern 500-acre suitable areas.

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