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ARTICLE



Key Topics in environmental sociology, 1990–2014: results from a computational text analysis

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ABSTRACT

Environmental sociology is a growing field producing a diverse body of literature while also moving into the mainstream of the larger discipline. The twin goals of this paper are to introduce environmental sociologists to innovations in content analysis, specifically a form of text-mining known as topic modeling, and then employing it to identify key themes and trends within our diverse field. We apply the topic modeling approach to a corpus of research articles within environmental sociology, identifying 25 central topics within the field and examining their prevalence over time, co-occurrence, impact (judged by citations), and prestige (judged by journal rankings). Our results indicate which topics are most prevalent, tend to occur together, and how both vary over time. They also indicate that the highest impact topics are not the most prevalent, the most prestigious topics are not the most prevalent, and topics can be prestigious without exerting much impact. We conclude with a discussion of the capabilities computational text analysis methods offer environmental sociologists.

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Computational social science; content analysis; text-mining; topic models; environmental sociology

Introduction


At its inception, environmental sociology operated at the relative margins of the discipline. Early contributions such as Catton and Dunlap (1978) and Schnaiberg (1980) were highly influential within the field, but garnered modest attention in mainstream sociology. Especially in the past two decades, however, environmental sociology scholarship has moved increasingly from the margins into the mainstream of the discipline – even while becoming more interdisciplinary (Pellow and Nyseth Brehm 2013). The mainstreaming of environmental sociology is evidenced in part by articles such as Foster (1999), Frank, Hironaka, and Schofer (2000), Grant, Bergesen, and Jones (2002), York, Rosa, and Dietz (2003), Hooks and Smith (2004), Cable, Shriver, and Mix (2008), Auyero and Switsun (2008), Rudel (2009), Crowder and Downey (2010), Grant et al. (2010), Longhofer and Schofer (2010), Foster and Holleman (2012), Jorgenson and Clark (2012), Pampel and Hunter (2012), Elliott and Frickel (2013, 2015), and Dokshin (2016) in the two top disciplinary journals, *American Sociological Review* and *American Journal of Sociology*, as well as two recent reviews of the field in the *Annual Review of Sociology* (Rudel, Timmons Roberts, and Carmin 2011; Pellow and Nyseth Brehm 2013). A new study by Scott and Johnson (2017) documents the growing presence of environmental sociology within top-tier sociology

journals,¹ and suggests that increasing attention to stratification and inequality has helped move environmental research into the disciplinary core. Our study complements theirs by providing an analysis of key topics in the field drawn from a far wider range of sociology journals, with the goal of shedding light on major themes and trends in our highly diverse field (Lockie 2015).

The analysis presented here identifies 25 key topics within environmental sociology over a quarter-century, making use of text-mining techniques. These techniques allow researchers to quantitatively analyze digitized text, with several contributions already made by sociologists in the areas of culture, discourse, environmental sociology, organizations, networks, and social movements (Moody and Light 2006; DiMaggio, Nag, and Blei 2013; Mohr and Bogdanov 2013; Light 2014; Bail 2016; Farrell 2016a, 2016b; Light and Cunningham 2016). For example, Farrell (2016a) utilized computational approaches to text analysis to explore thematic content produced by organizations promoting climate change denial, documenting trends that differ by funding source.

This paper aims to demonstrate the capabilities of text-mining for environmental sociologists through an exploratory analysis of a quarter-century of research in the field. Our hope is that researchers will see the applicability of this method to their specific topics of

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 The supplemental data for this article can be accessed [here](#).

expertise, as the case study provided here is intended as a general reference for scholars across the diverse areas within environmental sociology. Several questions guide this exploration. First, what are the most prevalent topics within the field over the last quarter-century, and how have they varied over time? Second, what topics are most likely to co-occur within a common article abstract? Third, which topics predict an article's impact (in terms of citations per year) and prestige (in terms of journal rankings)? Answering these questions will provide evidence regarding topical prevalence, impact, and prestige of differing topics within environmental sociology.

Before proceeding with our analysis, we should first note what this paper does *not* accomplish. This analysis does not represent all identifiable topics within environmental sociology, but instead focuses more narrowly on topics emerging from an analysis of a set of peer-reviewed, English-language articles published during 1990–2014 containing selected search terms and indexed in the Web of Science's Social Science Citation Index (SSCI). These search terms – listed below – by no means exhaust *all* article-based scholarship that might qualify as environmental sociology (if identifying this universe was somehow possible), and amending the search terms could certainly alter the number of articles returned by the search and forming the 'corpus' for our study.² Notably, no books are included, as the SSCI only indexes journal articles. Nonetheless, the SSCI covers a large majority of all scholarly journals and thereby captures the bulk of articles within each discipline.

The SSCI provides valuable metadata associated with each article in the form of publication date, journal, number of citations, institutional affiliation of author, etc., but restricts text to the article abstract rather than the full-text of the article. This doubtlessly impacts the results presented here, as many articles likely discuss various topics in the full-text (especially in literature reviews or discussion/implications sections) without explicitly addressing them in their abstracts. Researchers should keep this in mind while reading our results and consider alternative datasets relevant to their own research. Still, we believe that journal article authors signal their primary research agendas in their abstracts, and thus our topic model analysis is based on language most central to these scholarly works.

Topic modeling

At its core, topic modeling provides a statistical representation of text-based data, providing insight into the probability of word co-occurrence within documents. The latent 'topics' identified through this process represent codes of substantively meaningful themes contained within a corpus of text. Sociologists of science

have utilized methods that allow for the identification of specialties across large volumes of scientific literature in the past, including co-word analysis (Callon et al. 1983) and citation networks (Small and Griffith 1974). Topic modeling harnesses computing power to advance methods of modeling text. Mohr and Bogdanov (2013) provide a non-technical overview of the topic modeling approach, interpreting it as offering answers to fundamental questions proposed in the early era of content analysis by Lasswell, Lerner, and de Sola Pool (1952), while DiMaggio, Nag, and Blei (2013) view it as offering a useful analytical approach for the sociology of culture.

Innovative approaches such as topic modeling make use of latent Dirichlet allocation (LDA) to systematically identify latent associations between words (referred to as 'topics') across a set of documents. Outlined in Blei et al.'s (2003) pioneering work, topic models utilize LDA to model k topics across a corpus, using an algorithm to infer a latent topic structure underlying the text. This process assumes a relational linguistic structure wherein word co-occurrence within common documents infers topic assignment, with each document representing a mixture of coherent topics observed throughout the corpus. LDA rests on the assumption that k topics are known and fixed beforehand, which then provide the dimensionality of θ per-document topic proportions. Thus, rather than starting with pre-defined codes (as done in most traditional forms of content analysis), researchers specify an initial number of topics. This process is iterative and hermeneutic in practice, and models are accepted primarily upon their substantive interpretability and validation rather than exclusively passing a statistical test (DiMaggio, Nag, and Blei 2013; Grimmer and Stewart 2013). A variety of diagnostic tests have been proposed to arrive at a data-driven number of topics (Blei, Andrew, and Jordan 2003; Wallach et al. 2009; Taddy 2012; Lee and Mimno 2014). These disparate approaches can produce conflicting results in practice, and while they provide a helpful range of issues to consider, researchers ultimately need to decide that the operational number of topics appropriately balances semantic coherence and topic exclusivity.

Perhaps most attractive, content analysts can harness the computing power of clustering algorithms to code large numbers of documents that would be prohibitively difficult to analyze manually (see, e.g. Farrell 2016a, 2016b). Moreover, relying upon unsupervised machine learning can aid researchers in discovering patterns that manual coding may miss (Evans and Aceves 2016). However, while Roberts et al. (2014) demonstrate the reliability of unsupervised machine learning versus hand coding, topic modeling certainly does not relieve analysts of domain-specific expertise and familiarity when interpreting results generated by topic models.

Building upon earlier approaches to topic modeling, Roberts et al. (2014) developed structural topic modeling (STM) that allows researchers to make greater use of observed structural variables that characterize documents. Relevant to this paper, the STM approach builds on standard LDA by assuming that topics can be correlated with one another and that X covariates structure the distribution of topics over documents (Roberts et al. 2014, 1067). The STM approach can be used to explore topical correlation, as well as understand how document metadata (covariates such as publication dates, citation counts, or journal prestige) relate to topic distributions.

Data and methods

Data for this project were downloaded from the SSCI. All article abstracts published between 1990 and 2014 were collected that contained any of the following search terms³: climate change, environment and society, environmental behavior, environmental concern, environmental problems, environmental sociology, environmental values, or pollution. Article abstracts were then filtered by whether they appeared in journals categorized as 'sociology' in the SSCI, which captures the majority of generalist and specialist journals within our discipline. This led to the exclusion of some interdisciplinary journals such as *American Behavioral Scientist* (in SSCI's 'social science, interdisciplinary' category), where several influential articles in our field have appeared (e.g. Taylor 2000), and the inclusion of others such as *Annals of Tourism Research* where sociologists do not publish frequently but which include research relevant to environmental sociology. In the end, we decided that limiting research to journals categorized under 'sociology' by SSCI was appropriate, as expanding to other categories (such as 'environmental studies') invited too much 'noise' in the form of scholarship that does not resonate with sociologists.

This process yielded 815 article abstracts.⁴ Isolating research in environmental sociology is somewhat challenging given the semantic ambiguity of the words 'environment' and 'environmental'. Clearly the corpus analyzed here is not exhaustive of all scholarship rightfully belonging to the field of environmental sociology. By limiting the analysis to articles published in English, we exclude scholarship from many Asian, European, and Latin American researchers. However, while US and other English-language researchers are heavily represented in this corpus, contributions from scholars affiliated with institutions in over a dozen countries are included. As the results will indicate, the model applied to this corpus produces topics commonly mentioned and discussed within the field, as apparent from articles in this journal.

In addition to the text, several covariates were gathered with each article abstract. These include publication date, number of citations, and journal prestige. Publication date is measured by year. As older publications clearly have more opportunity to accumulate citations, this covariate was transformed into citations per year. To address outliers, citations per year were capped at 20, as the large majority of the articles in the corpus garnered fewer than 20 citations per year. Journal prestige was measured using the h5-index from Google Scholar at the time of download (September 2015).

The results presented in the next section derive from a model with a 25-topic solution. As mentioned earlier, several diagnostic methods exist to guide validation in selecting the number of topics for a model. One common method makes use of a quantitative measure known as a perplexity score. After a model is trained by observing only a portion of words contained in a document, it then predicts the distribution of remaining held-out words. Mathematically, perplexity measures the geometric average of the inverse probability of the held-out words, allowing for a comparison of models with different numbers of topic solutions (Goodman 2001; Blei, Andrew, and Jordan 2003; Blei and Lafferty 2007). Perplexity score results applied to this corpus suggest a topic model with a number of topics ranging from 25 to 31. Models in this range were qualitatively evaluated by their interpretability. A 25-topic model yielded the most substantively interpretable results, and thus was selected for this analysis. The topic model was generated using the `stm` package in R developed by Roberts, Stewart, and Tingley (2014). After computing the topic model, relationships between latent θ topic proportions and observed metadata structuring the corpus described earlier (publication date, citations per year, and journal prestige) were explored.

After computing topical correlations across documents, graphs were generated using the Fruchterman-Reingold algorithm available in the `igraph` R package (Csardi and Nepusz 2006). In these plots, nodes represent the 25 topics while edges represent topic ties, which indicate a greater likelihood of co-occurrence within mutual documents. Ascending correlation thresholds were then explored to visually display core topical clusters that populate the thematic landscape of environmental sociology.

Results

Prevalence

Figure 1 presents the 25 topics produced by the unsupervised model (with the top five word stems associated with each topic), ranked from most to least prevalent in the corpus. Environmental sociologists will readily recognize most if not all of them as common topics in

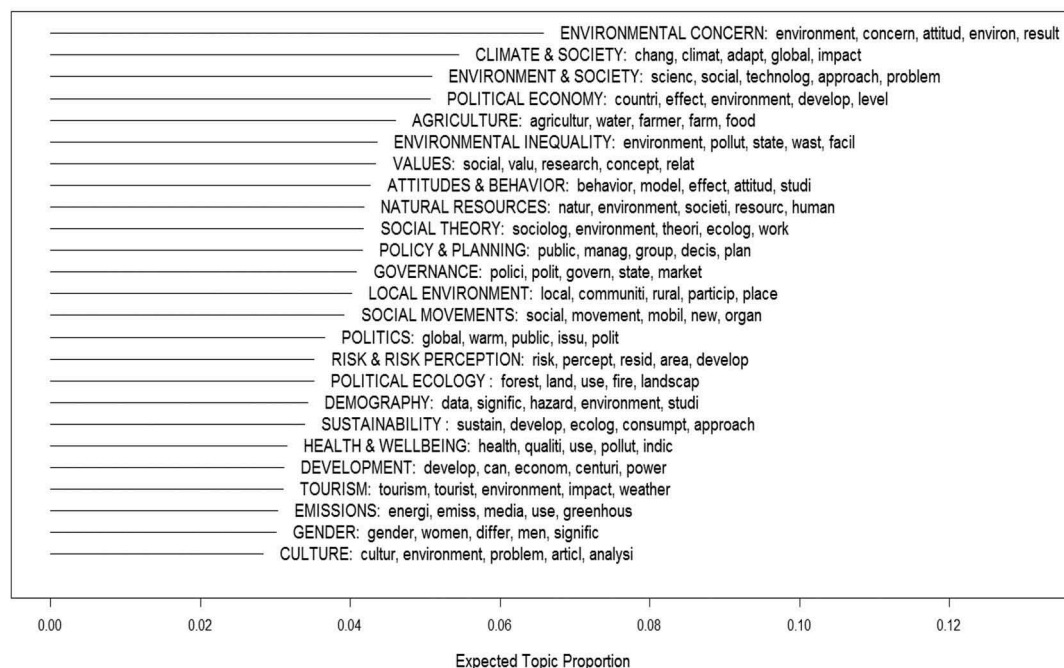


Figure 1. Labels for a 25-topic solution produced by a structural topic model of 815 environmental sociology articles, including the top five associated word stems. The x-axis represents the proportion of each topic within the overall corpus.

publications, sessions at professional meetings, course syllabi and intellectual discussion more broadly. Under this model, Environmental Concern emerges as the most prevalent topic in the corpus, accounting for nearly 7% of topical attention among all article abstracts. This is not surprising, as it has been a focus of environmental sociologists since the emergence of the field (Buttel 1987); however, as we show below, it is declining in prominence. Zhou (2013) is an illustrative example of this topic, in which research typically makes use of survey methods:

This article uses the 2006 World Values Survey data to examine which Canadians are most concerned about the environment. The results show that those individuals who have more education and greater knowledge of global environmental degradation are more likely to be concerned about the environment. Environmental concern in Canada is also politicized in that liberals are more concerned about the environment than conservatives. The results also show that environmental concern is multidimensional. Although some Canadians show more awareness of environmental threat and more willingness to pay for environmental protection, others are more likely to directly participate in environmental organizations.

Other articles in this topic include Dunlap and York (2008), Marquart-Pyatt (2012), Knight and Messer (2012), and Xiao, Dunlap, and Hong (2013). (See Appendix for a list of two sample articles for each of the 25 topics.)

Following Environmental Concern in prevalence is Climate & Society, and represented by Alston (2011):

Debate continues to rage as to the veracity of evidence around the permanence of climate change.

There is no doubt that changes are occurring across the world and that these changes are causing significant social hardship, including food and water insecurity and large-scale movements of people. What is also emerging in research across the world is that these social impacts and adaptations are highly gendered. This article draws on several years of research on the Australian drought and more recent research on declining water availability in the Murray – Darling Basin of Australia. It notes the significant social impacts, particularly in remote and irrigation areas, and draws out the gendered impacts of these changes. The article argues for more sensitive rights-based social policy to address people who are under extraordinary stress during times of unparalleled change.

Other articles focusing on the wide-ranging topic of Climate & Society include Rosa (2001), Molnar (2010), and Shove (2010), addressing areas such as adaptation, risk, and vulnerability relating to climate change. Notably, Climate & Society is receiving increasing attention within environmental sociology, as illustrated in Figure 2 where its topical prevalence is contrasted with that for Environmental Concern from 1990 to 2014. While there is a modest decline for Environmental Concern, there is a very noticeable increase for Climate & Society. The latter reflects the fact that climate change is increasingly recognized as an existential threat warranting sociological attention (Dunlap and Brulle 2015).

The third most prevalent topic, Environment & Society, includes a set of mostly theoretical and conceptual perspectives on contributions sociologists can make to analyses of environmental issues and problems (Williams 1998; Burningham and Cooper 1999; Carolan 2006). Williams (1998) provides a good illustration:

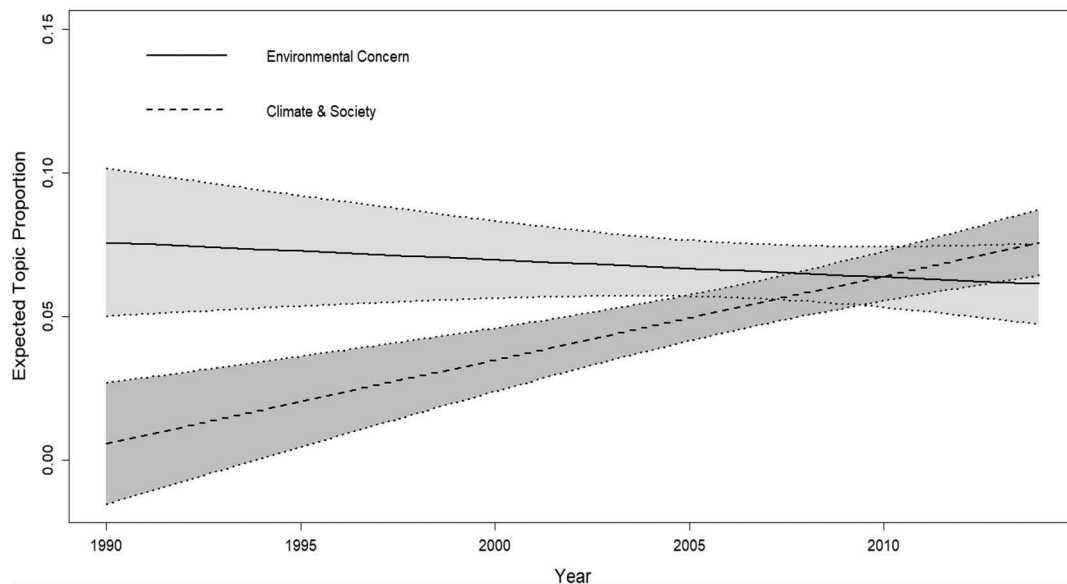


Figure 2. Topical prevalence of 'Environmental Concern' and 'Climate & Society' over time, 1990 – 2014 (with 95% confidence intervals).

Perhaps one of the most obvious yet difficult questions confronting sociologists concerned with large-scale environmental problems is an epistemological one: How do we know what we know about the state of the environment? This paper explores the realist and constructionist approaches to environmental-social problems and finds both inadequate as currently formulated. A case is made for a phenomenological constructionism that moves beyond relativism and simple definitional constructionism by exploring how we actually experience the world. This approach recognizes the existence of a natural world independent of our constructions, yet suggests that our knowledge of it is always mediated, indirect, and pragmatically motivated.

To some degree, articles engaging this topic explore the unique contributions of environmental sociology,

lay foundations for theoretical frameworks, or engage in 'boundary-work' for the field (Gieryn 1983). Figure 3 plots the Environment & Society topic over time, showing the declining prevalence of this topic. This trend may signal the maturing of environmental sociology, in that scholars feel less need to articulate its unique contributions – reinforcing Scott and Johnson's (2017) suggestion that the field has moved into the mainstream of sociology.

Political Economy is the fourth most prevalent topic and as also shown in Figure 3 it is rising rapidly in prevalence. This topic includes a collection of articles using cross-national approaches to global environmental problems, often providing tests of theoretical frameworks such as world systems or treadmill of production (examples include Jorgenson

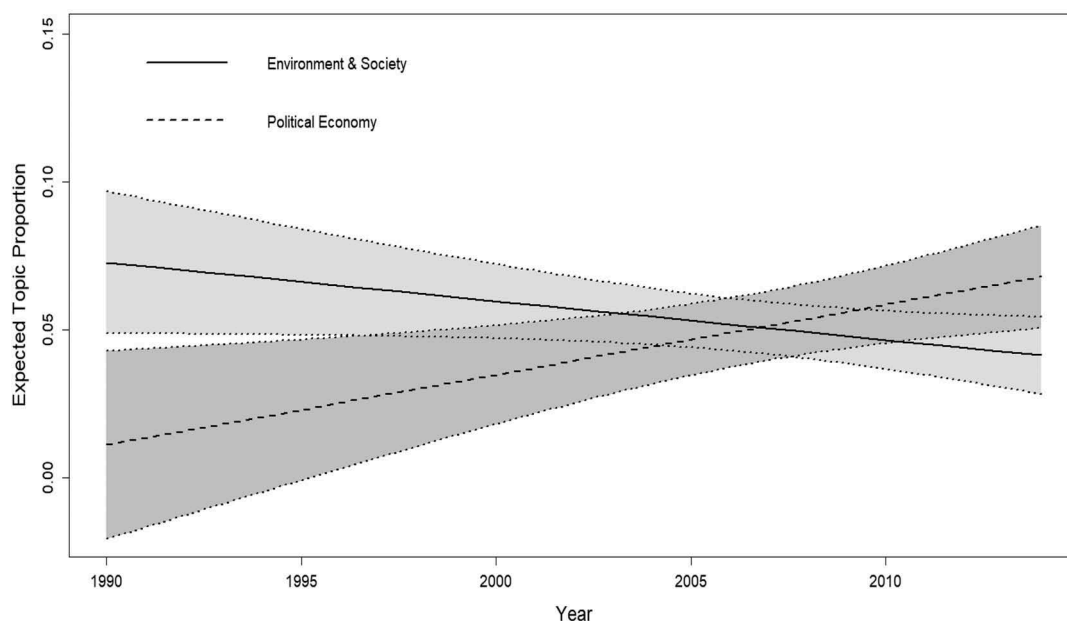


Figure 3. Topical prevalence of 'Environment & Society' and 'Political Economy' over time, 1990 – 2014 (with 95% confidence intervals).

2012; Stretesky and Lynch 2009; Jorgenson, Dick, and Austin 2010; Dick 2010). Jorgenson (2012) is representative of this topic:

The author engages the sociological theory of ecologically unequal exchange to assess the extent to which levels of per capita anthropogenic carbon dioxide emissions are a function of the “vertical flow” of exports to high-income nations. Results of cross-national fixed effects panel model estimates indicate that levels of such emissions are positively associated with the vertical flow of exports, and the relationship is much more pronounced for lower-income countries than for high-income countries. Additional findings suggest that the observed relationship for lower-income nations has grown in magnitude through time, indicating that structural associations between high-income and lower-income countries have become increasingly ecologically unequal, at least in the context of greenhouse gas emissions. These results hold, net of various important controls.

Rudel, Timmons Roberts, and Carmin (2011) review much of this research.

The rising prevalence of environmental sociology research employing political economy perspectives and that focused on climate change, coupled with the declining prevalence of research on environmental concern and especially on conceptual debates on environment and society, document important trends in the evolution of our field over time. Similar rises and declines are apparent in some of the less prevalent topics, with both Emissions and Governance rising; Development, Natural Resources, and Social

Theory declining⁵; while Agriculture, Health & Wellbeing and Social Movements remain steady in prevalence.

Correlation

We may also examine how topics correlate with one another through co-occurrence at the document level, to get a sense of how likely a single document discusses any given set of topics. These correlations are explored across Figures 4–6. In Figure 4, shorter distance between nodes and the presence of ties indicate a greater likelihood that topics will be discussed in the same document. Ties are set at all correlation values between topics greater than 0.01, with correlation values below this threshold set to zero. All topics are tied to at least one other topic at this extremely low correlational level, except for Culture (the least prevalent in the corpus) and Social Movements. This reflects the fact that article abstracts engaging these two topics tend to utilize language not commonly used in other topical areas of research. Also of note in Figure 4 is that Political Economy – one of the most prevalent topics in the corpus – is relatively isolated from other topics, sharing a sole tie with the Emissions topic. This may stem from researchers engaging the Political Economy topic using relatively unique language within the field, often drawn from well-developed theoretical perspectives, while frequently using greenhouse gas emissions as data in quantitative analyses.

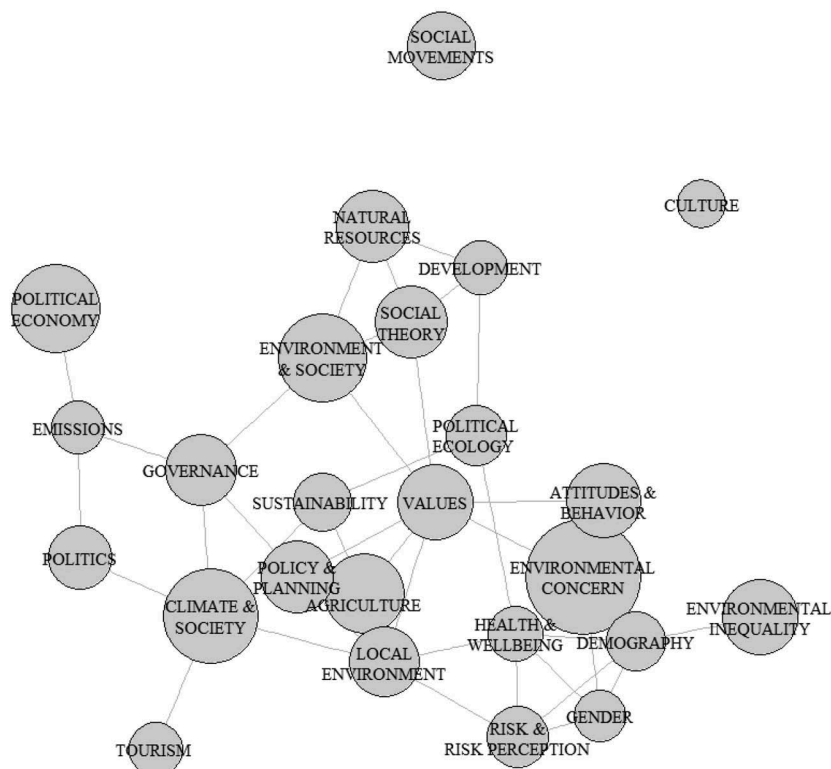


Figure 4. Topic Correlation Graph (Tie strength > 0.01). Node size reflects corpus-level topic proportion. Ties indicate greater likelihood that topics are discussed within common documents.

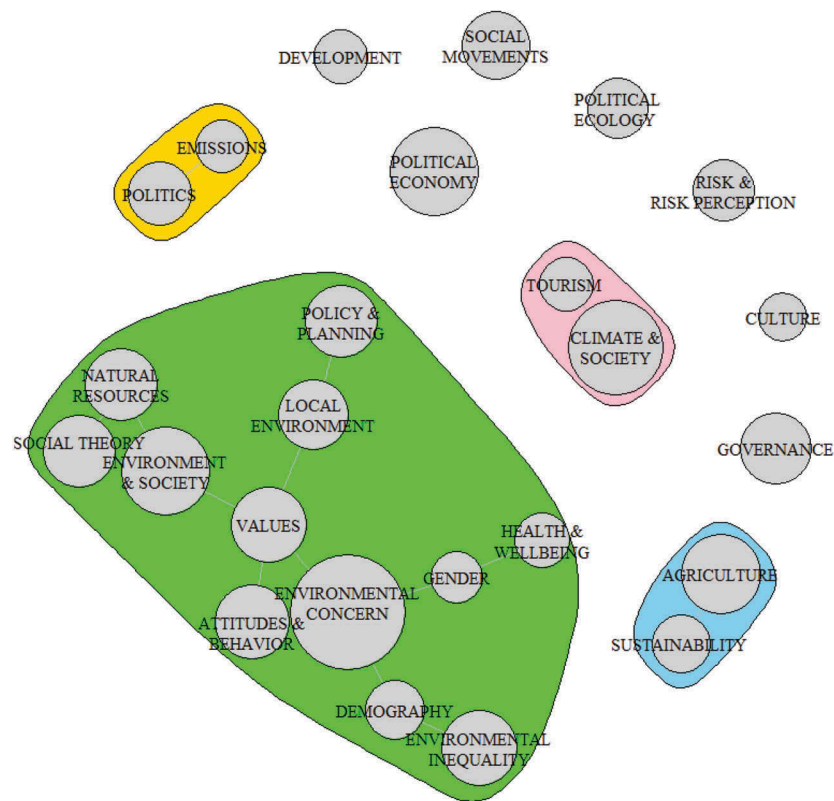


Figure 5. Topic Correlation Graph (Tie strength > 0.05). Node size reflects corpus-level topic proportion. Ties indicate greater likelihood that topics are discussed within common documents. Coloring emphasizes topic clusters.

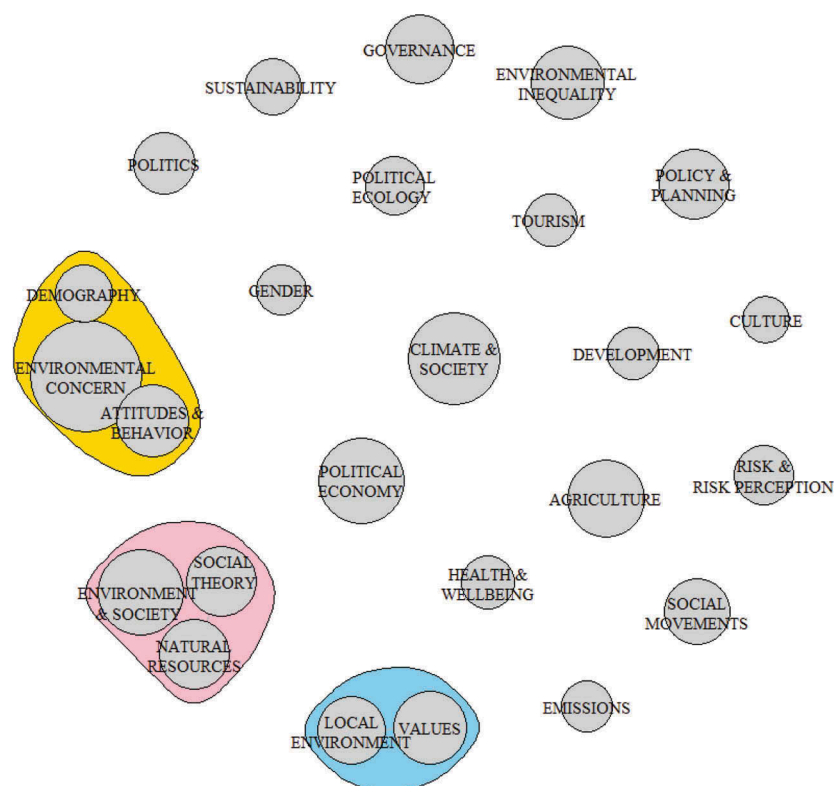


Figure 6. Topic Correlation Graph (Tie strength > 0.1). Node size reflects corpus-level topic proportion. Ties indicate greater likelihood that topics are discussed within common documents. Coloring emphasizes topic clusters.

To visualize core topic clusters, two additional plots were generated wherein correlations falling below two higher thresholds – 0.05 and 0.1 – were set to zero.

Figure 5 displays tie strengths greater than 0.05, while Figure 6 displays tie strengths greater than 0.1. Several topics become isolated in Figure 5. One large cluster

ties together about half the topics, and three small clusters contain the pairs Sustainability and Agriculture, Politics and Emissions, and Climate & Society and Tourism. In Figure 6, most topics are isolated, with three core clusters remaining: Attitudes & Behavior, Environmental Concern, and Demography; Environment & Society, Social Theory, and Natural Resources; and Values and Local Environment.

Additional topic correlations graphs were produced across multiple temporal subsets representing scholarship published between 1990–1999, 2000–2009, and 2010–2014 (available in the Online Appendix). Of the core clusters seen in the overall corpus, only the Environment & Society, Social Theory, and Natural Resources topic cluster was consistently evident across all three temporal ranges (Figures 12, 15, and 18 in the Online Appendix). Other interesting trends may be observed across these subsets, such as the recent development of a tie between Health & Wellbeing and Political Economy among research published from 2010 to 2014 (Figure 16 in the Online Appendix).

Impact and prestige

In addition to prevalence and correlation, we can evaluate the impact (measured by citations per year) and prestige (measured by journal impact rankings) associated with various topics. Figure 7 displays the Environmental Concern and Politics topics by citations per year. Of all topics modeled, Politics seems most predictive of having high impact, although it is only the fifteenth most common topic in terms of prevalence. Examples of the Politics topic include Cohen (2004), McCright and Dunlap (2011), Hoffbauer and

Ramos (2014), and McCright, Xiao, and Dunlap (2014). Other high impact topics include Demography and Social Theory. In contrast, there is little relationship between the extent to which an article abstract engages the Environmental Concern topic (most prevalent in the corpus overall) and the amount of citations per year it attracts.

Similarly, we can inspect topics by their prestige, judged by the rankings of the journals in which they appear. Looking at Environmental Concern and Political Economy by journal prestige, we see divergent trends (Figure 8). While Environmental Concern negatively correlates with journal prestige (meaning articles engaging this topic seldom appear in the most prestigious journals), Political Economy positively correlates with journal ranking (meaning articles engaging this topic are especially likely to appear in highly ranked journals). The Agriculture and Health & Well-being topics also correlate positively with journal prestige.

Comparing topics by both impact and prestige highlights interesting patterns. For example, the Environmental Inequality topic displays opposing trends in terms of predicting impact and prestige. Article examples include Bullard and Wright (1990), Stretesky and Hogan (1998), Downey (2006), Sicotte and Swanson (2007), and Grant et al. (2010). As seen in Figure 9, while articles engaging Environmental Inequality are disproportionately published in prestigious journals, they do not necessarily garner high numbers of citations. This is an example of how publishing work in a prestigious journal does not guarantee high impact as measured by citations. At the same time, the relationship between Environmental Inequality and journal prestige is consistent with Scott and Johnson's (2017) argument that increased

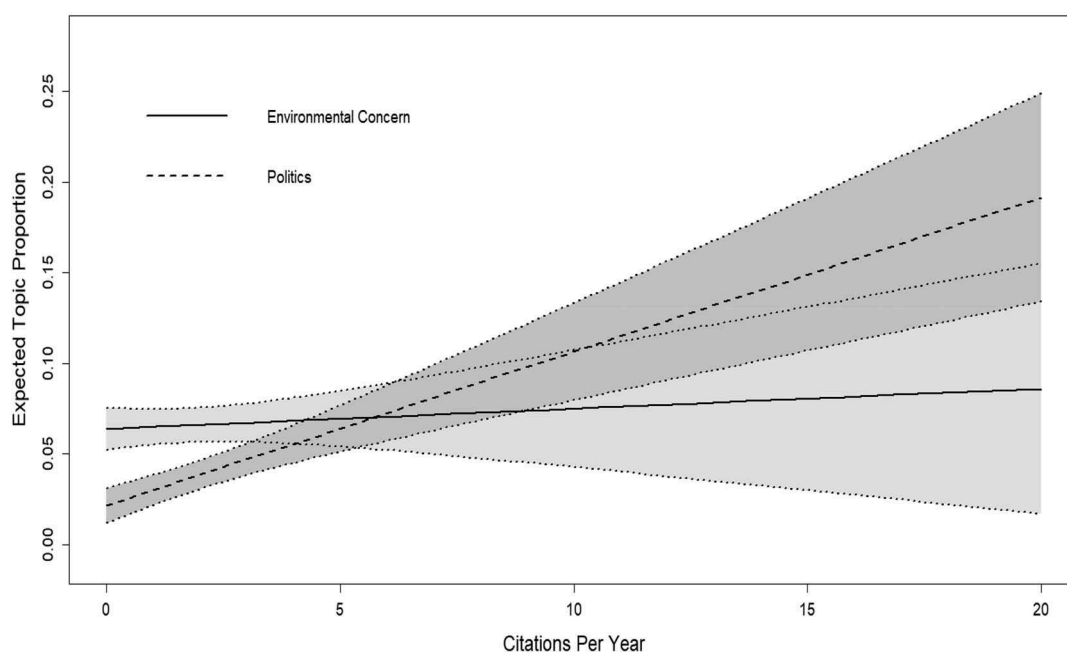


Figure 7. Topical prevalence of 'Environmental Concern' and 'Politics,' by citations per year (with 95% confidence intervals).

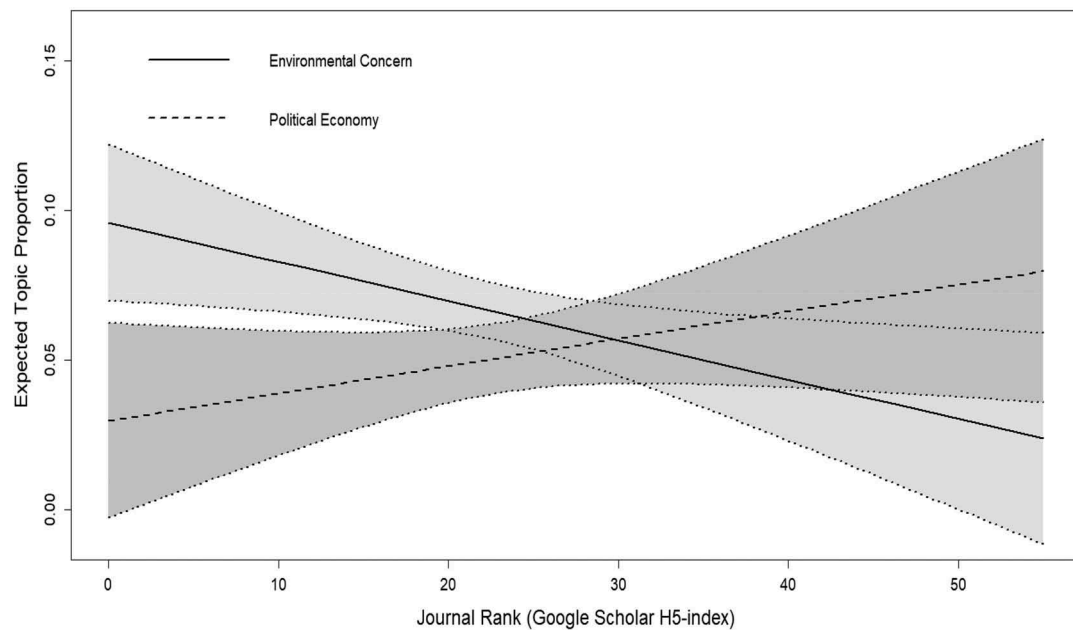


Figure 8. Topical prevalence of 'Environmental Concern' and 'Political Economy' by journal rank (with 95% confidence intervals).

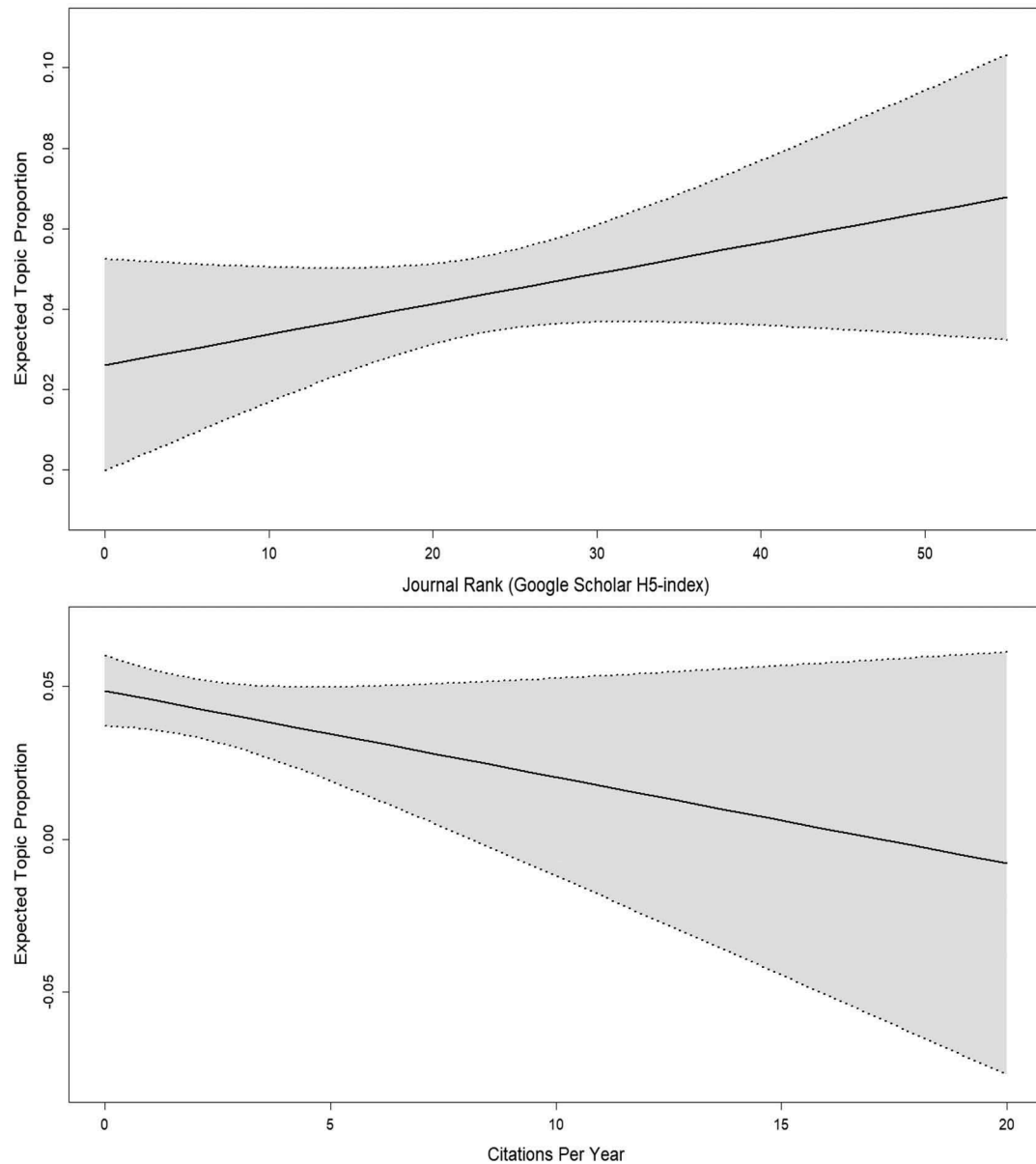


Figure 9. 'Environmental Inequality' topic proportion by journal rank (top) and citations per year (bottom), with 95% confidence intervals.

attention to issues of stratification and inequality by environmental sociology researchers helped move the field into the mainstream of the discipline (operationalized by publications in elite journals).

It is noteworthy that while environmental justice (EJ), an increasingly crucial focus for environmental sociologists (Pellow and Nyseth Brehm 2013), does not emerge as a standalone topic under this 25-topic model, many articles engaging Environmental Inequality focus explicitly on EJ, such as Pinderhughes (1996), Weinberg (1998), and Saha and Mohai (2005). Other examples of articles with a strong EJ focus show up under topics such as Demography or Social Movements. Also, the failure of EJ to emerge as a distinct topic may partially reflect the exclusion of books from the corpus, as EJ scholars appear to produce relatively more book-based scholarship than is the case for other areas of environmental sociology (e.g. Bullard 1990; Pellow 2002; Harrison 2011; Bell 2013; and Taylor 2014) – and may also publish relatively more of their work in interdisciplinary journals (Brulle and Pellow 2006; Mohai, Pellow, and Roberts 2009).

Drawing from the topical model presented here, we offer a series of summarizing observations regarding the relationship between topic prevalence, impact, and prestige within environmental sociology (at least as observed in the present corpus). First, the highest impact topics are not the most prevalent. Similarly, the most prestigious topics are not the most prevalent. Also, topics can appear in prestigious journals without having high impact. Thus, topics that receive the most attention from environmental sociologists do not align closely with those having the greatest impact, nor do they make the strongest inroads into the mainstream of sociology (equating ‘mainstream’ with work published in prestigious journals). Additionally, the weak relationship between impact and prestige indicates that researchers need not publish in the most prestigious venues for their work to exert high impact within our field. Conversely, publishing in highly ranked journals does not guarantee that an article will be highly cited. Finally, and most generally, there are notable changes over time in the relative prevalence, prestige, and impact of several topics, as one would expect in a dynamic field that responds to evolving and emerging ecological problems, as well as intellectual trends in the larger discipline.

Conclusion

Topic modeling provides a new method for analyzing thematic content. Although the example presented here may be of limited interest outside our field, we hope that environmental sociologists working with text-based data will see the opportunities made possible by this innovation in content analysis. It is worth reiterating that researchers should consider topic modeling as much of a beginning as a conclusion in the context of a larger project, offering a heuristic device

that asks questions about patterns found in data that may otherwise go unnoticed. In the current study, for example, we documented the prevalence, impact, and prestige associated with key topics, as well as correlations among the topics, within environmental sociology research – and how these change over time.

Text-mining and topic modeling tools are designed for analyzing datasets much larger than the one examined here, and admittedly researchers could apply traditional methods of content analysis to the corpus we examined without great difficulty. However, besides providing an example of these new techniques, our study offers some unique insights. First, a topic model provides proportional topic weights to each document in a corpus at a speed and consistency that otherwise might not be possible with manual coding; second, these proportional scores can then be used to explore correlations between topics or associations with metadata, as we have shown. The corpus analyzed here was selected not as an ideal candidate for computer-assisted text analysis, but as an example of such analysis that environmental sociologists should find of interest. Scholars can utilize the capabilities of computer-assisted text analysis for any type of social science research on environmental issues that potentially involves prohibitively large amounts of text, such as that collected through archival research, scraping information from websites, or downloading social media content.

There are at least two other applications that topic modeling can provide for environmental sociologists. First, we can use topic modeling to identify under-explored avenues of research in the field. For instance, we can critically examine the topic correlation graphs for what ties are absent, in addition to those present. Our study, for example, reveals very limited connection between the topics of Gender, Inequality and Social Theory (seen in Figure 5), reinforcing Kennedy and Dzialo’s (2015) call for increased theorizing about women and environment that highlights the importance of gender inequality. Repeating the analysis in 5 or 10 years could assess whether stronger links emerge between gender, inequality and theory, as well as whether the field gives more attention to gender analyses writ large as we think is likely. In addition, we could see if issues such as food justice that seem to be getting more attention in the field emerge as distinct topics (Alkon and Norgaard 2009; Sbicca 2012). Second, we can make use of additional tools such as the *stmBrowser* package available in R (Freeman et al. 2015), wherein users can create an interactive HTML file that provides a richly informative mode of viewing environmental sociology research. Such a tool could be of interest to scholars new to the field who are motivated to quickly learn the contours of environmental sociology research.

Not only do methods like topic modeling allow us to conduct our scholarship in new ways, but because digital text mediates so much social interaction in our contemporary world it behooves environmental sociologists to adopt these innovative methods in text analysis. A growing number of studies of climate change, for example, make use of text-mining data from sources such as Twitter (Kirilenko and Stepchenkova 2014; Williams et al. 2015), the blogosphere (Elgesem, Steskal, and Diakopoulos 2015), think tank websites (Boussalis and Coan 2016), online comments (Koteyko, et al. 2013), and newspaper coverage (Boussalis, Coan, and Poberezhskaya 2016), but sociological contributions remain rare (Farrell 2016a, 2016b). Applying computational text-mining techniques to social media and other digital data will further move environmental sociology into the academic mainstream, provide a sociological perspective on environmental issues within the growing field of computational social science, and engage the new forms of communication that are clearly reshaping contemporary society.

Notes

1. Their analysis included *Social Forces* and *Social Problems* along with *ASR* and *AJS* as the top four generalist journals.
2. In text-mining analyses, corpus refers to the total collection of texts being analyzed in a study.
3. This list of search terms produced a coherent set of research recognizable to environmental sociologists. Other relevant terms, such as 'energy', were excluded as they mostly returned research outside of the field. This again points to the challenge of isolating research in environmental sociology, and readers should take note of this when interpreting results.
4. Abstracts were manually inspected, and 38 abstracts were removed from the original corpus after being deemed outside the field of environmental sociology, leaving 815 abstracts for this analysis.
5. Although both topics heavily engage theoretical work, Social Theory is distinct from Environment & Society in that the former captures articles that apply perspectives from major theorists such as Durkheim, Goffman, Marx, and Weber.

Disclosure statement

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Appendix

Article Examples for 25 Topics in Environmental Sociology

| Topic | Examples |
|--------------------------|--|
| Agriculture | Wolf and Wood (1997) Storstad and Hilde (2003) |
| Attitudes and Behavior | Kimura and Shinoki (2007) Best and Mayerl (2013) |
| Climate and Society | Rosa (2001) Alston (2011) |
| Culture | Yanitsky (1999) Burgess and Horii (2012) |
| Demography | Grineski et al. (2010) Downey (2005) |
| Development | Gramling and Freudenburg (1996) Freudenburg and Gramling (1998) |
| Emissions | York (2008) York (2010) |
| Environmental Concern | Xiao, Dunlap, and Hong (2013) Zhou (2013) |
| Environmental Inequality | Bullard and Wright (1990) Grant et al. (2010) |
| Environment and Society | Williams (1998) Burningham and Cooper (1999) |
| Gender | Hampel, Boldero, and Holdsworth (1996) Carlsson-Kanyama, Linden, and Thelander (1999) |
| Governance | Pilgrim and Harvey (2010) Blok (2011) |
| Health and Wellbeing | Edgley, Pilnick, and Clarke (2011) Knight and Rosa (2011) |
| Local Environment | Malin and Petrzela (2010) Ashwood et al. (2014) |
| Natural Resources | Burke (2001) Dunlap and Catton (2002) |
| Policy and Planning | Mascarenhas and Scarce (2004) Marshall and Jones (2005) |
| Political Ecology | Barbosa (1996) Scott (2013) |
| Political Economy | Stretesky and Lynch (2009) Jorgenson (2012) |
| Politics | McCright and Dunlap (2011) McCright, Xiao, and Dunlap (2014) |
| Risk and Risk Perception | Freudenburg and Davidson (2007) Curran (2013) |
| Social Movements | Lachelle and Cable (1994) Sbicca (2012) |
| Social Theory | Foster (1999) Goldman and Schurman (2000) |
| Sustainability | Rannikko (1999) Rudel (2002) |
| Tourism | Michael and Saarinen (2010) Furunes and Mykletun (2012) |
| Values | Cordner et al. (2012) Brehm, Eisenhauer, and Stedman (2013) |