CONCILIATORY MODELING OF WEB SOURCES USING AUTOMATED CONTENT ANALYSIS: A VIGNETTE ON DRILLING FOR SHALE GAS IN UPSTATE NEW YORK

Abstract. This paper is motivated by the belief that automated content analysis is an essential tool for the facilitation of deliberative democracy. For deliberative democracy to work, it is a pre-requisite that each stakeholder trusts that the others are trying to understand his needs, aspirations and fears − without ideological bias. Then, given this prerequisite, it is necessary that the stakeholders look for a way forward that satisfies their mutual needs. The author terms this process "Conciliatory Modeling" and illustrates the process as applied in the context of a local instantiation of the Obama Administration's Open Government Initiative (OGI). Moreover, it is proposed that the routine application of automated content analysis to understanding each other's positions provides the requisite interpretative distance for stakeholders to search for conciliatory storylines.

BY

MIKE COOMBS
Diplomacy Media Research
139 Brady Road, Worcester, NY 12197
607-397-9462; coombs.mike.j@gmail.com

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Open Government Initiative (OGI), United States of America, 2009-2010

Soon after taking office, President Obama launched the Open Government Initiative (OGI).[1] One of the goals of the OGI is to find creative ways of using the Internet to involve the public more closely in the policy making of federal agencies. More specifically, the OGI called for government agencies (1) to publish more information online so as to aid informed public participation in policy decisions, increase economic opportunity and increase agency accountability, (2) to improve the quality of information available, (3) to create a culture of openness, and (4) to create an enabling policy for open government through new technologies.

The professional organization for public facilitators, the National Coalition for Dialogue and Deliberation (NCDD), was one of the groups active in submitting recommendations on the implementation of the OGI.[2] These recommendations were largely derived from experience in facilitating face-to-face dialogues, but are broadly applicable to any format that engages committed individuals to share respectfully their policy perspectives. These included the following principles.

1. *Careful Planning and Preparation.* Through adequate and inclusive planning, ensure that the design, organization, and convening of the process serve both a clearly defined purpose and the needs of participants.

2. *Inclusion and Demographic Diversity.* Equitably incorporate diverse people, voices, ideas, and information to lay the groundwork for quality outcomes and democratic legitimacy.

3. *Collaboration and Shared Purpose.* Support and encourage participants, government and community institutions, and others to work together to advance the common good.

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[1] Information on the background and current activities of the OGI) are available at the following website. http://www.whitehouse.gov/open/.

[2] Information on the NCDD is available at the following website. http://www.thataway.org/.

4. *Openness and Learning.* Help all involved to listen to each other, explore new ideas unconstrained by predetermined outcomes, learn and apply information in ways that generate new opinions, and rigorously evaluate public engagement activities for effectiveness.

5. *Transparency and Trust.* Be clear and open about the process, and provide a public record of the organizers, sponsors, outcomes, and range of views and ideas expressed.

6. *Impact and Action.* Ensure each participatory effort has real potential to make a difference, and that participants are aware of the potential.

7. *Sustained Engagement and Participatory Culture.* Promote a culture of participation with programs and institutions that support ongoing quality public engagement.

In the eyes of the administrators of the OGI, the National Academy of Public Administration (NAPA), these principles were met with approval but judged to be too general to be actionable.[3] This judgment is interesting in the light of NAPA support given to recommendations that focus on the technology of making government documents more readily available online, rather on facilitating public engagement with the agencies associated with the documents.[4] Indeed, it was only two months later, in August, 2009 that this very sentiment was forcefully made by those protesting their lack of a voice in health care reform by the organized disruption of town hall meetings called by elected officials to declare their positions.

What seems to have been missed in the OGI is that the public does not want more, often incomprehensible, documents. What it wants is exactly what NCDD proposed: a government that listens to, and learns from, the citizens; that through sustained engagement is sensitive to adverse consequences of policy and makes adjustments accordingly; that is dedicated to the common good rather than special interests. Unfortunately, it took the disruptive tactics of what became the Tea Party Movement to

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[3] The NAPA report discussing the viability of recommendations can be accessed from http://www.thataway.org/exchange/files/docs/NAPA_analysis_opengovtbrainstorm.pdf.

[4] These technology-based recommendations were made by MAX which is a component of NAPA concerned with inter-agency communication. Further information on MAX can be obtained through there website. https://max.omb.gov/maxportal/.

get the attention of elected officials that it was not open government but responsive government that was being demanded;[5] that the issue is not just health care but a whole constellation of concerns, including the corporatization of American politics and lack of influence of the individual citizen, the economic decline of the middle class, and fears for a future decided by special interests and big government.[6]

The disruptive tactics of the Tea Parties on health care have, however, had the positive effect of stimulating a counter-movement that emphasizes respectful dialogue. The Coffee Party alternative was launched by Annabel Park in February 2010 with a call for "real political dialogue with substance and compassion." The website states that:

> "The Coffee Party Movement gives voice to Americans who want to see cooperation in government. We recognize that the federal government is not the enemy of the people, but the expression of our collective will, and that we must participate in the democratic process in order to address the challenges that we face as Americans. As voters and grassroots volunteers, we will support leaders who work toward positive solutions, and hold accountable those who obstruct them." [7]

Capacity Building for Deliberative Democracy

While the Coffee Party's focus is on the federal government, the interpenetration of the local, state and federal sectors has become very evident as Washington congressmen look to the concerns of local voters that may affect their vote in the midterm elections.[8] Moreover, the financial crisis following the bursting of the housing bubble illustrates dramatically the tight coupling of sectors, bringing about the tightening of credit in local economies, the un-sustainability of state budgets, and serious unemployment all over America. Not surprisingly, the OGI is of scant interest to the Tea Party Movement, which sees little in federal initiatives that will bring back local prosperity. The irony is

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[5] Some principles for disruption town hall meetings can be accessed through http://thatsrightnate.com/2009/08/02/a-patriots-guide-to-disrupting-health-care-townhalls/.

[6] A comprehensive report of the September protest on the National Mall in Washington, DC that exposed this constellation of issues may be accessed from the New York Times archive. http://www.nytimes.com/2009/09/13/us/politics/13protestweb.html.

[7] The goals and activities of the Coffee Party can be accessed through their website. http://coffeepartyusa.com/.

[8] Dan Balz. "Health-care Vote Looms as Big Issue in November Elections." *Washington Post*, March 23 2010. http://www.washingtonpost.com/wp-dyn/content/article/2010/03/22/AR2010032203597.html.

that both the Tea and Coffee Parties agree that the issues that they care about are essentially local, and that under the current systems of representative democracy they are denied a voice on policy beyond fleeting personal contact during an election at voter clinics or community walkabouts, or highly-structured question-and-answer sessions at community town halls.[9] Then, once in office, consultation is reduced to a mere formality. Channels for citizen input are reduced to short answers to questions on structured surveys or website "Contact us" pages, where the chance of a serious response is minimal.

Both Tea and Coffee Parties seem to be asking for a democratic system where citizens are given a genuine voice. This is exactly what implementation of the principles submitted by the NCDD to the OGI was intended to generate. Significantly, the NCDD submission is classified by NAPA, the OGI facilitators, as related to the interests of grassroots movements, which is exactly how one would characterize the Tea and Coffee Parties. Furthermore, NAPA also associates the interests of grassroots movements with *deliberative democracy*.[10]

The core principle of deliberative democracy is *reciprocity*.[11] This principal combines the notions that citizens who are affected by laws or public policies should have a significant voice in framing them, the requirement that citizens owe each other justifications for the laws or policies that bind them, and that the deliberative process implies the willingness of citizens to seek reasonable agreement. However, as recent experience on health care reform has demonstrated, political convictions get in the way of collaboration and the fostering of shared purpose (recommendation 3 of the NCDD submission to the OGI). In the current political culture in America, major differences in the moral positions on policy taken by citizens and their representatives lead to rancor

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[9] Although, of course, there is a major difference in expression for the two movements, given the Tea Party's "extravert" and face-to-face confrontation means of expression grievance in contrast to the Coffee Party's favoring of "introvert" and mediated forms of expression – in addition to face-to-face meetings with political leaders.

[10] The National Academy of Public Administration (NAPA) report discussing the viability of recommendations can be accessed from http://www.thataway.org/exchange/files/docs/NAPA_analysis_opengovtbrainstorm.pdf, 5.

[11] Amy Gutmann and Dennis Thompson, *Why Deliberative Democracy?* (Princeton, NJ: Princeton University Press, 2004). Chapter 4 discusses the principles of deliberative democracy. Readers should also investigate the website of the Deliberative Democracy Consortium for information of how these principles are being implemented. http://www.deliberative-democracy.net/.

and manipulation rather than working on mutual understanding and the discovery of points of agreement.

Members of the NCDD community have long been working on antidotes to destructive patterns of human relationship.[12] Frequently developed to manage conflict in settings such as family therapy[13] and organization change,[14] different protocols for dialogue and deliberation have many features in common. These features often include some system of pre-agreement to abide by rules such as respectful listening, an avoidance of critical language, an emphasis on one's personal history when presenting a point-of-view, a focus on the future, and the management of contributions within a circle of speaking. In short, the protocols are structured to equalize opportunities to contribute, to reduce the negative impacts of strong emotion, and to humanize positions. However, the NCDD tradition is based on rich oral exchanges between small, often (self-) selected, groups of individuals committed to addressing conflict. This paper contends that for deliberative democracy to work, it is necessary for it to become commonplace for citizens to have a broad understanding of other viewpoints to the point where it is natural to see points of mutual development and without losing one's own orientation. This is a challenge that may well be achievable through new approaches to citizen engagement on the Internet.

Web-based capacity building for deliberative democracy at the local level is conjectured to preserve many of the features of face-to-face conflict resolution. These features include: (1) dialogue on an issue that participants are passionate about because of its local relevance and (2) contributions by voices that are *embodied* because they, and often their families, are known locally. Moreover, because people will generally need to interact face-to-face within the community after the dialogue, there will be an incentive to

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[12] Many of these projects, and the principles behind them, are discussed in W. Barnett Pearce and Stephen W. Littlejohn, Moral *conflict: When social worlds collide.* (Thousand Oaks, CA: Sage Publications, 1997).

[13] For example, the Public Conversations Project began as an application of conflict management techniques from family therapy to the facilitation of dialogue between individuals with positions either side of the moral divide of abortion. http://www.publicconversations.org/resources/debate-dialogue-facilitating-role-family-therapists-public-forum.

[14] For example, Appreciative Inquiry methods developed methods to facilitate organizational change by having people focus on the positive features of their organization and to envision a positive future. David L. Cooperrider and Diana Whitney, *A Positive Revolution in Change: Appreciative Inquiry*. http://appreciativeinquiry.case.edu/uploads/whatisai.pdf.

moderate aggressive behavior.   Indeed, by setting up dialogues on an invitation-only or sign-up basis, a facilitator could interact with participants before a dialogue to develop mutually agreed goals and rules of exchange.

In addition to preserving the features of face-to-face dialogues, web-based hosting has some significant advantages for fostering conciliatory interactions. The concept of *conciliatory media* grew out of discussion on the role of conventional war journalism to exacerbate conflicts with its focus, for example, on reporting the drama of the fight rather than on consequences and solutions.[15]   The name was coined by Simon Cottle in a book on "*Mediatized Conflict,*"[16] who also identified seven defining characteristics. The current author has summarized as follows: conciliatory media (1) hold authorities accountable for their actions; (2) give voice to the aggrieved, voiceless, unreported and underreported; (3) are self-critical of one's reporting; (4) provide a forum for repair of relationships in conflict and the development of models for future development. It is characteristics such as these that we wish to foster in a web-based medium for the conduct of local deliberative democracy.[17]

The above four characteristics provide a broad set of goals for the facilitator of a web conversation. Moreover, one might expect that their pursuit would encourage an ethics of conversation dedicated to building relationships and inter-personal understanding. Specifically, that:

- there be participative equality in relationships;
- there be reciprocal respect in relationships;
- substantive content be offered as hypothesis rather than fact;

[15] The initial term for a form of reporting dedicated to conflict resolution was Peace Journalism. The concept was first put forward by the peace activist Johan Galtung but was developed and popularized by the journalists Jake Lynch and Annabel McGoldrick. Some key references include the following. Johan Galtung, "Peace Journalism" in *Journalism and the New World Order: Studying War and the Media*, (eds) W. Kempf and H. Luostarinen (Gotenberg, Sweden: Nordicom, 2002). Jake Lynch and Annabel McGoldrick, *Peace Journalism* (Stroud, UK: Hawthorn Press, 2005).

[16] Simon Cottle, *Mediatized Conflict* (Berkshire, UK: Open University Press, 2006).

[17] In contrast to our application, the implementation of these principles at a global scale - by the satellite news channel Al –Jazeera English - is discussed in a study by Mohammad el-Nawawy and Shawn Powers. in Mohamad el-Nawawy and Shawn Powers, "Mediating Conflict: Al-Jazeera English and the Possibility of a Conciliatory Media." This study, funded by the John S. and James L. Knight Foundation and be accessed from
http://uscpublicdiplomacy.org/projects/AJERP%20el%20Nawawy%20&%20Powers%20Nov%205.2.pdf.

- anything that is said can be re-construed by another;
- it is accepted that no one can know the whole story;
- all speakers carefully monitor their own contributions;
- interactions foster creative rather than instructional construal. [18]

In short, these ethics require participants to be relationally responsible, in that they respect each other's contributions, and to be creative, in that they actively create a partnership that anticipates a joint future. The challenge, of course, is that the historical model for policy exchanges in America has been based more on a psychology of persuasion and manipulation, where "public servants" have usually already decided on a course of action that they consider is "in the public good," rather than one of relationship building and understanding. It is here that we think that routine use of automated content analysis and visualization tools may play a significant role.

Modifying a quote from a book by Linda Gordon on the photographer of the depression and New Deal, Dorothea Lange,[19] we claim that "Automated content analysis [the camera] is a tool for learning to understand [see] without content analysis [the camera]." In other words, the process of algorithmically grounding interpretations of participant contributions to a dialogue in the details of the language used provides the requisite distance to find common themes and sentiments without the lens of ideology. Indeed, it is proposed that content analysis and visualization tools are a new genre for expression and one that will stimulate a second transition in human consciousness. The first, as described by Walter Ong, was the transition from oral communication, in which people are integrated in a communal conversation, to written cultures, which creates conditions for ethnic and ideological separation.[20] However, the Internet has the potential

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[18] Vincent Kenny and Georgianna Gardner, "Changing Conversations: Persons in Transition." http://www.oikos.org/conversations.htm.

[19] The original quote is "The camera is a tool for learning to see without a camera." It was made in a review of Linda Gordon's book "Dorothea Lange: A Life Beyond Limits" and appeared in the *San Francisco Chronicle*, November 8, 2009. http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2009/11/06/RVKS1AE3ET.DTL&feed=rss.books.

[20] See Walter J. Ong, *Interfaces of the Word: Studies in the Evolution of Consciousness and Culture* (Ithaca, NH: Cornell University Press, 1977).

to reintegrate individuals in communal acts of empathy and sense making,[21] given the appropriate tools for voicing one's individual perspective and then finding a place for it within the communal conversation. The following vignette explores the use of such a tool, which is envisioned as the text equivalent of writing tools such as Microsoft Word or Adobe Dreamweaver for the next generation: tools that are used routinely in transacting relationships on the Web.

A Vignette on Drilling for Shale Gas in Upstate New York

Mining Web Resources to Ground Public Engagement

This vignette is intended to be the first in a series of illustrations to be presented in other papers suggesting how automated content analysis might be used to model web-based sources in order to facilitate dialogue and deliberation. The content analysis tool used in this illustration is Leximancer 3.1.[22] Leximancer 3.1 is a very stable automated content analysis system that has been under development for around six years as a commercial product, before which it benefited from many hours of academic research. It is also inexpensive for academics and nonprofits. The choice was made because of its stability but also because it does not require extensive training in content analysis to obtain sensible results from default settings of text analysis parameters. This is very important since we argue in the previous section that such tools needed to become as routinely used as writing tools such as Microsoft Word. For this to be possible, it is necessary for the tool to have a shallow learning curve. In this illustration, all but one application is created using default Leximancer settings. Additionally, Leximancer runs within a standard browser, such as Windows Explorer, Google Chrome or Firefox; it also processes text downloaded directly from the Web along with many other common formats including PDF files.

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[21] See Jeremy Rifkin, *The Empathic Civilization: The Race to Global Consciousness in a World in Crisis.* (New York, NY: Jeremy P. Tarcher/Penguin, 2009).

[22] Many papers on Leximancer are available on the company's website, http://www.leximancer.com/. The capabilities emphasized in this paper are mainly qualitative, focusing on visual inspection of concept maps and the common sense interpretation of snippets of text associated with concepts, rather than an extended investigation of the statistical relationships generated by Leximancer for making the maps and selecting snippets.
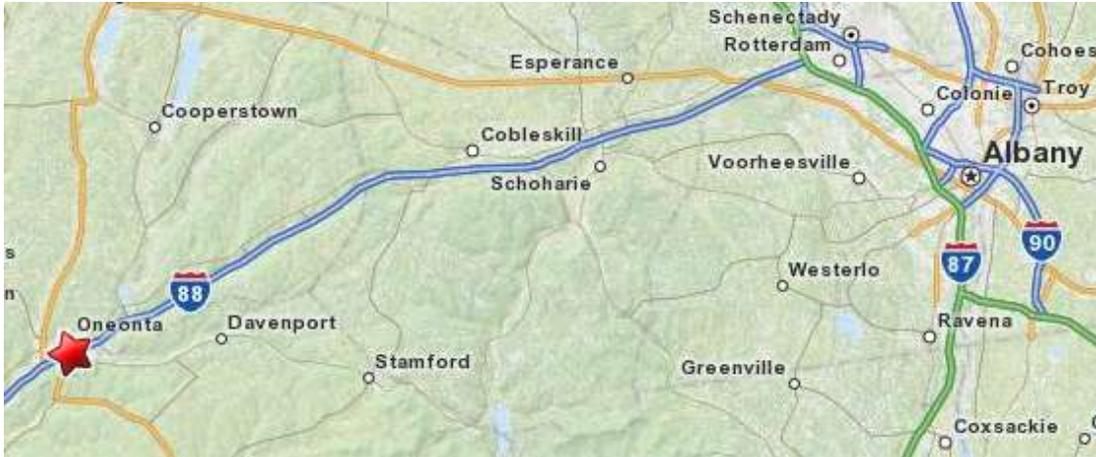
Figure 1. Mapquest map showing Oneonta, Cooperstown, and for reference, the New York State Capital of Albany.

The vignette was motivated by the author's personal involvement as the owner of a farm in Upstate New York that potentially could be a site for gas drilling. Natural gas extraction from shale (particular the Marcellus Shale formation) that underlies much of New York and Pennsylvania, is a major issue given the economic depression of the Upstate counties and the promise of the local economy being boosted from gas-related jobs and taxes – to say nothing of personal financial windfalls from drilling leases to an aging population of farmers with dairy farms, hurt by the low price of milk. Countering these advantages are widespread reports of incidents where a chemical mix used to help release gas from the shale – hydraulic fracturing (fracking) fluid – have contaminated domestic wells. Moreover, it is also reported that energy companies have been reluctant to accept responsibility for these incidents and to bear the costs of remediation.

In the vignette, we imagine that the leadership of a township in Upstate New York that is close to the city of Oneonta (see map) wishes to prepare for a meeting with the New York Department of Environmental Conservation (DEC) to discuss the possible impacts of text drilling in their area by various energy companies. The DEC meeting is in 10 days. Located north of Oneonta, the township is close to the tourist destination of Cooperstown. This is a region of great natural beauty that hosts the Baseball Hall of Fame, Glimmerglass Opera, boating on Otsego Lake, and fine dining. Not surprisingly, the leadership would not want to endanger these sources of revenue through groundwater

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pollution or the "industrialization" of their environment resulting from pipelines and drilling platforms.

We assume that, in preparation for talking to the DEC, the township leaders have met with a local landowner association. As is common in the region, this group had been organized for the collective negotiation of leasing agreements with energy companies. Generally, landowner collectives can get a better deal than individuals. However, while investigating the environmental implications of drilling on the Internet, they had become concerned over reports from Pennsylvania of the variety and frequency of drilling accidents. With the DEC meeting imminent, they want the township leaders to be aware of their concerns and to ensure that they are voiced at the scheduled meeting. While, as a group, they are not against drilling in principle, they do want to ensure that energy companies maintain the environmental integrity of their properties. For example, they want to make sure that the DEC has sufficient power to regulate dangers to local water resources and to remediate contamination.

Among this landowner group is a semi-retired geologist with experience of working with the energy industry on natural gas extraction in Colorado and Texas. Given this background, he is very aware of the environmental risks of hydraulic fracturing, along with the costs of remediation. Having browsed many of the websites of groups on all sides of the drilling debate in New York, he is also aware of the substantial representation of the negative effects of drilling that have already been made to the DEC, with the local landowners simply repeating many of them. His concern is that, with so much prior exposure to the negatives of drilling, serious engagement between the township and the DEC is only likely if the leaders can bring new insights into how risks can be reduced. With a shortage of time and office resources, the leaders are unlikely to be able to do either without help.

After due consideration, the geologist decides that the best way to prepare the leadership would be (1) to provide them with a small case study of a representative opposition group that they can use to ground their concerns regarding the adverse effects of drilling, and then (2) to develop one novel and conciliatory solution to a public concern that could become a focus for substantive engagement with both the DEC and energy companies. With the help of the automated content analysis tool, Leximancer 3.1,

along with an open source web crawler – IssueCrawler[23] – especially designed for mapping issue-related websites, he knows that he will be able to complete the task in three days. This will allow plenty of time to review the results with the leadership before the DEC meeting and to undertake any follow-up research.

Selecting an Opposition Website for Study

 Figure 2. Core network of websites discovered by IssueCrawler.

The first task for the geologist is to select a website for study that both opposes the drilling for natural gas in the Oneonta region and which appears to be an important point of reference. To do this, he needs a map of websites that is centered on the region, that covers those representing organizations opposed to drilling, and which provides an

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objective measure of significance. IssueCrawler will generate such a map, working outwards from an initial set of seed web pages. The geologist decides to use two specific DEC web pages that he knows were frequently referenced by local people to acquire information on the DEC, shale gas and gas drilling techniques – both of which contain many links to other pages; the URLs of two sites that he has frequently encountered in discussions with friends opposed to drilling; one site that provides a user-generated index for information related to many topics, including drilling for natural gas in New York. The specific web pages are as follows.

- http://otegony.com

- http://un-naturalgas.org

- http://www.dec.ny.gov/energy/205.html

- http://www.dec.ny.gov/energy/46288.html

- http://www.squidoo.com/fracbusters

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          1 - damascuscitizens.org - 14      PA opposition site.
34%       2 - txsharon.blogspot.com - 14     TX reference site reporting on accidents and
          3 - thepetitionsite.com - 14       (negative) experience with energy industry.
29%       4 - shaleshock.org - 12            Important site for adjacent region in NY.
          (5 - ny.gov - 11)
24%       6 - un-naturalgas.org - 10         Main opposition website for the Oneonta region.
          7 - nyh2o.org - 9
          8 - catskillmountainkeeper.org - 7
          9 - catskillcitizens.org - 7
          (10 - ftp.dec.state.ny.us - 7)
          11 - waterunderattack.com - 7
          12 - ogap.org - 7
          13 - splashdownpa.blogspot.com - 6
          14 - binghamtonsustainability.org - 6
          (15 - dec.ny.gov – 6)
          16 - marcelluseffect.blogspot.com - 5
          17 - chenangogreens.org - 5
          18 - preservethefingerlakes.com - 5
12%       19 - otegony.com - 5               Significant but smaller opposition website.
          20 - fwcando.org - 5
                                             (  ) = gov sites
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Figure 3. Top 20 sites ranked of the percentage of inlinks from the discovered network.

From these 5 seeds, Issue Crawler found 39 URLs plus two other hosts, including a DEC-run portal for citizen petitions, for example. The part of the map that includes sites maintained by those opposed to gas drilling in the Oneonta area are presented in Figure 2. The map was created by searching for co-links between pages: a co-link network retains a page if it has at least two known starting points in common. The map

shows inlinks[24] between sites. The relative importance of each website, as measured by the percentage of sites in the network linking to it, is indicated in the figure by the relative size of the node. The top 20 are listed in Figure 3.

Following a manual investigation of the websites in Figure 3, the geologist concludes that *un-naturalgas.org* should be the subject of his study. He also observes that the opposition movement is widely distributed across the United States; the network containing sites in many surrounding regions (for example, Ithaca (www.shaleshock.org) and the Catskills (catskillmountainkeeper.org) as well as websites located in other states that have significant experience of natural gas drilling. Major examples of such states include Pennsylvania (damascuscitizens.org and Texas (txsharon.blogspot.com).

Global Topic Analysis for FAQ Resources on *un-naturalgas.org*

Figure 4. Home page of un-naturalgas.org.

The website un-naturalgas.org is a project of the Chenango, Delaware, Otsego Gas Drilling Opposition Group, which they shorten to CDOG. The township in the vignette is located in Otsego County. Resources on the site range from a FAQ, presenting general information on the physical and legal aspects of natural gas drilling, to images, news

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[24] "Inlinks" are the links directed at a site. Technically, given that the map was created by co-link analysis and that those links could exist at levels below the URL's home page, the displayed links indicate that there was at least one co-link on any of the pages accessed by IssueCrawler on that URL. Inlink counts are commonly used as the basis for measures of the importance of a site.

reports, documents and event information that will be of interest to an opposition activist or a landowner who has been approached by an energy company. There is also a blog that includes posts commenting on drilling news across America and Canada, external links, solicitations to support events and petitions, cartoons, and comments. The site's home page is presented in Figure 4. The page is, in effect, a distributed index, with most of the text being clickable.

Given the rich array of content and information types on the website, the geologist is faced with the dilemma of where to focus given time constraints. However, after two hours reading into the site, it is clear that the FAQ is a good starting point. The FAQ covers almost all the topics considered on the rest of the website rang across the hydraulic fracturing process, the composition of fracturing (fracking) fluid, the toxicity and disposal of fracking fluid, the DEC's regulation of drilling, the land leasing process, and the experience of environmental impacts in other states. These topics are listed in the orange column on the right side of the home page presented in Figure 4. With this coverage, an analysis of the aggregated FAQ material should give a clear picture of the main issues of interest to CDOG.

The geologist poses three questions.

- What are the issues of concern to CDOG?
- How are these issues related?
- What specific evaluations are being made regarding the advantages/disadvantages of drilling and the behavior of all players involved in drilling?

He addresses these questions with the support of Internet researchers at the local university, who provide access to Leximancer 3.1.

Leximancer visualizes the meaning of content in a text by first extracting concepts from the text and then graphically mapping relations between concepts. [25] A concept is a set of words that travel together (co-occur) in the text as the author expresses his thoughts. In its automated mode, the system seeds its search for co-occurring words using those that occur most frequently, although the algorithm adds less commonly related

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[25] Paul Stockwell, Robert M. Colomb, Andrew E. Smith and Janet Wiles, *Uses of an Automatic Content Analysis Tool: A Technique for Seeing both Local and Global Scope.* https://www.leximancer.com/wiki/index.php/Academic_Publications.

words as it progresses. Relationships between words are defined using a statistical odds measure that takes into account both the frequency with which words occur together in a block of text and the frequency with which they occur separately. [26] [27]

- What is natural gas?
- What's hydraulic fracturing?
- How about horizontal drilling?
- Well spacing
- Eminent domain
- Water consumption and disposal
- Air quality
- Toxins
- Health issues
- What about NYC's water?

- Pipelines
- Accidents happen
- Will I be affected?
- Community & infrastructure
- Local government
- Won't the DEC take care of it?
- Moretoria and why we need 'em
- How do I help?
- Energy independence

Figure 5. FAQ topics.

FAQ topics are listed in Figure 5. Initial questions concern physical issues related to gas drilling, including discussion on the Marcellus Shale, drilling methods, well spacing and the acquisition of leases on which to site drills. The list continues with a focus on toxins and the types of gas extraction and transportation accidents that can release toxins. Finally, the main focus is on regulation, the role of the DEC in regulation, and the impact on the community.

With the DEC presentation in mind, the geologist is particularly interested in seeing if there are some themes that bridge FAQ topics because this may suggest how themes should be prioritized in the DEC meeting. His analytic approach is to set up Leximancer so as to treat the set of FAQs as a single corpus and so to look for concepts without regard for topic boundaries. To do this in Leximancer, he enters the text for each of the FAQs as a separate file in a FAQ folder and then submits the folder to Leximancer. The resulting map is presented in Figure 6.

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[26] The size of a "block of text" can be set automatically or manually. The default setting is 3 sentences, which is what has been used in this paper.

[27] The actual metric is given in the paper referenced in the previous footnote and is a version of a Naïve Bayesian Classifier. Naïve Bayesian Classifiers have been shown to be very robust in the text analytics literature. S.T. Dumais, J. Platt, D. Heckerman and M. Sahami., "Inductive Learninhg Algorithms and Representations for Text Classification." *In Proceedings of the 7th International Conference on Information and Knowledge Management,* eds G. Gardarin, J.C. French, N. Pissinou, K. Makki and L. Bougamin (New York, NY: ACM Press, 1998), 148-155.

The map contains the graph of the main *concepts* learned by Leximancer from the aggregated text. Each concept is represented by a node that is labeled with the concept name. The darker the concept name, the more frequently the concept appears in the text; the larger the concept node, the more that concept is coded simultaneously (co-occurs) with other concepts. Moreover, concepts that occur close together on the map tend to occur together in the same context. Finally, the large colored circles define *themes* in the text in terms of the main concept clusters. These have been further clustered into groups of issues. These may be defined informally as the main branches of the concept graph. These are indicated by the large black ovals on the map.
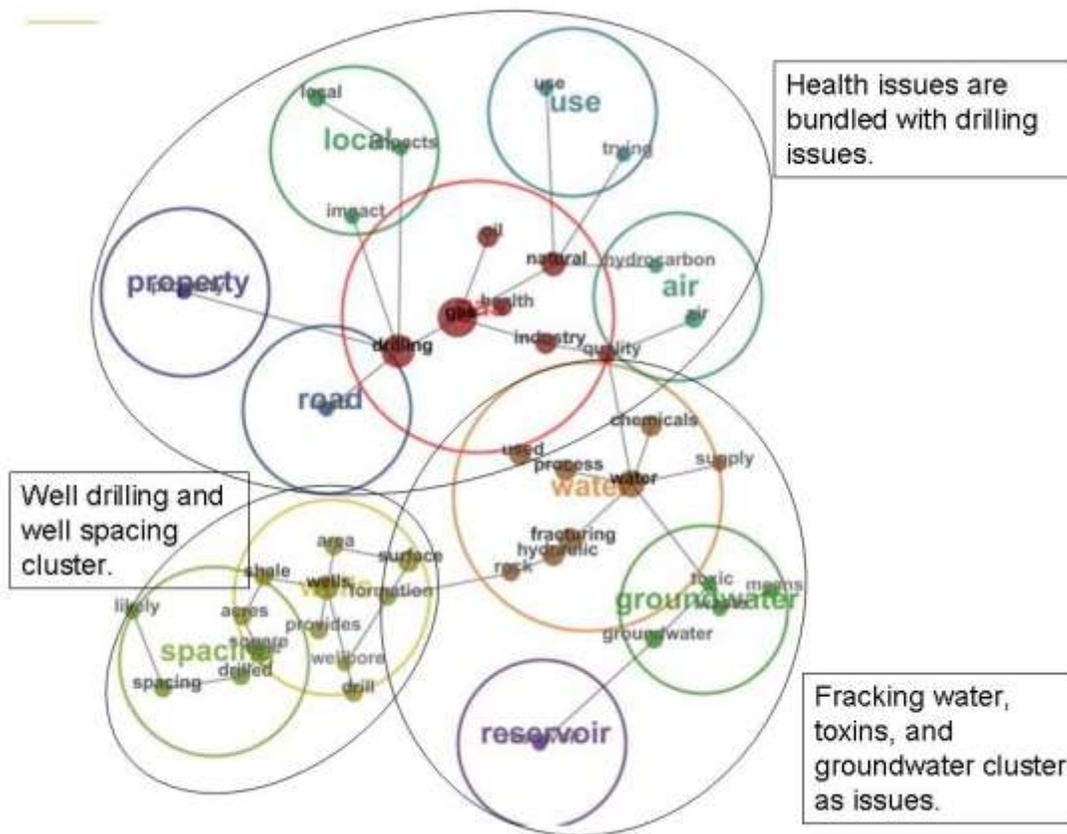
Figure 6. Concept map with themes for the entire FAQ corpus.

The first thing the geologist notices is that, as he expected, "gas," "water" and "drilling" are among the most frequent concepts (dark labels) in the FAQ corpus. They are also the concepts that most frequently co-occur with others (large nodes). Moreover, it is interesting that the concept "water" – fracking "water" and "groundwater" – is not located in the same thematic cluster as "gas" and "drilling." However, the concept of

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"health" does appear very close to "gas." It is also interesting that, within the FAQ corpus, the concepts related to well drilling and well spacing also form their own cluster, rather than being associated with the concept "drilling" specifically, or even "property." In short, the geologist observes that issues cluster into three groups: (1) physical factors involved in the development of gas drilling platforms and infrastructure within an area and associated health hazards, including air pollution; (2) environmental and legal factors involved in the establishment of a drilling platform well and regulations regarding the spacing of drilling platforms given the practice of horizontal drilling away from a drill site; (3) factors to do with the contamination of drinking and ground water by toxic chemicals in the fracking fluid.

The geologist suspects that this clustering is significant because it reflects the way drilling issues are perceived by CDOG to impact residents and the environment. He, therefore, digs deeper to explore how the FAQ topics are related to the main concept clusters. Fortunately, Leximancer has the capability of tagging concepts with the files that contain their generating terms. Leximancer is, therefore, re-run with an instruction to embed the FAQ file tags in the map. The names of the specific FAQs are used as tags.

The first conjecture of the geologist was that the answers to the question regarding the legal issue of *eminent domain* would be closely related to issues of well spacing and the potential of horizontal drilling for an energy company to access gas outside of a leased property. Eminent domain is the state regulation that allows the DEC to obtain assess to an individual's property in certain circumstances without the landowner's agreement. For example, if you were unwilling to lease your property for drilling and it was located between two landowners who were willing to lease, the state could acquire it for gas production through eminent domain. In other words, the geologist scoped the issue of eminent domain at the level of a local landowner's control over his property for drilling. However, the Leximancer result is surprising; the Eminent Domain FAQ is more closely related to the social, rather than personal costs, of drilling. The linkages (purple arcs) between the tag and related concepts run to concepts such as "health," "industrial," "process," and "water." While the "spacing" of wells is an issue, it

appears more as incidental rather than a main topic. The relevant map is presented in Figure 7.[28]

Figure 7. Concepts associated with the Eminent Domain FAQ.

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[28] The layout of the concepts in the map is slightly different from Figure 6 because the mapping algorithm is probabilistic. However, the clustering of the concepts remains the same.
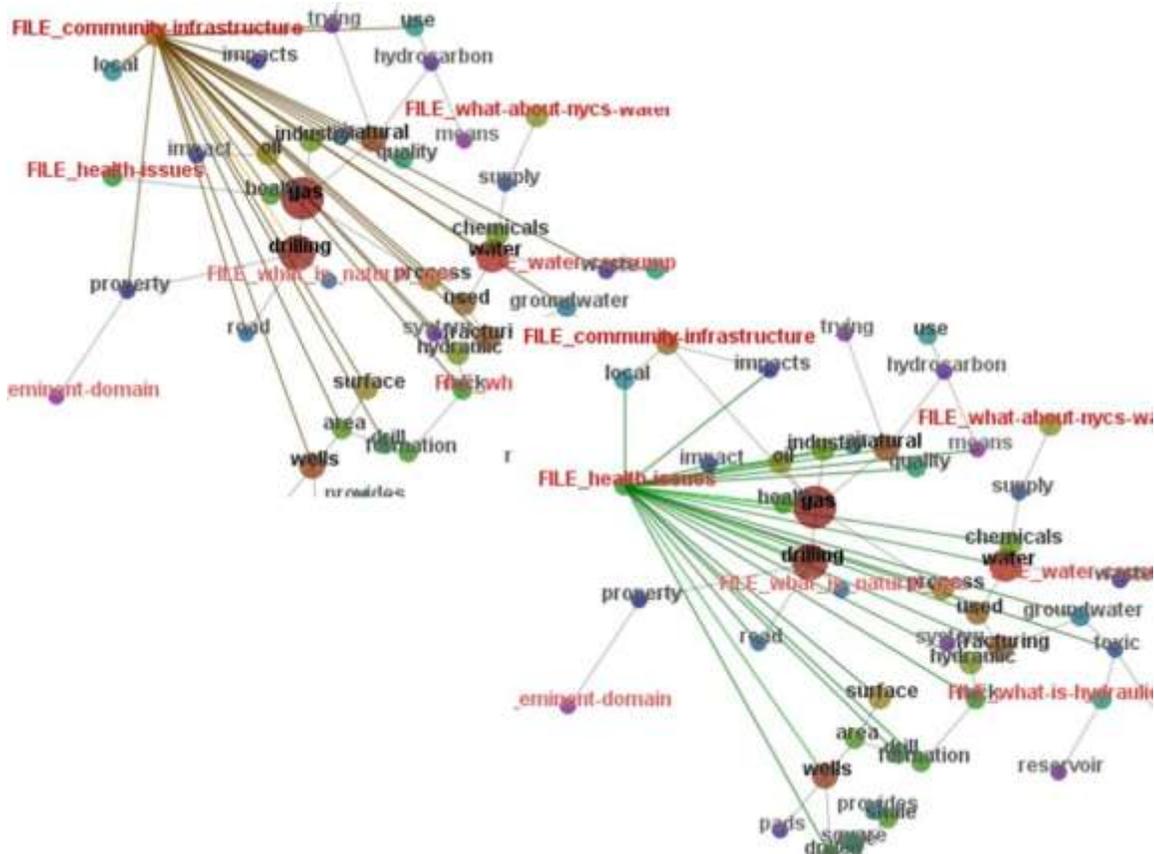
Figure 8. Concepts associated with the Community & Infrastructure and Health Issues FAQ.

Given that eminent domain issues were unexpectedly associated with the social impacts of drilling, the geologist wonders how the explicitly named Community & Infrastructure FAQ links to the concept map. Additionally, given that the concept "health" was positioned with the same social concerns about industrialization and air pollution, he is curious to see how the concept "water" is related to the FAQ on Health Issues. This, of course, would be the topic one would turn to first for information on the effect of toxins from fracking fluid on the health of one's family and purity of one's drinking water. Concept linkages for both questions are illustrated in Figure 8.

Inspection of the Community & Infrastructure map indicates that this FAQ bridges all three main issue clusters but with a specific focus on the spectrum of water issues. From inspection of the concepts, these include everything from the toxicity of fracking fluid, the disposal of fracking fluid, the direct contamination of groundwater by fluid entering the aquifer, and its effect of leaching naturally occurring toxic chemical in the shale into the water supply. Maintaining the purity of the water supply is clearly

construed by CDOG as a major issue for communities as well as individuals. Finally, inspection of the concept links for the Health Issues FAQ is very similar to the Community & Infrastructure FAQ. This suggests that the website views decisions to drill for natural gas as concerns of the community in general – not just for individual landowners.

<p style="text-align: center;">Local Analysis of the Moral Issues Involved in Opposition to Drilling</p>

Having identified the global topics at issue for un-naturalgas.com, the geologist decides to investigate further the specifics of how these issues are being framed. His focus is the three FAQs already identified. While employed by an energy company, the geologist had been involved in meetings on organizational change. There, he had become familiar with methods for reading the moral content of text in terms of expressions of the moral rights and moral duties or obligations of an agent.[29] Moreover, Leximancer makes it particularly easy to identify such expressions as they are related to the concepts on the concept map because (1) clicking on a FAQ tag will identify all of its related concepts, and then (2) clicking on these concepts will display all snippets of text related to that concept, including related text from another FAQ. These text snippets can then be examined for words or phrases related to the moral positioning of a stakeholder with an interest in natural gas drilling in New York. Stakeholders might include, for example, individual citizens, landowners, townships, the DEC, and energy companies.

In the process of extracting concepts, Leximancer identifies those "snippets" of text that realize them.[30] For example, Figure 8 gives some text snippets that contain the concept "gas" and which are associated with the tag "What is natural gas?," although not necessarily contained in that FAQ (the last bullet, which occurs in the FAQ related to Eminent Domain). The concept "gas" has been underlined and bolded in each snippet. The other bolded text includes language that the geologist considers expresses a moral position made by or about a stakeholder. Note that these are universally negative: in the first bullet, "natural gas is just another highly polluting hydrocarbon," and in the last

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[29] The author's approach to the analysis of the moral content of discourse borrows heavily from Rom Harré and Luk van Langenhoven, eds, *Positioning Theory*. (Oxford, UK: Blackwell Publishers, Ltd., 1999).

[30] The bounds of a text snippet are set to be 3 sentences. This is the default Leximancer setting.

bullet, "Horizontal drilling makes it possible for drillers to remove gas from the property of a landowner who does not want to sell his or her gas reserves."

- Recently, individuals and companies with a financial stake in natural **gas** production have been engaged in an effort to *re-brand natural gas as an 'alternative' fuel.*
- In fact, natural **gas** is just another *highly polluting hydrocarbon* and conventional - that is, *non-alternative - fuel like oil, to which it is closely related and with which it is frequently* found.
- Further, *extracting natural gas and transporting it to markets takes huge amounts of, you guessed it, (imported) oil.*
- Natural **gas** is often informally referred to as simply gas, especially when compared to other energy sources such as electricity. Before natural gas can be used as a fuel, it must undergo *extensive processing* to remove almost all materials other than methane.
- *Horizontal drilling also makes it possible for drillers to remove **gas** from the property of a landowner who does not want to sell her or his gas reserves, even though the landowner denies the drillers access to the surface of his property.* This is done through a DEC-mediated form of eminent domain called "compulsory integration."

Figure 9. Text snippets for the concept "gas" linked to the FAQ "What is natural gas?"

Figure 10 presents a sample of text snippets for Health Issues and Community & Infrastructure. Under Health Issues, there are assertions regarding the potential health risks to local residents from both drilling itself and the chemicals used in hydraulic fracking. It is asserted that while fracking "remains legal, it has been documented to cause groundwater contamination and even earthquakes." However, it appears that the federal institutions of the Environmental Protection Agency and the Center for Disease Control have failed the public in not conducting long-term studies on the public impacts of drilling. Given the failure of federal authorities to regulate, responsibility falls to local governments to minimize the negative impacts. However, the Community & Infrastructure FAQ sees a potential difference in perspective between the state and local levels of government: "The DEC is trying to discourage local governments from using moratoriums to delay the drilling until the Towns put needed protections in place." It also flags the fact that communities are only just realizing that there are a range of hidden impacts of drilling, including noise pollution, impacts on water systems and (negative) effects of property values. Indeed, since these impacts will "cost the local government money" new laws are needed to minimize impacts to the community and to "Implement community impact fees for schools and roads."

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Health Issues

- Haire's doctor blamed her ill health on the changes that occurred around her. In the last two years, gas companies have drilled over 600 natural gas wells.
- Critics say **health hazards from the wells don't stop with air pollution.** They point to a process called hydraulic fracturing, whereby a gas company injects into the ground a mix of water, sand and **chemicals that include carcinogens such as benzene, arsenic and lead.**
- **Despite the potential for health problems from unregulated pollution, neither the Centers for Disease Control nor the Environmental Protection Agency is conducting long-term public health studies connected to all this drilling. So no one knows how natural gas development may be polluting the air or water or affecting human health.**
- They found that the chemicals being used and produced **pose a potential health risk to local residents,** and recommended a thorough health impact assessment before expansion of oil and gas activities.
- Underground injection is a process supported by big industry, which lacks other ways to deal with large volume of wastes, but despite the success of industry efforts to co-opt government agencies so that the method remains legal, it also remains controversial and has been **documented to cause groundwater contamination and even earthquakes.**
- what local governments can do to minimize **negative impacts** of drilling.

Community & Infrastructure

- as well as the noise from compressor stations will impact on health when the drilling is near a school, hospital, nursing home or village.
- And there is the impact on water systems, including municipal water, underground aquifer, individual wells, as well as our ponds, lakes and rivers. Those impacts include both the sheer volume of water being pumped out of current water sources to use in the drilling process and the occasional **damage to water systems (wells, aquifers, ground water) when the drilling fluids get into those systems.**
- Implement community **impact fees** for schools and roads, e. g. assess taxes of number of trucks/day and weight.
- But the fact is that municipal lawyers use moratoriums regularly to allow their communities to study, investigate and determine **whether new laws are needed to minimize the negative impact of some development.**
- The DEC is trying to **discourage local governments from using moratoriums** to delay the drilling until the Towns put needed protections in place.
- **Local government officials are only beginning to hear about the unanticipated consequences of gas drilling on their communities. These impacts will cost the local government money and thus affect all of us whether we signed a lease or own any land.**
- And there is the impact on water systems, including **municipal water, underground aquifer, individual wells, as well as our ponds, lakes and rivers.** Those impacts include both the sheer volume of water being pumped out of current water sources to use in the drilling process and the occasional damage to water systems (wells, aquifers, ground water) when the drilling fluids get into those systems.
- *Prepare* plans to deal with impacts arising from changing property values. Pass Municipal watershed ordinances. The taking of water for drilling is not a one-shot deal.

Figure 10. Sample text snippets for the FAQs on Health Impacts and Community & Infrastructure.

At this point in the investigation, the geologist believes that he can give specific textual references from un-naturalgas.org for sentiments that were expressed at the township meeting over the possible negative impacts of drilling. Some of these textual references can also be linked through the FAQ to external sources. For example, points in the Health Issues FAQ come from sources as diverse as a New York City public commission on the environmental impacts of drilling in the New York City watershed and a Western environmental news magazine. He does think, however, that he may be able to do a reduction of the moral positioning snippets for the township leaders into moral classes. This reduction would set the text snippets within a set of general moral coordinates. However, this presents the challenge of deciding on a system for selecting coordinates.

The geologist again draws on his previous experience of moral content analysis in a corporate setting to re-classify text snippets in terms of basic human needs, such as

subsistence, protection, participation or *security.*[31] A manual study of the evaluative terms in the snippets suggested that they mainly concerned *subsistence* (for example, issues of health, pure water, and control over one's land) and protection (for example, issues of protection from the DEC or energy companies from drilling-based harm).

Figure 11 shows how the geologist organizes text snippets related to S*ubstance*. He identifies three main coordinates: (1) *Injury* to personal health, (2) the *Despoilment* of the environment and means of livelihood, and (3) the *Abandonment* of communities by state and federal institutions to fend for themselves in working with the energy companies on remediation or compensation. Snippets are placed in the figure to represent their approximate relationship to the *Subsistence* coordinates. Figure 12 presents a similar placing of snippets as they relate to *Protection.* The three coordinates in this case are: (1) *Theft* of gas through horizontal drilling or by the DEC through eminent domain, (2) *Dissembling* by all of the authorities in claims about the carbon footprint of natural gas or allowed well densities, and (3) *Collusion* between the energy companies and DEC to misinform the public on the leasing and the state power of compulsory access to private land through compulsory integration.

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[31] There are several different classifications of basic human needs, the best known of which is Maslow's Hierarchy of Needs. http://en.wikipedia.org/wiki/Maslow%27s_hierarchy_of_needs. The scheme used in this paper was created to guide rural development projects in South America by sensitizing projects to the needs of individuals being served, along with the positive and negative effects of proposed satisfiers of those needs. The system is elaborated by its creator, the Chilean economist Manfred Max-Neef in his book "Human Scale Development: Conceptions, Applications and Further Reflections." This book can be downloaded from the following website. http://www.max-neef.cl/download/Max-neef_Human_Scale_development.pdf.

Injury

Health hazards from the wells don't stop with air pollution.

Haire's doctor blamed her ill health on the changes that occurred around her. In the last two years, gas companies have drilled over 600 natural gas wells.

As well as the noise from compressor stations will impact on health when the drilling is near a school, hospital, nursing home or village.

They found that the chemicals being used and produced pose a potential health risk to local residents, and recommended a thorough health impact assessment before expansion of oil and gas activities.

Chemicals that include carcinogens such as benzene, arsenic and lead.

Damage to water systems (wells, aquifers, ground water) when the drilling fluids get into those systems.

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Moral Claims

Subsistence Focused
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Despite the potential for health problems from unregulated pollution, neither the Centers for Disease Control nor the Environmental Protection Agency is conducting long-term public health studies connected to all this drilling. So no one knows how natural gas development may be polluting the air or water or affecting human health.

It also remains controversial and has been documented to cause groundwater contamination and even earthquakes.

What local governments can do to minimize negative impacts of drilling.

Whether new laws are needed to minimize the negative impact of some development.

And there is the impact on water systems, including municipal water, underground aquifer, individual wells, as well as our ponds, lakes and rivers.

Prepare plans to deal with impacts arising from changing property values.

Local government officials are only beginning to hear about the unanticipated consequences of gas drilling on their communities. These impacts will cost the local government money and thus affect all of us whether we signed a lease or own any land.

The DEC is trying to discourage local governments from using moratoriums to delay the drilling until the Towns put needed protections in place.

Despoilment

Abandonment

Figure 11. Text snippets in the coordinates of a Subsistence human needs framework.

Theft

Horizontal drilling also makes it possible for drillers to remove gas from the property of a landowner who does not want to sell her or his gas reserves, even though the landowner denies the drillers access to the surface of his property.

it would be even better to declare our independence from greedy energy corporations who co-opt (that's a polite word for 'steal') our tax dollars, who monopolize the market & manipulate prices by inducing artificial shortages, and who keep trying to convince us that we have no other choices besides their hydrocarbon fuels that pollute at every step.

Everything is wrong when the state eagerly brokers a process by which one party's private property rights are violated and manipulated in favor of another (much bigger) party's financial interests.

Increased the property tax burden in other areas.

They're simultaneously making plans to export natural gas extracted here to countries overseas.

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Moral Claims

Protection Focused
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Compulsory integration is likely to be employed.

Allowing compulsory integration to proceed may still be the most financially rewarding option for a landowner.

Highly polluting hydrocarbon.

We've got to figure out a way to get some linkage to the world market and we are dedicated to trying to find a way to achieve that linkage.

Extracting natural gas and transporting it to markets takes huge amounts of, you guessed it, (imported) oil.

Larger drill pads disturb more contiguous surface area and result in more surface runoff from one location.

When energy companies extol the benefits of natural gas as a domestically-produced fuel, they're selling an illusion.

Through this compulsory integration process mediated by the DEC, the state gives the drilling company the right to take the unwilling seller's mineral resource, with some, non-negotiable, compensation.

Re-brand natural gas as an 'alternative' fuel.   Extensive processing.

There's no separate tank that allows us to buy domestically produced oil or natural gas at a lower price.
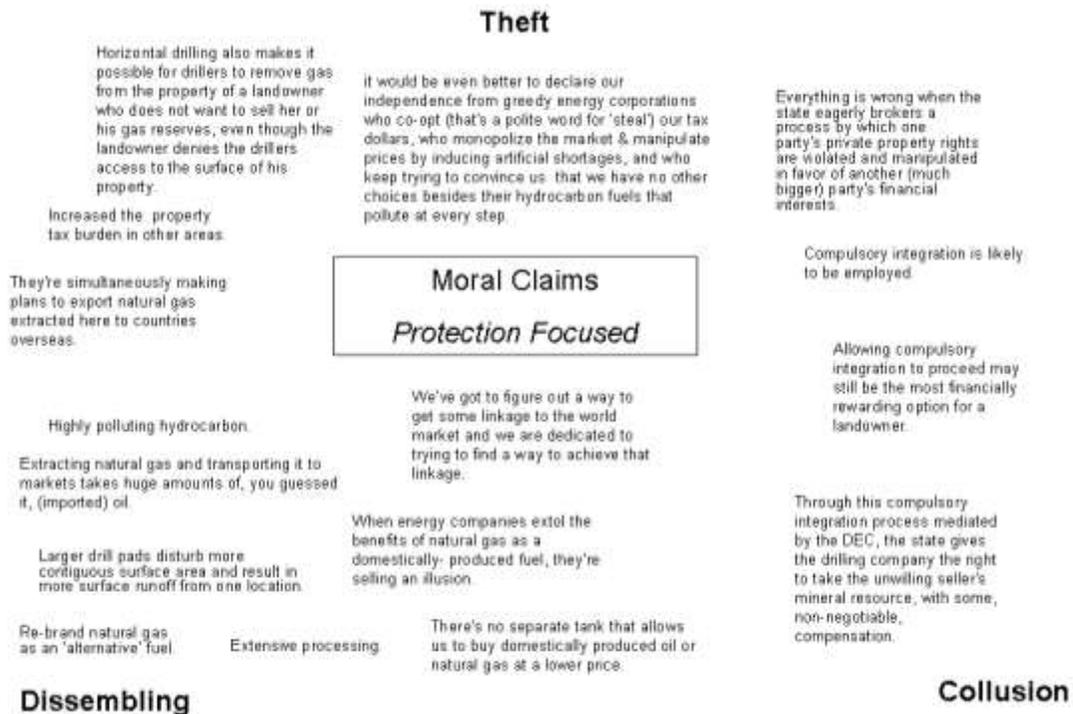
Dissembling

Collusion

Figure 12. Text snippets in the coordinates of a Protection human needs framework.

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Storylines for Seeding Conciliatory Conversations on Gas Drilling

The geologist is now in the final stages of his preparation for a presentation to the township leaders. His Leximancer 3.1 analysis of un-naturalgas.org has enabled him to ground what had previously been suppositions and rumors related to citizen concerns about gas drilling in the FAQ text of the area's main opposition website. Furthermore, it has enabled him to organize the issues into clusters associated with the website's moral positions regarding the possible community impacts and environmental justice of drilling. However, the geologist's goal is to go beyond a simple description of opposition issues to help the township leaders prepare for their meeting with the DEC. Ideally, he would like to prepare them for developing dialogue between opposing stakeholders in general, whether between the township and energy or state interests, or between the residents themselves.

The Leximancer research (Figure 6) has indicated that personal and environmental health issues represent two of three major, and linked, clusters of concern; the third combines the issues of well density, eminent domain and landowner rights. At the core of health concerns, but also impacting concerns over well density, is the issue of the toxicity of fracking fluid. From his previous involvement with the industry, however, the geologist is aware of alternatives. These include hydraulic fracturing using biodegradable chemicals and fracturing the shale with propane instead of water. He, therefore, conjectures that addressing the use of non-toxic alternatives in the Oneonta region might be a suitable topic to at least keep the discussions open with all stakeholders, including the DEC.

The geologist considers this an opportune time to introduce a conciliatory perspective into the discourse on drilling for shale gas in Upstate New York, since the discourse is only in its early stages. He wants to stimulate people to explore the needs of all parties, so that all voices have an opportunity to marshal evidence, frame arguments, and to be heard. He also wants to stimulate a diversity of viewpoints, so that the discourse does not become divisive. Additionally, he wants some vehicle to make available objective information on all aspects of the recovery of natural gas in the area as a small component of the nation's energy portfolio. Such a vehicle would provide a platform for presenting objective data on drilling options, costs, benefits and risks; it

would also provide a forum for exchange, along with the provision of facilitation and data research services for those requesting them. However, for now, the geologist is simply interested in developing a storyline regarding the shale fracturing options for a presentation that the township leaders could use to develop a dialogue with DEC scientists beyond the scheduled meeting.

Figure 13. Leximancer induced pathway between "waste" and "health."

The first stage of storyline development involves exploring the existing Leximancer concept map for linkages between a concept that represents the product of the fracking process that is most likely to cause health problems, and the concept "health." The geologist selects the term "waste." Given these two concepts, Leximancer provides a function for computing a pathway between them, as illustrated in Figure 13. This pathway traverses the most likely path between pairs of concepts on the map, where the legs of the pathway indicate pairs of concepts that are most closely related in the text. In Figure 13, "waste" is the start concept, "health" is the end concept, and the path traverses "waste" > "groundwater" > "hydraulic" > "fracturing" > "used" > process > "industry" > "oil" > "health."

Another view of the pathway is given in Figure 14, where each leg is associated with text in the instances where its start and end concepts appear within a text block. The empty legs represent linkages that are implicit in the sense that the relationships exist

through the intersection of the terms that define the start and end concepts of the leg, although the major term used to denote each of the concepts do not occur within any one text block.
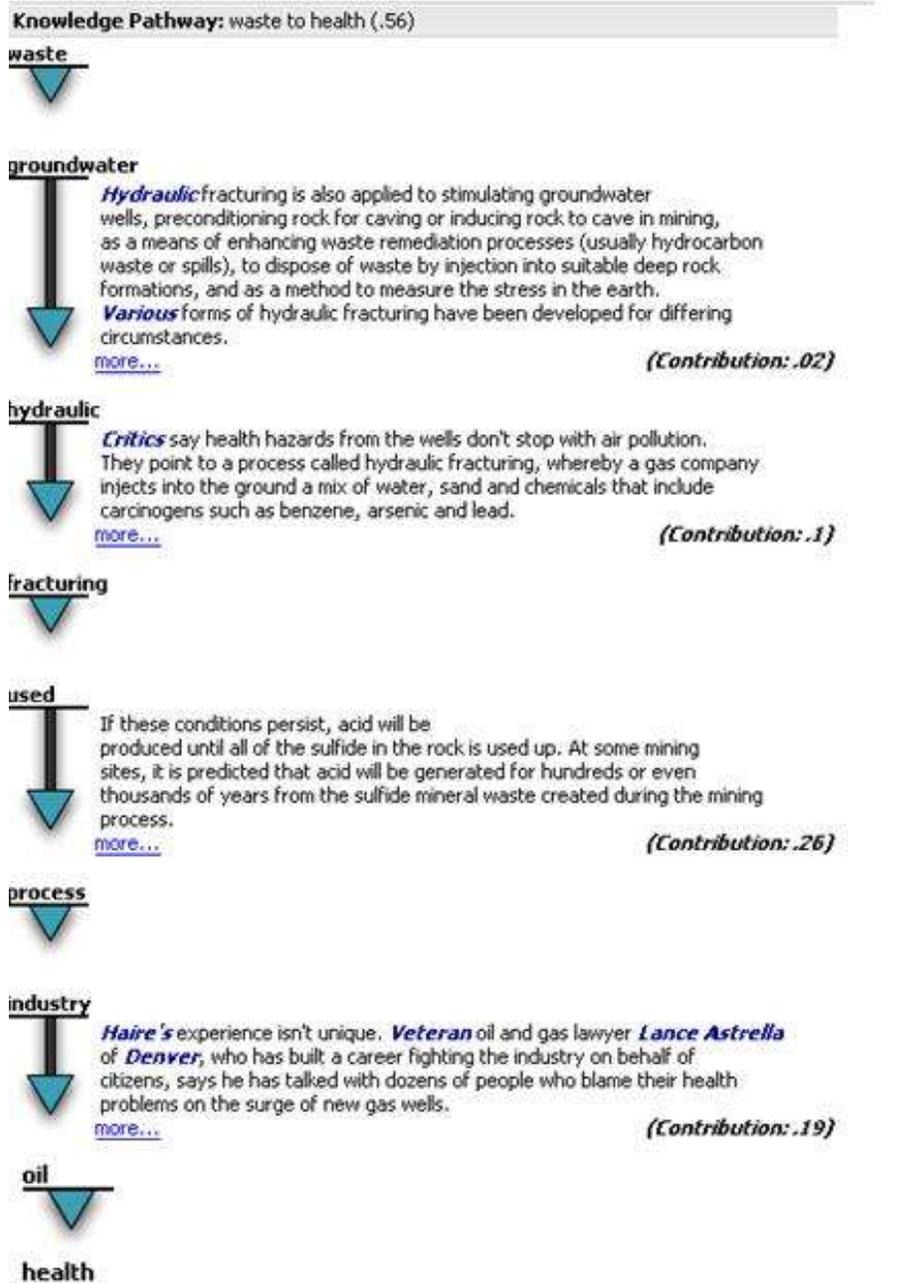

Knowledge Pathway: waste to health (.56)

waste

groundwater

Hydraulic fracturing is also applied to stimulating groundwater wells, preconditioning rock for caving or inducing rock to cave in mining, as a means of enhancing waste remediation processes (usually hydrocarbon waste or spills), to dispose of waste by injection into suitable deep rock formations, and as a method to measure the stress in the earth. *Various* forms of hydraulic fracturing have been developed for differing circumstances.

more...   *(Contribution: .02)*

hydraulic

Critics say health hazards from the wells don't stop with air pollution. They point to a process called hydraulic fracturing, whereby a gas company injects into the ground a mix of water, sand and chemicals that include carcinogens such as benzene, arsenic and lead.

more...   *(Contribution: .1)*

fracturing

used

If these conditions persist, acid will be produced until all of the sulfide in the rock is used up. At some mining sites, it is predicted that acid will be generated for hundreds or even thousands of years from the sulfide mineral waste created during the mining process.

more...   *(Contribution: .26)*

process

industry

Haire's experience isn't unique. *Veteran* oil and gas lawyer *Lance Astrella* of *Denver*, who has built a career fighting the industry on behalf of citizens, says he has talked with dozens of people who blame their health problems on the surge of new gas wells.

more...   *(Contribution: .19)*

oil

health

Figure 14. Text instantiating the pathway from the concepts "waste" to "health."

The number (.56) at the top of the figure can be read as a correlation indicating the degree of relationship between "waste" and "health." Contributions for each leg of the pathway are given to the right of that leg, if it is instantiated by a text snippet. Furthermore, the entire pathway can be interpreted as a storyline where the plot concerns the disposal of waste fracking fluid, along with the effects of waste residue remaining in the rock that can react with sulfides. The story continues that these residues can contaminate groundwater for a very long time and the issue that the energy industry seems unwilling to admit to the adverse effects of drilling, compensating property owners as appropriate..
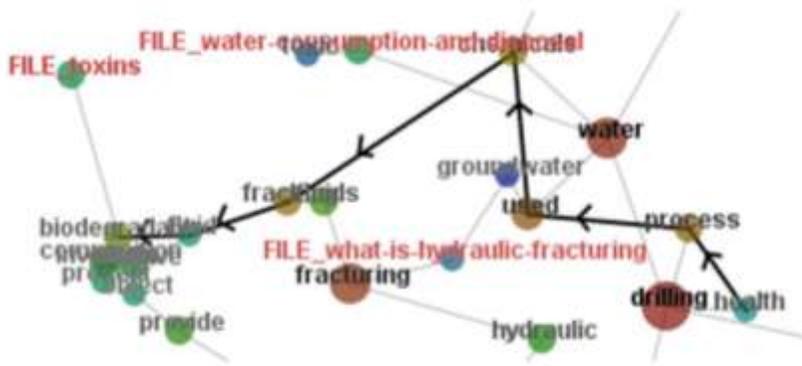
Figure 15. Pathway linking "health" with "biodegradable."

Having followed the logic of the relationships expressed in the concepts "waste" and "health" pathway, the geologist decides to explore how the global concept map would be configured if material on biodegradable fracking fluid had been included in the FAQ. He is specifically interested in research by Schlumberger on green chemistry.[32] Drawing on his knowledge as a geologist, he embeds in all FAQs referencing the toxic effects of conventional fluid new material based on Schlumberger reports on the advantages of biodegradable fracking fluid. He then re-runs Leximancer on a corpus that includes this new material and explores the emergent storylines involving "health" and "biodegradable." In his view, the most interesting is the one pictured in Figure 15 that starts with "health," the issue of major concern, and end with "biodegradable," the source of a possible solution. This is interesting because "groundwater," which was a concept of

[32] The fact that this technology is being explored is referenced in the article by Toby Shute, "Can Shale Gas Go Green?" *The Motley Fool*, March 29, 2010. http://www.fool.com/investing/general/2010/03/29/can-shale-gas-go-green.aspx.

crucial concern on the pathway from "waste" to "health" is not even referenced with "biodegradable" as an endpoint. Figure 16 shows the pathway instantiated by text. Note the similar level of correlation at (.54) to the alternative pathway at (.56).
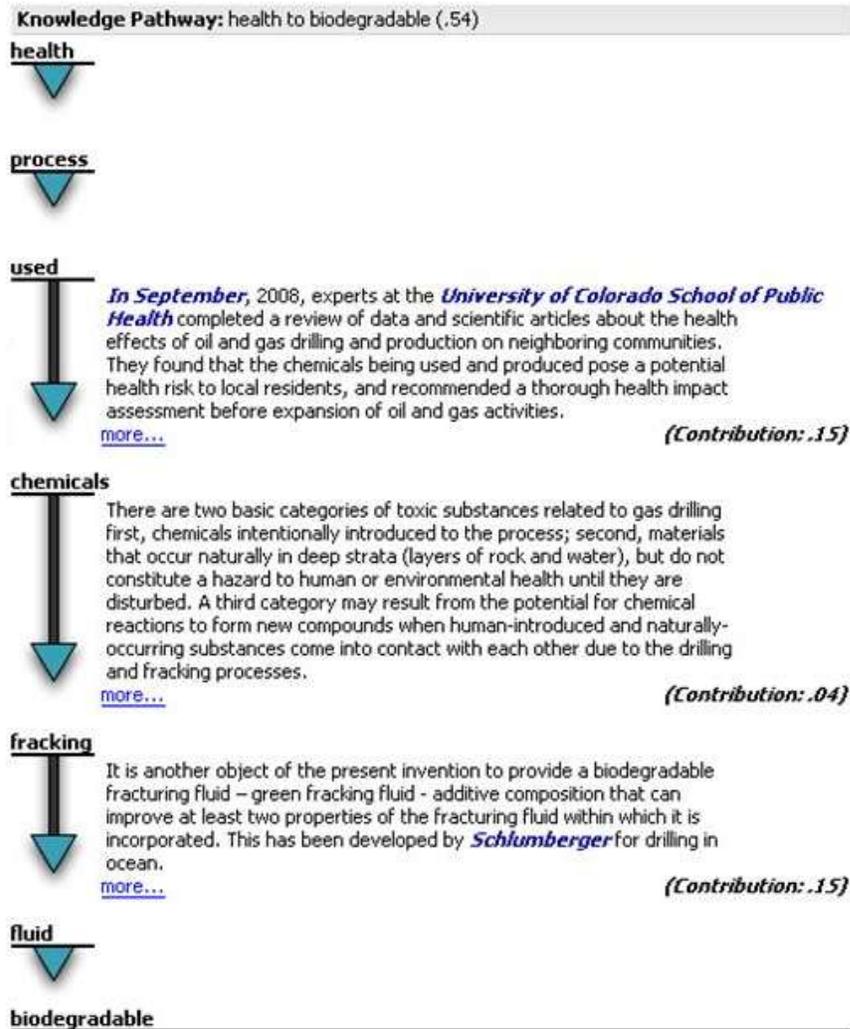

Knowledge Pathway: health to biodegradable (.54)

health

process

used

In September, 2008, experts at the *University of Colorado School of Public Health* completed a review of data and scientific articles about the health effects of oil and gas drilling and production on neighboring communities. They found that the chemicals being used and produced pose a potential health risk to local residents, and recommended a thorough health impact assessment before expansion of oil and gas activities.
more... *(Contribution: .15)*

chemicals

There are two basic categories of toxic substances related to gas drilling first, chemicals intentionally introduced to the process; second, materials that occur naturally in deep strata (layers of rock and water), but do not constitute a hazard to human or environmental health until they are disturbed. A third category may result from the potential for chemical reactions to form new compounds when human-introduced and naturally-occurring substances come into contact with each other due to the drilling and fracking processes.
more... *(Contribution: .04)*

fracking

It is another object of the present invention to provide a biodegradable fracturing fluid – green fracking fluid - additive composition that can improve at least two properties of the fracturing fluid within which it is incorporated. This has been developed by *Schlumberger* for drilling in ocean.
more... *(Contribution: .15)*

fluid

biodegradable

Figure 16. Storyline linking "health" to "biodegradable."

This storyline re-iterates the dangers of conventional fluid but raises the issue of an alternative green fluid that is being researched by Schlumberger. However, there are narrative gaps in various legs of the pathway where the FAQs do not articulate the relationship between a start and end concept within the bounds of meaning used in the Leximancer analysis.[33] The geologist decides that he would like to fill these gaps so that he can present a coherent narrative to the township leaders for them to have ready to offer

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[33] Recall that these bounds can be set as a parameter. In this example we have uses blocks of three sentences.

at the DEC meeting. Consistent with conciliatory modeling objectives, he wants this narrative to be sufficiently compelling to be regarded seriously by the DEC, although he also hopes that it will be challenged and will provide a segue into a discussion of the potential long-term costs to the community of drilling. In turn, this could lead to discussion with landowners and the DEC on risk management, remediation, and emergency preparedness for possible contamination of the aquifer.

Examining the biodegradable fracking fluid storyline again, the geologist decides that he wishes to understand in more detail how the concept of "biodegradable" relates to the concept "fracking," since the latter word is used to designate both the process of fracturing the shale as well as the fluid used to accomplish the fracturing. Figure 17

Figure 17. Text snippets linking "biodegradable" with "fracking."

presents the text snippets identified by Leximancer as linking "biodegradable" with "fracking."

For the geologist, three snippets stand out. The first concerns the properties of the biodegradable fracking fluid, and how they mirror those of the toxic conventional fluid; the second concerns the explicit statement that the biodegradable "eliminates the need for toxic chemicals;"[34] the third expresses one of the significant consequences of the use of biodegradable fluid, namely that natural gas extraction could take place in areas close to vital aquifers without endangering the aquifer and health of residents drinking the water.
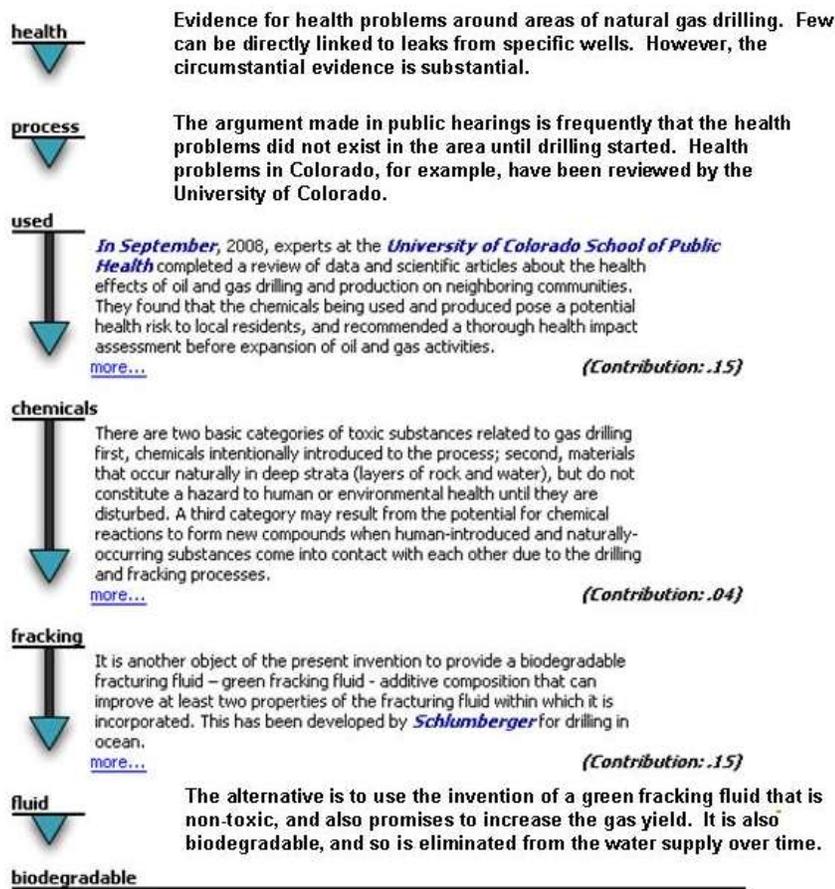
health

Evidence for health problems around areas of natural gas drilling. Few can be directly linked to leaks from specific wells. However, the circumstantial evidence is substantial.

process

The argument made in public hearings is frequently that the health problems did not exist in the area until drilling started. Health problems in Colorado, for example, have been reviewed by the University of Colorado.

used

In September, 2008, experts at the *University of Colorado School of Public Health* completed a review of data and scientific articles about the health effects of oil and gas drilling and production on neighboring communities. They found that the chemicals being used and produced pose a potential health risk to local residents, and recommended a thorough health impact assessment before expansion of oil and gas activities.
more...   *(Contribution: .15)*

chemicals

There are two basic categories of toxic substances related to gas drilling first, chemicals intentionally introduced to the process; second, materials that occur naturally in deep strata (layers of rock and water), but do not constitute a hazard to human or environmental health until they are disturbed. A third category may result from the potential for chemical reactions to form new compounds when human-introduced and naturally-occurring substances come into contact with each other due to the drilling and fracking processes.
more...   *(Contribution: .04)*

fracking

It is another object of the present invention to provide a biodegradable fracturing fluid – green fracking fluid - additive composition that can improve at least two properties of the fracturing fluid within which it is incorporated. This has been developed by *Schlumberger* for drilling in ocean.
more...   *(Contribution: .15)*

fluid

The alternative is to use the invention of a green fracking fluid that is non-toxic, and also promises to increase the gas yield. It is also biodegradable, and so is eliminated from the water supply over time.

biodegradable

Figure 18. Sample storyline regarding the avoidance of health problems through the use of biodegradable fracking fluid.

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[34] Hopefully the geologist makes a mental note that he needs to research this further in the scientific literature. After all, he wrote the additional text; in the words of Wikipedia, additional references are needed.

The geologist now finalizes the biodegradable fracking fluid storyline, weaving in some of the existing ideas of the dangers of conventional fluids. The final version is given in Figure 18. The storyline is structured to appeal to all stakeholders by taking a non-blaming perspective on the past tendency of energy companies to take a legal, rather than an empathic, attitude to claims that their activity has adversely affected the health of local residents. The geologist starts by proposing that evidence for the health effects of drilling is often circumstantial. However, he points out that an extensive University of Colorado study has reviewed data from that state, where drilling has been extensive, and finds that there is cause for concern. Sources of concern include the effects of direct contamination of water supplies from the toxic chemicals used in hydraulic fracturing and also from the release of toxic materials in the rock itself resulting from interaction with the fluid. However, the storyline goes on to mention that both these risks could be eliminated by the use of biodegradable fluid since these fluids are nontoxic if they find themselves in domestic wells and are, of course, eliminated from the water supply completely over time.

Conciliatory Modeling for Deliberative Democracy

Coming to the end of his brief case study, the geologist prepares his material for the township leaders. He enters the opposition network, concept maps, text snippets, moral coordinates, and storylines into a Powerpoint presentation. The presentation lays out a strategy for using the material to stimulate dialogue between stakeholders rather than looking for solutions to specific problems. His opinion is that viewpoints are becoming sufficiently polarized and emotionally colored that amicable local relationships, for which the township is known, may be hard to maintain once the energy companies begin to contact landowners directly to sign leases. To counter this possibility, he believes that it would be beneficial for the community to take the broadest perspective on the many facets of benefits, costs and risks.

The development of a multi-faceted perspective should have the community working together towards a policy on drilling, where all voices are heard and where there is a future oriented discussion that at least airs the multiple factors that need to be considered in any solution. For example, irrespective of whether the township wants to

deal with an energy company following the suspected contamination of a water supply, it will have to be involved. It, therefore, needs to address the possibility in advance and develop appropriate relationships with all players, as well as planning for the funds to cover any costs of legal representation.

Consistent with the local instantiation of the OGI, the geologist believes that the township should set up a discursive website, consult on the development of a policy issue set, facilitate both Internet and face-to-face forums on solutions, and then bring residents in on policy decisions. Where there are gaps within Internet service in the area, schools and libraries should be mobilized to contribute. As an exercise in deliberative democracy, it would be hoped that narrative products could provide sufficient coverage of the community households to become a guide to action that had legitimacy due to its transparent embedding in the community and the objectivity of the mapping of community positions due to the Leximancer content analysis of web discourse.[35]

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[35] The grounding of the community's position in the text that they generate would be achieved through Leximancer. The new version of Leximancer, version 3.5, is especially suited to this task with new the incorporation of new tools to help an analyst or facilitator sort out differences and similarities in positions.