### Abuse v. Care of Land, Water, and Air, 1990-2015: The Doomsday Map and Stewardship Map Concepts as Compelling Arguments to Retrospectively Mine the Popular Literature for GIS Nuggets

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ABSTRACT. This paper encourages and supports mining the popular literature – newspapers, magazines, television, radio, and all other forms of media – for GIS nuggets, that is, GIS findings which serve three related functions: designing and developing geographic information systems technology; defining and elaborating geographic information science; and, using geographic information systems technology and geographic information science. Organized around the concepts of the Doomsday Map and the Stewardship Map, media articles on the abuse versus care of land, water, and air resources over the 25 years between 1990 and 2015 provide the basis for questions to guide retrospectively mining for GIS nuggets: Who caused the change from abuse to care to occur, or not? What caused the change from abuse to care to occur, or not? When did the change from abuse to care occur, or not? When did the change from abuse to care occur, or not? How did the change occur, or not? And, for each of those questions, Was GIS a factor? Media reports confirm that it is critically important to retrospectively mine this body of literature for GIS nuggets, and provide suggestions about how the mining process could be designed.

**KEYWORDS**. Air Resources, *AutoCarto Six Retrospective*, Content Analysis, Doomsday Map, Eco-Development; Environment, Esri, Geo-Factor, Geographer's Lament, Geography, Geographic Information Systems (GIS), Geographic Variables, Geospatial Data, Geospatial information, Geospatial Knowledge, GIS Applications, GIS Day, GIS Findings, GIS Nuggets, GIS Technology, GIS Uses, Geographic Information Science (GISc), GIScience Methods, GIScience Operations, GIScience Techniques, Government Land Resources, Literature Mining Processes, News Headlines, News Media, Oversight Agencies, Popular Literature, Project Design, Research Colloquium, Research Curriculum Design, Research Design, Research Methodology, Research Mission, Resource Abuse Practices, Resource Care Practices, Retrospective Approach, Retrospective Research Design, Spatial Trend line Analysis, Stewardship Map, Water Resources, WCED.

#### 1. GIS Nuggets = Significant Findings from Retrospective Research

The definition of GIS nuggets was initially made available in the *Guide for Papers on Using the Retrospective Approach to Mine for GIS Nuggets*<sup>1</sup> (Wellar 2014), and is the initial design production for the Esri-GIS retrospective project.

Readers wanting details on what is meant by "mining for GIS nuggets" are referred to four tables in the *Guide* which provide the parameters for conference presentations:

- Table 1. Examples of <u>doing</u> in research and <u>doing</u> in GIS upon which to base conference papers.
- Table 2. Prescribed objects of attention for conference papers.
- Table 3. An indicative list of principal GIS topics for the Conference on Using the Retrospective Approach to Mine for GIS Nuggets.
- Table 4. A list of question-based topics for the Conference on Using the Retrospective Approach to Mine for GIS Nuggets.

This paper is the second production prepared for the Esri-GIS retrospective project, and is written in response to two related concerns about more direction being needed for authors of presentations on the topic of using the retrospective approach to mine for GIS nuggets.

First, several dozen core members of the generation which sponsored much of the work in GIS over the past 30 years expressed support for continuing and expanding the retrospective research that was launched with the AutoCarto Six project<sup>2</sup>.

However, a number of them also observed that this kind of research involves statement of problem considerations, and research design aspects, which are quite different from much of the recent GIS research in government, business, or academe. It was suggested that In addition to materials to be presented during the research colloquium, it would probably be helpful to provide presentations and/or papers which describe <a href="https://www.mean.org/wigness/">why retrospective research in the GIS field is important.</a>

Second, it was also observed that the literature on the methodology of <a href="https://how.no...">how.</a> to use the retrospective approach to mine for GIS nuggets is relatively thin. Again, it was suggested that in addition to materials to be presented during the research colloquium, illustrative papers might be necessary to provide guidance for potential contributors, and especially for contributors who are new to or have limited experience with the retrospective line of inquiry.

Those are very instructive comments which bear directly on the success of the Esri-GIS retro project, and hence this paper.

For reasons which are given throughout the following pages, I use headlines and stories in the popular literature as the vehicle for explaining why and how the retrospective approach could be, and in my opinion should be used to mine various kinds of literature for GIS nuggets. I begin by recalling what is meant by GIS nuggets, and thereby provide a context for making the connection between introducing the Doomsday Map Project at conferences *circa* 25 years ago, and re-visiting it for the present colloquium on using the retrospective approach to mine for GIS nuggets.

As stated in Figure 1, GIS nuggets are <u>findings</u> from the literature or other sources which serve one or more GIS purposes. The three core, related missions in Figure 1 which are served by GIS nuggets are from the *Guide for Papers on Using the Retrospective Approach to Mine for GIS Nuggets*.

#### Figure 1. GIS nuggets defined

GIS nuggets are <u>findings</u> from the literature or other sources which serve three core, related missions:

- M1. Designing and developing geographic information systems technology;
- **M2**. Defining and elaborating geographic information science;
- **M3**. Using geographic information systems technology and/or geographic information science.

The task of this paper, therefore, is to re-visit the Doomsday Map Project as a case-inpoint for using the retrospective approach to mine the popular literature for nuggets which serve a purpose stated in Figure 1. General nuggets of possible or probable value include those listed in Table 1.

The specific findings obtained or proposed as a result of using the retrospective approach to mine the Doomsday Map materials is, of course, a more definitive line of inquiry. Clues, hints, pointers, indications, threads, suggestions, etc., about hundreds of such potential findings and sources of findings, are contained in tables 1-4 in the *Guide for Papers on Using the Retrospective Approach to Mine for GIS Nuggets*.

With the GIS nuggets context in place, the next section recalls the Doomsday Map Project for some readers and introduces it for others. In order to make the proper case on behalf of retrospective research, both background and lead-in details are required to explain using the Doomsday Map Project as my "literature guinea pig".

### Table 1. Possible nuggets derived from using the retrospective approach to examine "the literature"

- 1. New or different reasons to add to GIS technology;
- 2. New or different ways to add to GIS technology;
- 3. New or different reasons to add to geospatial data:
- 4. New or different reasons to add to geospatial information;
- 5. New or different reasons to add to geospatial knowledge;
- 6. New or different ways to add to geospatial data;
- 7. New or different ways to add to geospatial information;
- 8. New or different ways to add to geospatial knowledge;
- 9. New or different uses of GIS technology;
- 10. New or different uses of geospatial data;
- 11. New or different uses of geospatial information;

- 12. New or different uses of geospatial knowledge;
- 13. New or different uses of GIScience research methods;
- 14. New or different uses of GIScience research techniques;
- 15. New or different uses of GIScience research operations

To clarify for readers who may be puzzled by the use of quotes for "the literature" in the heading for Table 1, I wish to signify that the literature in this project refers to nine different bodies of literature which are identified in the *Guide for Papers on Using the Retrospective Approach to Mine for GIS Nuggets* (Wellar 2014).

For convenience, I note that the bodies of literature include learned; popular; legal; regulatory; oversight; professional group; public interest group; special interest group or vested interest group; corporate/institutional-public; and corporate/institutional-private, plus other productions.

All bodies and sub-bodies of the listed literatures are candidates for being retrospectively mined for GIS nuggets. Popular literature is the focus of this paper, with emphasis on newspapers since they were the popular medium of primary interest when assembling materials and beginning to elaborate the Doomsday Map concept in the 1980s.

#### 2. Background of the Doomsday Map Project

The Doomsday Map Project was developed in the mid-1980s as an element in urban geography, urban and regional planning, GIS, and research methods courses that I taught at the University of Ottawa. It was introduced into the broader public domain about 25 years ago in conference presentations, proceedings papers and media stories, a selection of which are included as references (MacGregor 1990; Wellar 1988, 1989, 1990a, 1990b; Wellar, Parr & Somers 1990).

Now, 25 years later, and with a great deal of hindsight from which to benefit, I am discussing why and how the Doomsday Map Project and, by extension, similar projects of years past for any body of literature, warrant retrospective examination as potential sources of the kinds of GIS nuggets identified in Table 1.

The thesis behind the Doomsday Map Project (DMP for short), and its pertinence to the Esri-GIS retro project, may be outlined as follows.

Numerous reports encountered during my stint (1972-1979) at the Ministry of State for Urban Affairs, Government of Canada, established that decisions made by governments at all levels, businesses, and individuals were having serious, negative impacts on land, water, and air resources<sup>3</sup>.

However, relatively few publicly-available reports established that sustained or targeted actions were being undertaken by governments at any level, by local, regional, or national businesses, or by individuals to mitigate, reduce, terminate, or otherwise

effectively combat decades of serious abuse of Canada's land, water, and air resources.

Overall, the decisions taken, and actions not taken, in regard to land, water, and air abuses were enthusiastically and vigorously driven by political, economic, and financial ideologies, abetted by large dollops of self-interest and convenience.

Conversely, minimal consideration was given to long-term implications, or to the inclusion of geographic factors as decision variables, with the only exception of note that I recall being to provide assurances about the availability of sufficient quantities of zoned land for future residential and commercial development purposes (Wellar 1989).

During the post-1979 years when I returned to academe, the inclusion of newspaper-based assignments in my undergraduate and graduate courses yielded an unending supply of articles from across Canada (as well as from the U.S. and abroad) about the chronic, widespread, and seemingly wholesale abuse of land, water, and air resources, thereby perpetuating and reinforcing the record of resource abuse observed during my appointment at Urban Affairs.

The triangulation of evidence was completed by participation in community-based transportation, planning, and development matters throughout the National Capital Region, and in other areas of Canada. That experience provided ground-level confirmation of the findings expressed above.

As I have noted in numerous publications, as well as in presentations to local government committees and councils, throughout the 1970s and 1980s the term "geography" (or any for synonym for geography) received little to no substantive consideration by local governments (Wellar 1989).

Further, inter-governmental dealings involving the disposition of resources at the local level, and hearings and rulings by quasi-judicial bodies such as the Ontario Municipal Board (OMB) which frequently intervened in local planning and development actions, did not fare any better.

In the face of such abject disregard for things geographic by governments, businesses, bodies such as the OMB, and seemingly a large portion of the Canadian public, the notion of the "Doomsday Map" was born.

In brief, as a working hypothesis it was my thinking that

If the argument was persuasively made that continued abuse of our land, water, and air resources would result in dire consequences in the near future, then responsible individuals and businesses, and eventually governments, would cease their resource-abusive ways.

The persuasive word that came to mind was **doomsday**. I believed that on its face the notion of **doomsday** was sufficiently clear in its connotation to give reasonable

individuals, business owners, executives, and shareholders, as well as government officials, cause to pause.

And, at the risk of being overly optimistic, there was always the hope that some serious thought would be given changing resource-abusive behaviours, with appropriate corrective actions to follow in a timely manner.

As for the word *map*, it met three critical criteria.

First, land, water, and air resources are phenomena which readily lend themselves to being described in geographic terms and, hence, being mapped in various ways, many of which are readily understood by children, teens, and adults. To re-coin a phrase that no doubt has been stated many times "There is something for everybody, in a map".

Second, maps do not need to involve large quantities of numbers, which are anathema to many Canadians, including civil servants and, in my experience, an overwhelming majority of politicians at all levels. If the Doomsday Map minimized the use of numbers while conveying an important message, then its likely rate of acceptance would be considerably higher than if the story was told using ratios, expressions, equations, or tables of parameters and/or statistics from any field of science, including geography, engineering, ecology, economics, demography, hydrology, chemistry, physics, pedology, meteorology, glaciology, agronomy, oceanography, remote sensing, or geomorphology.

Third, maps can be made relatively self-explanatory, which minimizes the amount of text required to describe or explain the entities, relationships, themes, etc., represented on a map. As a bureaucrat whose government assignments included reducing hundreds of pages of text to one-page briefing notes consisting of bullet points with no compound sentences, and a professor who heard more than a few laments about his 'heavy' reading lists, I was well aware of the general appeal of maps as visual alternatives to even several pages of dense text, much less many pages calling for sustained, focused attention.

Informal testing over several years suggested by the late 1980s that there was both need and merit in putting the concept of the **Doomsday Map** into the broader public domain. Further, significant advances in GIS technology and its increased usage in academia, government, and business supported such an initiative.

In the next two sections, I outline the approach taken to express the concept of the Doomsday Map, and to put a geographic foundation in place to map states of and changes in resource-abuse practices.

## 3. A Selection of *Circa*-1990 Newspaper Headlines Illustrating the Doomsday Map Scenario

Previous to and during the 1970s, 1980s, and 1990s it was commonplace for people of all stations and walks of life to read newspapers for local, national, and international

news. And, as learned during my government, university, and community activist experiences, newspapers from across Canada and in many countries regularly carried stories about abuses of land, water, and air resources.

From a practical standpoint, factors such as accessibility to materials, the immediacy of locating relevant articles at relatively low cost, the ease of obtaining pertinent materials from colleagues in other cities and countries, and the ability of students to conduct newspaper surveys, made newspapers the means of choice to obtain inputs to the Doomsday Map chronicles<sup>4</sup>.

And, as a further plus, there was the matter of credibility. Based on my experience it seemed likely that newspapers were, and were perceived to be more credible than governments or corporations when it came to telling the truth about resource abuse. Moreover, stories could be checked by consulting other newspapers and/or radio and television sources. Or, for that matter, confirmation could be sought from colleagues at other universities, as well as fellow members of professional organizations or associations.

Figures 2, 3, 4, 5, 6, and 7 are from my Doomsday Map-related productions *circa* 1990. Although they represent only a small portion of the newspaper headlines assembled over the span of several years, they appear sufficient to demonstrate why I thought the term 'doomsday scenario' was an apt descriptor of the implications of pandemic abuse of land, water, and air resources.

MAKING CONNECTIONS:

GARBAGE?
WHY JUST PUT IT...

Barges won't sovle the waste problem
New York Times

Stemming the tide of trash

Kansas City Star

Grier spurs "garbage apocalypse" council says

Figure 2. 25 Years Ago, Waste Disposal Headlines

Toronto Star

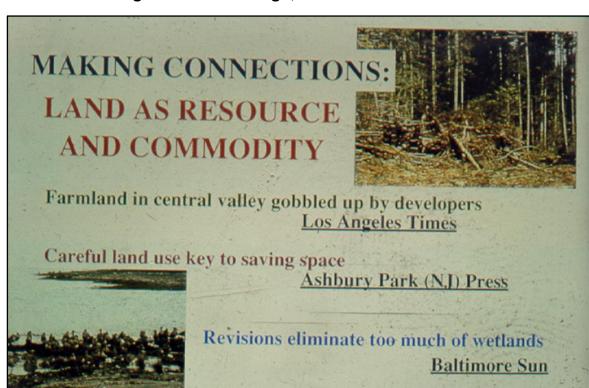


Figure 3. 25 Years Ago, Land Conflict Headlines

Figure 4. 25 Years Ago, Water Problem Headlines



MAKING CONNECTIONS:

GLOBAL WARMING?

GLOBAL FRYING?

Scientists finding many 'leaks' in northern zone

Baltimore Sun

Ozone threat: Time for action, not panic

Ottawa Citizen

Europeans try to plug ozone hole

Philadelphia Inquirer

Ozone-hole conditions spreading: High

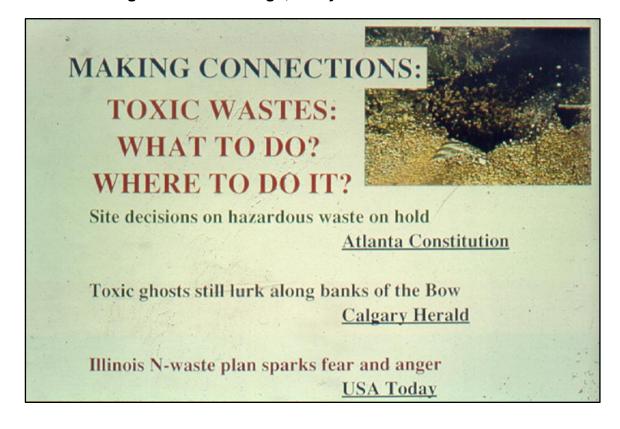
concentrations of key pollutants

Figure 5. 25 Years Ago, Global Warming Headlines

Figure 6. 25 Years Ago, Nasty Toxic Waste Headlines

discovered over U.S.

**Washington Post** 



MAKING CONNECTIONS:
GIS & TOXIC WASTE
IN LOUISIANA:
BEST WORST CASE

The wasteland: Abandoned toxic dumps
brimming with hazards
Underground hazards: Drinking-water fears spread with waste

Dumping ground: State a final stop for nation's toxic waste

The Times-Picayune, New Orleans, LA
March 24-26, 1991

Figure 7. 25 Years Ago, More Nasty Toxic Waste Headlines

Further, and the reason for their pertinence to this colloquium, is that all the headlines dealt with concepts, things, decisions, actions, etc., that can be described or explained in <u>geographic</u> terms, that is, for example,

- As geographic entities or attributes.
- As occupants of geographic spaces,
- As occupants of geographic locations,
- As occurrences at geographic places,
- As representations of geographic processes,
- As representations of spatial patterns,
- As representations of spatial interactions,
- As representations of spatial diffusion,
- As representations of spatial flows,
- As representations of clustered spatial distributions,
- As representations of ordered, regular, or uniform spatial distributions.
- As representations of random spatial distributions,
- As representations of source-sink spatial networks
- As representations of space-time confluence,
- As manifestations of geographic relationships,
- As inputs to spatial decision support systems, and
- As outcomes of spatial decision support systems.

Consequently, and providing the *raison d'être* for this paper, because the contents of the stories are of a geographic nature, they could potentially be mined for GIS nuggets.

The process of moving from the stories to the mining operation is outlined in Figure 8.

Figure 8. Conditions for building files from news reports about land, water, and air abuse or care practices as potential resources to mine for GIS nuggets.

If the stories about land, water, and air abuse or care practices can be

- Represented by geospatial data,
- Incorporated in a geographic information system (GIS), and
- Displayed in map form or other graphic representations,

#### Then they could be

• Mined for possible pointers, hints, indicators, suggestions, clues, etc., about where and how to discover, recover, or uncover GIS nuggets.

I return to the doomsday scenario in section 5, after briefly commenting on the *Geographer's Lament* which appeared in the original DMP presentations and papers.

It is my impression that such a comment may be instructive for those not familiar with the academic, scientific, institutional, political, and other obstacles, some self-inflicted, that confronted the field of geography several decades ago, and which continue to arise on frequent occasions.

### 4. Connecting the Doomsday Scenario and the Geographer's Lament

The Geographer's Lament (Figure 9) was included in DMP presentations and papers as an expression of concern derived from reading thousands of newspaper stories with a common theme.

That is, although the abuses of land, water, and air resources were of a seemingly obvious geographic nature, the geographic aspect of the abuses received little or no short-term much less long-term consideration by the perpetrators, or by many of the journalists writing the stories. Seemingly, it was as though geographic considerations *per se* simply did not matter to governments, to businesses, or to many individuals.

Drawing on my experience in government and academe, the Lament was designed to be brief and on point, but with an edge or twist so as to catch and hold attention. Leaving part of the Lament blank invited audience and reader involvement, and often led to "creative" language to put it politely, by students, conference or seminar attendees, and readers.

#### Figure 9.

The Geographer's Lament

With so many wrong things
In so many wrong places,
We have just about -----
All our life-support spaces

For GIS Day 2009 at the University of Ottawa, presentations to elementary and secondary school students included slides about the Doomsday Map and the Lament (http://www.geomatics.uottawa.ca/gaw09/index.html).

I inserted "ruined" in the Lament, and demonstrated the day-to-day relevance of the Doomsday Map and the Lament by providing the following list of questions to illustrate the importance of knowing about and having respect for geography:

- Where are we to put our garbage?
- Where do we grow food?
- ◆ Where do we obtain clean water?
- Where do immigrants locate in Canada?
- Where do we intensify in order not to sprawl?
- Where do we locate the mass transit lines?
- Where are the most dangerous intersections?
- Where have the glaciers gone?
- Where are the sources of airborne pollutants?
- Where are residents to shop if the area loses its food store?
- Where should the new bridge be located?
- Where does the wildlife go if the wetland is drained?

Feedback on the presentations was gratifying, and gives me hope that the school-age generation is keenly interested in learning more about how geography affects their lives, and in using GIS to ensure that the doomsday scenario does not become their doomsday reality.

### 5. Circa 25 Years Later, How Well Are We Doing?

I sought assistance in answering this question by sending the message in Figure 10 to several list serves, and to a number of contacts in academe, government, business, NGOs such as community associations, and members of the media.

By way of a brief comment on the four classes of articles which are of interest at this time, articles in classes A and B are directly comparable to those presented in Figures 2, 3, 4, 5, 6, and 7. In short, they inform whether there has or has not been change

over the past 25 years in the content of popular literature articles reporting on the state of land, water, and air resources.

## Figure 10. Request for inputs to an informal assessment of the current state of the Doomsday Map scenario

Seeking news stories about abuse or care of land, water, and air resources.

In 1989-1990 I introduced the Doomsday Map and the Geographer's Lament to the literature

(http://www.geomatics.uottawa.ca/gaw09/GISDAYWELLARPRES.pdf). 25 years later I am re-visiting both topics for a paper that I am preparing for the Conference on Using the Retrospective Approach to Mine for GIS Nuggets (http://wellar.ca/wellarconsulting/EsriGISRetroCallForPapers.pdf).

I welcome receiving information (links would be most appreciated) about stories in the news (newspapers, radio, television) in 2013-2015 that contribute to answering the question that I posed 25 years ago, "How well are we doing?" in regard to the treatment of land, water, and air resources in Canada and abroad.

Articles of particular interest at this time include those which discuss:

- A. Lessening, cessation, etc., of previous abuses of land, water, or air resources;
- B Continuation of previous abuses of land, water, or air resources;
- C. Abuses of land, water, or air resources in ways that did not exist 20 to 30 years ago;
- D. Abuses of land, water, or air resources that might have occurred post-1990, but were prevented or avoided due to interventions by governments, businesses, or individuals.

Thanks are given in advance, please send suggestions to wellarb@uottawa.ca.

Classes C and D, on the other hand, are similar to, yet quite different from A and B. That is, class C introduces the possibility of new kinds of land, water, and air abuses arising after the Doomsday Map scenario was conceived more than 25 years ago. And, class D raises the possibility that between 1990 and 2015 abuses known before 1990, and/or new ones arising after 1990, have been stopped, curtailed, terminated, cut-off, nipped in the bud, etc.

Each of A, B, C, or D is a challenging search topic, and a comprehensive compilation of news stories for any one of them is far beyond the scope of this paper<sup>5</sup>. However, the headlines and stories in Figure 11 are sufficient to establish the significance of

### geography in considering the question, How well are we doing in 2015 vis-à-vis 1990?

As for the content of Figure 11, questions may arise about the relatively limited attention given to climate change, and especially in view of the world-wide effort to move the issue of climate change beyond the talking stage and into the action stage on the parts of governments, businesses, and individuals. My reasoning for the prominent but limited attention given to climate change is summarized as follows.

When I was a teenager 60 years ago and a university student 50 years ago, there was general understanding of the meaning of climate, the meaning of weather, and the difference between the two concepts. Over the years, however, a great deal of misinformation, dis-information, and mis-representation by vested interests has seriously distorted the doomsday-stewardship discussion.

Under the circumstances, therefore, my approach in recent years is to briefly recognize climate change arguments, and to then quickly move away from that very broad concept to focus on readily definable, quantifiable variables whereby measures are used to cleave through the murk and cut to the chase in ascertaining whether the Doomsday Map is gaining or losing layers<sup>6</sup>.

Figure 11 follows that design by beginning with several broad brush headlines about climate change in the Earth's various climatic regions and the planet as a whole, and then attention turns to such fact-oriented, climate-related variables as: rising or dropping temperatures; rising or dropping ocean levels; ice cap reductions or increases; wetland boundary expansions or contractions; desert boundary expansions or contractions; precipitation amount increases or decreases; forest cover increases or decreases; ozone layer thickening or thinning; growing season shifts in time and/or space; atmospheric pollution level increases or decreases; and other changes in the Earth's body of land, water, and air resources which are directly pertinent to examining changes in the status of Doomsday Map or Stewardship Map layers over the 25 years between *circa* 1990 and *circa* 2015.

With regard to the wisdom of that research design choice, it was emphatically confirmed on September 17, 2014 when White House Science Adviser Dr. John Holdren appeared at the hearing of the U.S. House of Representative's Science, Space, and Technology Committee on the Obama administration's plan to fight climate change.

It is my impression upon careful examination of the record that questions from several House Committee members' revealed an understanding of the science behind weather and climate which was considerably less than that of the elementary and secondary school students who attended my presentations during GIS Day 2009. Further, I hasten to add, the decision to focus on individual variables rather than "the big picture" of climate change has been ratified numerous times by members of Canadian governments at all levels over the past decade, and most noticeably by elected officials at the federal level.

## Figure 11. Another look at Doomsday Map headlines *circa* 25 years later: How well are we doing now?

National climate assessment: 15 arresting images of climate change now and in the pipeline. *The Washington Post*. May 6, 2014.

Climate and the civic race – Most candidates say city has a role to play. *Ottawa Citizen*. September 27, 2014.

Thousands march to draw attention to global warning. *Associated Press*. September 9, 2014.

Scientists trace extreme heat in Australia to climate change. *NY Times*. September 29, 2014.

Climate change threatens birds, pushes them north -- 314 North American bird species at risk due to climate change, report finds. CBC News Posted: September 10, 2014.

Global warming's warning signs – Nine of 16 extreme weather events in 2013 blamed on human action. *Associated Press.* September 30, 2014.

Bees, bikes, and oversight worry Ontario watchdog – Provincial environment commissioner sees little action behind good words. *Ottawa Citizen*. October 8, 2014.

Farmland loss is forever. *Richmond News.* June 4, 2014. <a href="http://www.richmond-news.com/opinion/letters/farmland-loss-is-forever-1.1114267#sthash.MpAicrqv.dpuf">http://www.richmond-news.com/opinion/letters/farmland-loss-is-forever-1.1114267#sthash.MpAicrqv.dpuf</a>

USDA data shows rate of farmland loss slows. Southern Maryland News Net. February 22, 2014. <a href="http://smnewsnet.com/">http://smnewsnet.com/</a>.

China says one-fifth of its farmland is polluted. The Japan Times. April 15, 2014.

A new approach is needed to curb the loss of farmland. *Guelph Mercury*. www.guelphmercury.com. July 14, 2014.

3 million hectares of farmland lost in two decades. *Today's Zaman* (Turkey). www.todayszaman.com. September 23, 2014.

lowa is getting sucked into scary vanishing gullies. *Mother Jones*. February 7, 2014. <a href="http://www.motherjones.com/tom-philpott/2014/02/iowas-vaunted-farms-are-losing-topsoil-alarming-rate">http://www.motherjones.com/tom-philpott/2014/02/iowas-vaunted-farms-are-losing-topsoil-alarming-rate</a>

California's doomsday droughts. *LA. Times*. February 25, 2014.

California drought: San Joaquin Valley sinking as farmers race to tap aquifer. San Jose Mercury News. March 29, 2014.

China wakes up to its water crisis -- More than 70 per cent of China's rivers and lakes are polluted and almost half may contain water that is unfit for human consumption or contact. Toronto Star. May 12, 2014.

Former ag secretary addresses water issues, aquifer depletion. *Lawrence Journal-World*. January 5, 2014.

Dry argument: Australia's drought policy dilemma. ABC Rural. February 24, 2014.

German water supply threatened as climate change boosts droughts. *Bloomberg.com.* July 30, 2014.

Water shortage crisis looming in South Africa. *The Citizen.* www.citizen.co.za/200559/water-crisis-looming-in-south-africa/. June 25, 2014.

Modi pursues 1980s plan to solve India's water shortages. Bloomberg.net. September 24, 2014.

Groundwater depletion sinks portions of Cedar Valley. *Deseret News.* March 31 2014.

China to spend \$330 billion to fight water pollution – paper. Reuters. February 18, 2014.

North Carolina: Lawmakers pass coal ash restrictions. *Associated Press*. August 21, 2014.

The threats to our drinking water. NY Times. August 5, 2014.

4 states confirm water pollution from drilling. *Associated Press.* January 05, 2014.

World faces 'insurmountable' water crisis by 2040 – report. *Reuters* <a href="http://rt.com/news/176828-world-water-crisis-2040/">http://rt.com/news/176828-world-water-crisis-2040/</a>. July 30, 2014.

Water scarcity could limit the spread of fracking worldwide. *Vox.* September 2, 2014.

Texas Is mad Mexico won't share the Rio Grande's water. *The Wire*. September 8, 2014. <a href="http://www.thewire.com/national/2014/09/texas-is-mad-mexico-wont-share-the-rio-grandes-water/379793/">http://www.thewire.com/national/2014/09/texas-is-mad-mexico-wont-share-the-rio-grandes-water/379793/</a>

Climate change and health: drinking water in decline. *The Globe and Mail*. April 29, 2014.

Air pollution kills 7 million people every year, World Health Organization finds. *Huff Post.* March 3, 2014.

10 million Canadians at risk from exposure to traffic pollution: researchers. *CTV News*. October 21, 2014.

Bad air day: Pollution in our cities now so bad healthy people are at risk of harm. *Mirror*. March 25, 2014.

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Fears of urban sprawl pose problems for Lincoln area villages. <u>Lincolnshire</u> <u>Echo</u>. September 26, 2014 <u>http://www.lincolnshireecho.co.uk/Fears-urban-sprawl-pose-problems-village-people/story-22978231-detail/story.html#ixzz3EQTrkUlo</u>

Here's how to change Canada from a suburban to an urban nation. *The Globe and Mail*. May 12, 2014.

Since geography is at the core of each headline and story, each of them and numerous related stories published over the past 25 years are potential sources of GIS nuggets. The questions in Figure 12 are illustrative of those which could be the basis of GIS-related investigations of popular media articles labelled A, B, C, and D in Figure 10, and for several other bodies of literature including regulatory, oversight, professional group, public interest group, and corporate/institutional-public.

## Figure 12. Questions Investigating the Role of GIS in Decisions Affecting the State of Land, Water, and Air Resources

- **QA.** Was <u>GIS</u> a factor in lessening, mitigating, terminating etc., previous abuses of land, water, or air resources?
- **QB.** Did <u>GIS</u> support or promote continuation of previous abuses of land, water, or air resources?
- **QC**. Did <u>GIS</u> support or promote abuses of land, water, or air resources in ways that did not exist 25 to 30 years ago?
- **QD**. For abuses of land, water, or air resources that might have occurred post-1990, but were prevented or avoided due to interventions by governments, businesses, or individuals, did <u>GIS</u> contribute to the interventions?

Questions QA and QB are directly applicable to the headlines and stories in Figure 11, which are a tiny portion of the thousands of related items published in 2014<sup>7</sup>. And, they are equally applicable to the many, many thousands of pertinent items published in the years between 1990 and 2014.

Moreover, at the risk of belabouring the obvious, the implications of these stories go far beyond the abuse of land, water, and air resources *per se*. That is, the vast majority of people and other creatures everywhere on Earth are directly and significantly affected by the abuse of land, water, and air resources.

Consequently, the headlines and stories in Figures 2, 3, 4, 5, 6, 7, and 11 are part of what I believe to be a prime and perhaps pre-eminent body of documentation pertinent to the question,

#### **How Well Are We Doing?**

As for questions QC and QD in Figure 12, both questions generate substantial amounts of significant results when applied to other types of literature. However, major challenges are encountered when it comes to searching the 2014 popular literature for class C articles on new or different abuses arising any year after 1990, and/or 2014 class D articles on abuses negated by interventions in any year after 1990.

In the next section, I outline the nature of the challenges in searching the popular literature for class C and D materials, and suggest a search design that could assist in accessing these potentially very valuable but also relatively hard-to-find sources of GIS nuggets.

# **6. Comments on Popular Literature Materials Regarding Oversight Agency Productions**

As a rule, neither private sector corporations nor government line departments such as Agriculture, Commerce, Economic Development, Energy, Environment, Finance, Fisheries and Oceans, Forestry, Housing, Industry, Infrastructure, Interior, Land Management, Mining, Municipal Affairs, Natural Resources, Parks and Recreation, Planning and Development, Public Works, Regional Development, Transportation, Urban Affairs, Utilities, or Water/Wastewater rush to publicly admit to committing or aiding and abetting abuses of land, water, and air resources<sup>8</sup>.

Consequently, in the case of class C situations, that is, abuses of land, water, and air resources arising since 1990, we tend to learn about them from <u>oversight agencies</u> which are (purportedly) independent of "political strings", and whose mandate is to inform about matters of public interest.

I suggest that there are three primary criteria to shape the search for popular literature materials which are derived from productions of oversight agencies.

First, it is advisable to start with the assumption that the search must be done at least every year. Several forays into oversight holdings indicate that tracking reports about the state and disposition of abuses is most accurately and effectively done on an annual basis where possible, and the briefest timespan available if oversight reports are not produced on an annual basis.

As asked in QC, what we seek to ascertain is,

Did <u>GIS</u> support or promote abuses of land, water, or air resources in ways that did not exist 25 to 30 years ago?

I believe that this kind of retrospective mining is best done from an evidentiary perspective by having an access design which is as temporally and spatially disaggregate as conditions permit.

A recommended approach is to obtain the report release schedules for the agency or agencies of interest, and then search (as appropriate) for local, national, and international headlines on the days and weeks after the releases, with emphasis on locating explicit or implicit statements about geography, geospatial information, and decisions or actions to address or not address the land, water, or air abuses.

Second, in my experience reports from oversight agencies are usually the most technically sophisticated of all documents published for public consumption by government agencies.

Evidence in that regard includes performances by elected officials, pundits, and others who demonstrate that they clearly do not grasp the methodology behind oversight productions.

The research colloquium program addresses this matter by discussing skill requirements and providing reference materials needed to understand the reports, and to appreciate whether the popular literature is accurately interpreting oversight agency materials<sup>9</sup>.

Third, there are great variations among countries as to the numbers and roles of oversight agencies in general, and in particular those which have land, water, and air resources within their terms of reference.

For the purposes of this paper, I believe it is sufficient to provide an indicative list of oversight agencies which I encountered during my searches.

Again, not all oversight agency names are applicable in all countries, and names could change by February 2015, but in terms of mining for GIS nuggets the focus is on which oversight agencies are in place regardless of name or jurisdiction.

Since the list in Table 2 is indicative rather than comprehensive, for reasons of convenience and experience I begin with entries from Canada where oversight agencies are relatively popular<sup>10</sup>.

Additions are then made for other jurisdictions to create a more illustrative list of names of oversight agencies<sup>11</sup>.

(Note: There may be an opportunity to amend Table 2 prior to the colloquium, so I welcome receiving additional titles of land, water, air, or natural resource oversight agencies by country.)

## Table 2. An Indicative list of Oversight Agencies with Responsibilities for Informing about the State of Land, Water, and Air Resources

- 1. Alberta Environmental Monitoring, Evaluation and Reporting Agency (Canada)
- 2. Auditor (numerous countries and jurisdictions)
- 3. Auditor General (Canada)
- 4. Bureau of Land Management (USA)
- 5. California Department of Fish and Game (USA)
- 6. California Office of Spill Prevention and Response (USA)
- 7. California State Water Board (USA)
- 8. Canadian Environmental Assessment Agency
- 9. Canadian Food Inspection Agency
- 10. Climate and Pollution Agency (Norway)
- 11. Commissioner of the Environment and Sustainable Development (Canada)
- 12. Congressional Budget Office (USA)
- 13. Environment Pollution (Prevention and Control) Authority (India)
- 14. Environmental Protection Agency (USA)
- 15. Environmentally Sensitive Lands Oversight Committee (FL, USA)
- 16. European Environment Agency (EU)
- 17. Federal Environment Agency Soil Protection Commission (Germany)
- 18. Government Accountability Office (USA)
- 19. International Joint Commission (water) (Canada, USA)
- 20. Intergovernmental Panel on Climate Change (UN)
- 21. Managed Forest Council (B.C., Canada)
- 22. Mining and Petroleum Gateway Panel (NSW, Australia)
- 23. Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (Québec, Canada)
- 24. Ministry of Infrastructure and the Environment (Netherlands)
- 25. National Commission of the Environment (Chile)
- 26. National Energy Board (Canada)
- 27. National Institute of Health Sciences (Japan)
- 28. National Transportation Safety Board (Canada)
- 29. National Water Commission (Australia)
- 30. Northern Pipeline Agency (Canada)
- 31. Office of Management and Budget (USA)
- 32. Ohio Department of Natural Resources (USA)
- 33. Ontario Municipal Board (Canada)
- 34. Public Ministry (Brazil)
- 35. Remediation Monitoring Oversight Board (N.S., Canada)
- 36. Soil Conservation Service (Iceland)
- 37. Transportation Safety Board (Canada)
- 38. Virginia Department of Environmental Quality (USA)

The overriding message of Table 2 is that many aspects of abuse or stewardship of land, water, and air resources do fall, could fall, or should fall within the purview of oversight agencies.

Hence, it is most likely if not inevitable that the reports of these agencies contain a great deal of geographic data, geographic information, and/or geographic knowledge about the state of land, water, and air resources in their respective jurisdictions.

The qualifying question to be asked is whether the agencies were the sources for popular literature productions since 1990. And, the more specific question which follows the qualifying question is,

Did <u>GIS</u> support or promote abuses of land, water, or air resources in ways that did not exist 25 to 30 years ago?

Further, for those who want to begin with 2014 or 2015 to get a sense of what might be found before the retrospective search to previous years unfolds, it might be useful to bear in mind that what is learned about the states of affairs in 2014 or 2015 could be the basis for prospective research as the future unfolds.

With regard to QD,

For abuses of land, water, or air resources that might have occurred post-1990, but were prevented or avoided due to interventions by governments, businesses, or individuals, did <u>GIS</u> contribute to the interventions?

it is my experience that for reasons of <u>candour</u> it is best to begin the search for potential GIS nuggets by examining the reports of oversight agencies.

In brief, I believe that since oversight agencies are more likely to play honest broker than politicians, heads of line departments, or heads of corporate or vested interests, it is prudent to give them highest priority consideration<sup>12</sup>.

Then, after the oversight agencies have been searched for references to potential popular news items, or leads on actual items, it is appropriate to expand the search to line departments, businesses, and individuals or groups of individuals (e.g., public interest groups such as Sierra Club, Friends of the Rainforest, World Wildlife Fund, etc.) which are likely to have been the subjects of popular literature attention.

Clearly, searching for QC and QD materials via oversight agency reports is likely to be a far more difficult process than simply doing search engine operations by combining land, water, and air terms with abuse and care terms, and clicking.

However, GIS nuggets are not likely to be in the category of "low-hanging fruit" just waiting to be picked from the vast quantity of popular literature which is generated on a daily basis.

Rather, findings about GIS that arise from the retrospective approach will most likely involve difficult investigations, and enlisting the aid of oversight agency reports at the

outset is one of the few means available to increase the prospects of productive media searches under challenging circumstances.

I close this section by mentioning the United Nations, which is an international body with huge oversight responsibilities, including those involving land, water, and air resources.

Based on a review of numerous oversight agency publications, including those along the lines of "United Nations: Poor data, weak agencies hamstring environmental oversight" (Groenwold 2009), it occurs that oversight agencies and the GIS community could mutually benefit from collaborating on how to use the retrospective approach to mine for both GIS nuggets and action-oriented environmental enlightenment.

In the next section I change the discussion from the doomsday and abuse perspective to that of stewardship care and a bright future perspective.

This line of thinking is from the counterfoil school of research design, and could be a catalyst for thinking about GIS nuggets in ways which are quite different from those discussed thus far in the paper.

# 7. Retrospective Mining for GIS Nuggets Includes Locating and Examining "Good News and Bright Futures" Stories

The Doomsday Map concept presented 25 or so years ago was designed to call attention to an asserted problem, and the headlines in Figure 11 demonstrate that many of the abuses identified then are still present today.

However, the headline search with its abuse orientation may not have done justice to the notion of stewardship of land, water, or air resources.

To compensate for such a possible limitation, and to give a fuller sense of the media literature which could, and if repeated for several years, most likely would remove layers from the Doomsday Map, or elaborate what might be termed the Stewardship Map, I created a number of illustratively caring headlines for Figure 13.

In brief, each of the illustrative headlines is

- Geography-based;
- Deals with a significant matter of public interest;
- Involves the care or stewardship of land, water, or air resources;
- Represents a general thought, hoped-for-future wish, election promise, letter-to-editor comment, etc., with a brighter future orientation;
- Represents a significant departure from past practices, which prompts questions about why and how the shift occurred,

And, most importantly for this project,

Represents a potential source to be mined for GIS nuggets.

# Figure 13. A Short List of Illustrative Good News and Bright Futures Headlines\* about the Care (Stewardship) of Land, Water, and Air Resources

Midwest aquifer recharging rate best in a decade

Algae blooms decrease across Mexico

Tailings dams in Australia checked, no leaks

Ottawa beaches now open after decades of run-off pollution

Another great salmon run for Washington's Pristine River

Strategic greening reduces urban flash flood impacts in India

Zoning now precludes building in Mississippi River flood plain

ATV group promotes saving Vermont's environmentally sensitive lands

World Bank allocates \$50 billion in 3-year plan for rainforest preservation

Convictions on clear-cutting mean jail time for executives in Malaysia

U.N. congratulates Equatorial Africa for national forest reserve program

Soil erosion remedies working in Illinois and Wisconsin

Prime farmland designated sole highest and best land use in Finland

Japan's prime agricultural land reserves expanded

Natural habitat loss in Germany cut for third straight year

Loons returning to Minnesota

Critters now "roaming old stomping grounds" in the Maritimes

Urban sprawl thing of the past in more of China's metro regions

Smart intensification key to Nashville's sprawl turnaround

Agency uses geographic index to direct urban development in Brazil

Integrated land use and transit planning cuts demand for roads in B.C.

Worldwide, commuter vehicle use declines, air pollution levels drop

Paris leader in sustainable transport: Wins Challenge Cup

In landmark decision, New Mexico court accepts GIS standard of care evidence

Clear skies in Ontario signal drop in pollution from coal-burning plants in the U.S.

Vigorous enforcement of 3R policy extends NYC landfill life by 35 years

Glaciers and ice caps expanding, ocean levels lowering

Insurance companies impose new limits on building in harm's way

Republicans enthusiastically endorse Obama's *Green Initiative* 

Renewable energy supply growing rapidly across Europe

Switzerland enshrines stewardship principle in law

Google hosts worldwide Stewardship Map program

Canada tops in providing citizens and media open access to scientists

\*It is emphasized that the stewardship headlines are created or imagined for the purposes of this paper. I searched for such headlines or lists of such headlines on various websites, including those which reject arguments about climate change and global warning, but without success<sup>12</sup>. I welcome learning of any websites or other accessible sources which maintain lists of real, (*i.e.*, verifiable) good news and bright futures headlines about care (stewardship) of land, water, and air resource practices which could be the basis of a list similar to the one presented as Figure 13.

For the purposes of this paper, several comments arise concerning the headlines in Figure 13, regardless of whether the headlines are real or imagined.

That is, if a headline refers to an actual situation, then the task is a matter of obtaining the details which respond to the questions in Table 3. And, if the headline is imaginary, then a hypothetical situation exists and the task becomes one of creating a scenario, vision, narrative, account, story, etc., which "creates" a connection between the headlines and the questions in Table 3.

# Table 3. Questions for Ascertaining the Reasons behind the Change from Abuse to Care of Land, Water, and Air Resources, and the Role of GIS

- 1. Who caused the change from abuse to care to occur? Was GIS a factor?
- 2. What caused the change from abuse to care to occur? Was GIS a factor?
- 3. Why did the change from abuse to care occur? Was GIS a factor?
- 4. When did the change from abuse to care occur? Was GIS a factor?
- 5. Where did the change occur? Was GIS a factor?
- 6. How did the change occur? Was GIS a factor?

Published responses to the questions in Table 3, whether representing actual or imagined situations, are important contributions to the literature on changes from abuse to care of land, water, and air resources, and the role of GIS in effecting that change.

Further, they will likely be instructive in shaping subsequent questions in the process of retrospectively mining for GIS nuggets, as well as in the process of designing questions for prospective mining expeditions.

In the next section I outline why the doomsday and stewardship headlines representing land, water, and air resource situations invite applying the retrospective approach to mine the stories behind these headlines for GIS nuggets.

# 8. Suggested Core Questions to Guide Using the Retrospective Approach to Mine the Doomsday and Stewardship Headlines/Stories for GIS Nuggets

Figure 1 and Table 1 from section I provide context for what I suggest are core questions to guide mining the popular literature for GIS nuggets.

Figure 1 establishes that nuggets are findings, and that the findings may serve three missions, that is, GIS technology, GIScience, and uses of the technology and/or the science. I hasten to add there are other terms which can be used instead of "serve", and there could be missions other than M1, M2, and M3, but I suggest that kind of detailing is best done as part of an actual mining experience involving the popular literature or any body of literature.

#### Figure 1. GIS nuggets defined

GIS nuggets are <u>findings</u> from the literature or other sources which serve:

- **M1.** Designing and developing geographic information systems technology;
- **M2.** Defining and elaborating geographic information science;
- **M3.** Using geographic information systems technology and/or geographic information science.

Table 1 then provides a number of examples of nuggets which could be obtained through mining the literature.

## Table 1. Possible nuggets derived from using the retrospective approach to examine "the literature"

- 1. New or different reasons to add to GIS technology;
- 2. New or different ways to add to GIS technology;
- 3. New or different reasons to add to geospatial data;
- 4. New or different reasons to add to geospatial information;
- 5. New or different reasons to add to geospatial knowledge;
- 6. New or different ways to add to geospatial data;

- 7. New or different ways to add to geospatial information;
- 8. New or different ways to add to geospatial knowledge;
- 9. New or different uses of GIS technology;
- 10. New or different uses of geospatial data;
- 11. New or different uses of geospatial information;
- 12. New or different uses of geospatial knowledge;
- 13. New or different uses of GIScience research methods;
- 14. New or different uses of GIScience research techniques;
- 15. New or different uses of GIScience research operations.

Following from Figure 1, the nuggets may serve three missions, that is, GIS technology, GIScience, and uses of the technology and/or the science.

And, similar to the comment about Figure 1, there could be other questions in Table 1, or other ways of phrasing questions.

However, it appears that kind of detailing is best done as part of an actual mining experience involving the popular literature or any body of literature.

With Figure 1 and Table 1 providing context, the quest for GIS nuggets begins with statements and questions about abuse and care relationships between 1990 and 2015.

Table 4 presents four basic statements about situations and patterns derived from the doomsday and stewardship headlines, which are labelled R1, R2, R3, and R4. Each relationship statement is accompanied by several associated questions, which I suggest serve as initial guides to retrospectively search the popular literature for GIS nuggets.

# Table 4. Basic land, water, or air abuse and care relationships, 1990- 2015, and associated questions to use in mining for GIS nuggets

**R1.** There was apparent land, water, or air <u>abuse in 1990</u>, and there is apparent land, water, or air <u>abuse now</u>. Over the years,

Was GIS used?

If yes, did GIS fail?

Why did GIS fail?

If GIS was not used, why not?

In the mining for nuggets process, what we want to know is whether GIS had anything to do with what happened in R1 and the resultant effect on M1, M2, or M3 from Figure 1.

**R2.** There was apparent land, water, or air <u>abuse in 1990</u>, and there is apparent land, water, or air <u>care now</u>. Over the years,

Was GIS used?

Did it support the abuse-to-care change?

If yes, how?

In the mining for nuggets process, what we want to know is whether GIS had anything to do with what happened in R2 and the resultant effect on M1, M2, or M3 from Figure 1.

**R3.** There was apparent land, water, or air <u>care in 1990</u>, and there is apparent land, water, or air <u>abuse now</u>. Over the years,

Was GIS used?

Did it fail?

Why did GIS fail?

In the mining for nuggets process, what we want to know is whether GIS had anything to do with what happened in R3 and the resultant effect on M1, M2, or M3 from Figure 1.

**R4.** There was apparent land, water, or air <u>care in 1990</u>, and there is apparent land, water, or air <u>care now</u>. Over the years,

Was GIS used?

If yes, how was it used?

In the mining for nuggets process, what we want to know is whether GIS had anything to do with what happened in R4 and the resultant effect on M1, M2, or M3 from Figure 1.

Figure 4 summarizes the basic abuse-care relationships, and provides an opening set of associated GIS questions for land, water, and air media headlines and stories on or about 1989-1990 and 2014-2015, and over the 25 or so intervening years.

Further, because of their general nature, relationships R1, R2, R3, and R4 and the associated questions can apply to single jurisdictions or to multiple jurisdictions.

Moreover, R1, R2, R3, and R4 can be used without loss of generality in whatever timeframe is supported by the popular literature, that is, from days, weeks, months, and years, to decades.

Finally, there is a forward-looking aspect to Figure 4. In brief, because of the general design of the relationships connecting 1990 and 2015, in principle they can be used to examine connections between headlines and stories in 2015 and those published in years beyond 2015.

#### 9. Conclusion

This paper responds to feedback from contributors to the *AutoCarto Six Retrospective* project, and from reviewers of the *Guide for Papers on Using the Retrospective Approach to Mine for GIS Nuggets.* 

In brief, it was suggested that illustrative papers may be needed to provide guidance for potential contributors to the Conference on Using the Retrospective Approach to Mine for GIS Nuggets, and especially for contributors who are new to or have limited experience with the retrospective line of inquiry. I chose the popular literature as the basis of the first Research Colloquium paper, and organized the paper around the Doomsday Map concept which was conceived in the 1980s.

The Doomsday Map concept, which was introduced to the GIS community 25 years ago, was one of the early, widely-circulated commentaries on the negative aspects of global warming, and land, water, air abuse<sup>14</sup>. It is used in this paper in combination with the concept of a Stewardship Map to illustrate why and how headlines and stories in the popular literature about the abuse or care of land, water, and air resources could be used to retrospectively mine for GIS nuggets.

With GIS nuggets defined as findings which serve three important functions,

- Designing and developing geographic information systems technology,
- Defining and elaborating geographic information science, and,
- Using geographic information systems technology and/or geographic information science.

the paper presents a selection of GIS nuggets that could be obtained by retrospectively mining the literature in search of such findings as::

- New or different reasons to add to GIS technology;
- New or different ways to add to GIS technology;
- New or different reasons to add to geospatial data;
- New or different reasons to add to geospatial information:
- New or different reasons to add to geospatial knowledge;
- New or different ways to add to geospatial data;
- New or different ways to add to geospatial information;
- New or different ways to add to geospatial knowledge;
- New or different uses of GIS technology;
- New or different uses of geospatial data:
- New or different uses of geospatial information;
- New or different uses of geospatial knowledge;
- New or different uses of GIScience research methods;
- New or different uses of GIScience research techniques:
- New or different uses of GIScience research operations.

In the case of mining the popular literature for GIS nuggets, the paper emphasizes that the land, water, and air resources which are featured in media headlines and stories are intrinsically geographic.

It follows, therefore, that if the contents of thousands of stories every year about land, water, and air abuse or care practices could be represented by geospatial data, incorporated in a geographic information system (GIS), and displayed in map form or other graphic representations, then they could be mined for possible pointers, hints, indicators, suggestions, clues, etc., about where and how to discover, recover, or uncover GIS nuggets.

After presenting doomsday and stewardship headlines for 1989-1990 and 2014-2015, the paper then presents four basic land, water, or air abuse and care relationships, and associated questions, to use in mining for GIS nuggets.

**R1.** There was apparent land, water, or air <u>abuse in 1990</u>, and there is apparent land, water, or air <u>abuse now</u>. Over the years,

Was GIS used?

If yes, did GIS fail?

Why did GIS fail?

If GIS was not used, why not?

**R2.** There was apparent land, water, or air <u>abuse in 1990</u>, and there is apparent land, water, or air <u>care now</u>. Over the years,

Was GIS used?

Did it support the abuse-to-care change?

If yes, how?

**R3.** There was apparent land, water, or air <u>care in 1990</u>, and there is apparent land, water, or air <u>abuse now</u>. Over the years,

Was GIS used?

Did it fail?

Why did GIS fail?

**R4.** There was apparent land, water, or air <u>care in 1990</u>, and there is apparent land, water, or air <u>care now</u>. Over the years,

Was GIS used?

If yes, how was it used?

In the mining for nuggets process, what we want to know is whether GIS had anything to do with the situations described in R1, R2, R3, or R4, and, ultimately, the resultant effect on GIS technology, GIScience methods, techniques, or operations, and the uses of GIS and GIScience.

This paper outlines why I believe it is critically important to retrospectively mine the popular literature for GIS nuggets, and provides suggestions about how the mining process could be designed.

#### 10. Endnotes

- 1. http://wellar.ca/wellarconsulting/EsriGISRetroCONFGuideForPapers.pdf
- 2. http://wellar.ca/wellarconsulting/AutoCarto Six Retrospective.pdf
- 3. Between 1972 and 1979 my positions at Urban Affairs included Senior Research Officer, Urban Information Theme Coordinator, Assistant Director of Data Processing Services, Director of Non-Metropolitan Community Development, and Senior Policy Advisor. I served on numerous inter-departmental and inter-governmental committees, including an eco-development group that did basic research in advance of the U.N. sustainable development work (WCED, 1987), and represented the Ministry and the Government of Canada at many meetings across Canada, as well as on OECD panels, U.N. projects, U.S. projects, and professional organizations.

For those not familiar with "government speak", I learned early and often that damage, degradation, destruction, and other forms of abuse of water, land, and air resources were regularly referred to by mushy terms such as issues, concerns, situations, worries, problems, challenges, or difficulties but, simply put, they were abuses. Four decades later, not much has changed.

- 4. Just to be clear, high-speed electronic search engines did not exist in the public domain 25 years ago, so back in that day if we wanted news we had three choices: obtain and read written texts; get access to and listen to radio broadcasts; and get access to and listen to/watch television programs. Since e-access to any of the mediums was a non-starter, newspapers were the relatively more operational choice, and especially for class projects.
- 5. Each of A, B, C, and D holds potential as a rich field of inquiry, and I suggest that they be considered as class assignment projects, thesis and dissertation topics, and research proposals.
- 6. As discussed in subsequent sections, layers could be added to or subtracted from the Stewardship Map instead of the Doomsday Map if one prefers the caring perspective.
- 7. Some land, water, and air resources receiving attention today could be new or different relative to those included in the searches *circa* 1990. To the extent that is in

fact the case, the universe of potential Doomsday Map or Stewardship Map headlines and stories, and GIS nuggets, expands accordingly.

- 8. The reader may be aware of government interventions which are termed "political decisions". On the evidence, and admissions made by politicians upon hard and/or persistent questioning through the media, including social media, these decisions have nothing to do with preventing land, water, or air abuses; rather, they have everything to do with cultivating the electorate or a segment of the electorate for the express purposes of the party in power. Parties in opposition make similar "political decisions".
- 9. Generally speaking, different skill sets are required for different oversight agencies. However, it appears appropriate for this meeting on retrospective research to focus on universals related to GIS and GIScience and, as time permits, the Research Colloquium can venture into subject-, profession-, or discipline-related specifics.
- 10. There are similar central, federal, state, provincial, regional, and local government offices and agencies in countries around the world, and I expect that a comparative analysis would be very revealing as to the kinds of activities undertaken by the respective oversight offices and agencies, and their effectiveness.
- 11. This list is for 2014, and there may well be differences between the current situation and those of earlier years in most if not all countries. However, reporting on the history of oversight agencies with land, water, and air abuse responsibilities is a task for another day.
- 12. I believe that this would be an excellent research project for students in geography, earth sciences, environmental studies, etc., who are inquiring into the pros and cons of climate change discourse.
- 13. At the time of this writing in October 2014, the Government of Canada is confronted by the recently-released report of the Federal Commissioner of the Environment and Sustainable Development, which is critical of the government's lack of progress (eight years and counting) in implementing regulations to reduce greenhouse gas emissions. A media scan and a scan of public interest communications bear out my position that the credible source in the discourse is the Commissioner of the oversight agency,
- 14. The Doomsday Map scenario was presented as part of the opening keynote session at the 1990 GIS/LIS conference in Anaheim, California. With 4,000 attendees at the meeting, and sponsorship by six organizations (American Congress on Surveying and Mapping, the American Society for Photogrammetry and Remote Sensing, AM/FM International, the Association of American Geographers, and the Urban and Regional Information Systems Association), the matter of land, water, and air abuse or care as the case may be, was explicitly "put out there" 25 years ago for the international community of individuals, agencies, firms, etc., engaged in the evolution and use of geographic information systems, automated cartography, remote sensing, and related technologies.

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