SOCIETY OF ACTUARIES

Climate Sources for Actuaries

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Climate Sources for Actuaries

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SPONSOR Climate and Environmental Sustainability Research Committee

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Section I: Background and Research Objective

The Climate and Environmental Sustainability Research Committee (CESRC) is one of the newest practice research committees of the Society of Actuaries (SOA). The CESRC is tasked with generating research on climate and environmental sustainability topics, to support expansion of actuarial practice in this area. It is hoped that CESRC research will help demonstrate to the SOA's membership and its other stakeholders, as well as to the scientific community and the public at large, the role actuaries can play in analyzing the financial risks, and the costs and benefits of mitigation strategies, associated with global climate change and environmental (un)sustainability. It is further hoped that this research will lead to new and rewarding career paths for increasing numbers of actuaries.

The purpose of this project was to initiate the development of a repository of information regarding existing climate and environmental sustainability research of interest to actuaries. The repository, which we refer to as the Climate Sources for Actuaries Resource Index (or Resource Index), will be of use to the SOA and the CESRC in developing their future environmental research programs; to actuaries practicing in the area of climate change and environmental sustainability; to actuaries and their employers, who need to understand the implications of climate change to their existing areas of practice; and to climate researchers interested in improved financial projections associated with climate change.

Section II: Research Approach

To meet this objective, we performed a search of existing literature related to climate change, sustainability or the environment that might be of "interest to actuaries" (i.e., literature that involves insurance, pension or financial systems; that touches on traditional actuarial work—e.g., insurance pricing or valuation, risk management, projection of losses or contingent cash flows, projection of mortality and morbidity risks, or asset/liability management for insurance and pension liabilities; or that can otherwise be used by actuaries in the measurement, management and mitigation of the associated risks).

Identification of applicable research, reports, articles and so on in the universe of existing literature was accomplished through a combination of directed and undirected Web searches. Directed searches focused on actuarial organizations—e.g., the SOA, Casualty Actuarial Society, American Academy of Actuaries, International Actuarial Association, Institute and Faculty of Actuaries, Actuaries Institute Australia, and Canadian Institute of Actuaries; insurance industry organizations such as The Geneva Association; (re)insurance companies active in climate research, such as Swiss Re and Munich Re; and governmental or scientific bodies, such as the Intergovernmental Panel on Climate Change (IPCC) and the National Oceanic and Atmospheric Association. Undirected searches were performed using such tools as Google and the Social Science Research Network (SSRN), with appropriate search terms. Identified applicable literature also served as a valuable source for additional literature or search resources.

In most cases, we were able to access literature directly via links from our search results. One exception was data from the IPCC. The IPCC does not maintain research or links to research reports on its website. However, its assessment reports and other reports include extensive bibliographies. The IPCC's most recent assessment report, *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, includes a chapter (Chapter 10, "Key Economic Sectors and Services") with a section on insurance and other financial services. In addition to including this chapter

in the Document Index, we reviewed its bibliography to identify relevant sources and performed individual Web searches for these documents to include in the Resource Index.

The literature determined to be of interest to actuaries was organized and indexed by topic and document type. Three separate indices were created for three broad forms of content:

- Document Index—an index of research reports, magazine articles and other documents published as reading material
- Presentation Index—an index of documents or content related to meetings, conferences or seminars, such as presentation slides, conference proceedings and conference programs
- Web Page Index—an index of Web pages of interest

Collectively, these three indices comprise the Climate Sources for Actuaries Resource Index and have been published in an Excel file that accompanies this report. The indices include complete information to identify the document, author, publisher and other relevant information as would typically be included in a citation. Each entry also includes a Web link, a primary topic, sub-topic(s) and a brief description. The information provided in each index is intended to make it relatively easy for the user to identify those documents most relevant to his or her purposes.

Given the volume of content, our project scope did not include a detailed literature review. The identification of topics, sub-topics and descriptions was based on a fairly cursory review of the document, often limited to the abstract or executive summary.

Section III: Overview of the Climate Sources for Actuaries Resource Index

As noted, the Climate Sources for Actuaries Resource Index consists of three separate indices—the Document Index, the Presentation Index and the Web Page Index. The Document Index includes approximately 350 entries of different types, with most being research reports. The Presentation Index contains approximately 60 entries, with approximately 40 being presentation slides and the remainder being other documents related to meetings and other events. The Web Page Index contains more than 40 Web pages maintained by more than 25 different organizations. The Resource Index may be considered extensive but not exhaustive—it contains a wealth of material but is far from a complete accounting of the available material.

In general, we sought open-access content that would be available to any user, and we used this as a constraint in selecting most of the entries for the Resource Index. We made an exception with reports identified through the IPCC's *Fifth Assessment Report*. Many of the reports cited by the IPCC are not open access. However, we considered a citation by the IPCC to be important enough to trump the open-access restriction; we included a field to indicate which documents are open access. Restricted-access reports require purchase from most sources; however, we identified one source, ResearchGate.net, which provides a mechanism to request restricted-access documents directly from the author(s). Where possible, we have referenced a ResearchGate Web link in these cases.

Both the Document Index and the Presentation Index identify a primary topic and a limited number of sub-topics covered by each entry. The full listing of topics and sub-topics is provided in Appendix A. Appendix B provides counts of the Document Index and Presentation Index entries by topic, and Appendix C provides counts of the Document Index and Presentation Index entries by sub-topic. Topics were selected to be broad. In selecting the sub-topics, we tried to be specific enough to meaningfully describe the content of the document but also general enough so that the number of sub-topics would

be manageable. See the discussion of topic, sub-topic and description/comments fields in Section 0 for additional discussion of how the topics and sub-topics were selected, along with guidance in using them to search the Resource Index.

In total, we identified 8 topics with 55 separate sub-topics relevant to the various documents, as listed in Appendix A. The topics relate to such broad categories as the impact of climate change, responses to climate change, catastrophe risk and so forth. Sub-topics include more granular topic areas, such as climate change impact on insurers, climate change adaptation, and disaster insurance. The most common topics are responses to climate change, with 96 Document Index entries and 13 Presentation Index entries, and catastrophe risk, with 93 Document Index entries and 5 Presentation Index entries. The most common sub-topic is climate change impact on insurers, with 85 Document Index entries and 9 Presentation Index entries. Other common sub-topics are disaster insurance, insurance as an adaptation mechanism, and economic impact of climate change, with each having at least 50 entries in the Document Index. Thirty-one sub-topics include 10 or more entries in the Document Index, and 47 sub-topics include 5 or more entries. This indicates that the selection of sub-topics allowed for reasonable coverage of most of them.

All three indices provide summary comments describing each entry. In most cases, these comments are largely or entirely taken from the document itself. For entries in the Document Index, this information is often from the abstract, executive summary or introduction. For entries in the Presentation Index, this information is generally from the agenda or introductory slides. For entries in the Web Page Index, this information is generally from the "About Us" pages or similar pages of the applicable website. By using the authors' summaries, we attempted to avoid misinterpretation. In some cases, we found it more useful to develop our own summary, but this was the exception.

We believe that the Climate Sources for Actuaries Resource Index strikes a reasonable balance—enough entries to provide broad coverage of the type of existing research that may be relevant to actuaries without being so large as to be overwhelming.

The following sections provide more description of the three separate indices comprising the Resource Index.

Document Index

The Document Index includes 21 types of documents. The vast majority (264) of these documents are research reports but also included are articles (e.g., from magazines), books, book chapters, survey reports and various other types of documents. Other than survey reports, which may be considered a form of research report, we did not attempt to stratify research reports by research methodology or approach. See Appendix D for a listing of the document types.

Table 1 lists all the fields included in the Document Index, along with some pertinent comments.

Table 1: Document Index Fields

Field	**Comments**
Author(s)	In most cases, authorship is attributed to one or more individuals. In some cases, individual author names were not provided, and authorship was attributed to an institution.
Document title	
Year	Year of publication
Document type	See Appendix D.
Publishing institution	For books, the publishing company was provided. For nonbook documents, this field was filled in only if the publishing entity were an institution or research organization (not a commercial publisher). In other cases, it was left blank.
Publication	This field was filled in only when the document was part of a larger publication, such as a journal or a book.
Author affiliation	This field was filled in only when the author affiliation was readily available from the source document. In the case of multiple authors, affiliations were numbered in the same order as the author listing.
Link/file name	Most documents are available from multiple Web sources. When available, we chose Web links for the original publishing entity, the SSRN or ResearchGate. We note that Web links may change over time, so we have provided sufficient information so that the user may search for another source if the referenced link fails.
IPCC5?	An indicator of whether the document was referenced in the bibliography to Chapter 10 in the IPCC's *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Working Group II Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*
Open access?	A yes/no indicator of whether the document is available as open access
Topic	See Appendix A, Appendix B, and Section 0 discussion.
Sub-topic 1	See Appendix A, Appendix C, and Section 0 discussion.

Sub-topic 2	See Appendix A, Appendix C, and Section 0 discussion.
Sub-topic 3	See Appendix A, Appendix C, and Section 0 discussion.
Description/comments	This field generally includes a portion or all of the abstract, executive summary or introduction to the document. In a few cases, we have supplied the description. See Section 0 discussion.

Presentation Index

The Presentation Index provides mainly presentation slides. These entries were all from various actuarial organizations or from The Geneva Association. Primarily, these were presentations on climate-related topics at broader actuarial conferences and meetings. However, some events, particularly those presented by The Geneva Association, were specifically related to climate issues. For these events, the entries might include meeting programs or meeting Web pages. For some of The Geneva Association's meetings, the slides for individual presentations are readily available through the event's Web page or program and were therefore not included individually in the Presentation Index. See Appendix E for a complete listing and counts of the document types included in the Presentation Index.

Table 2 lists all the fields included in the Presentation Index, along with some pertinent comments.

Table 2: Presentation Index Fields

Field	**Comments**
Sponsoring organization	Organization responsible for the conference
Conference name	
Year	Year the event was held
Author/presenter	Author or presenter of the specific presentation
Document title	
Document type	See Appendix E.
Link/file name	Generally, the link to the specific document referenced
Author affiliation	The author's affiliation, if known
Topic	See Appendix A, Appendix B, and Section 0 discussion.
Sub-topic	See Appendix A, Appendix C, and Section 0 discussion.

Description/comments	This field generally includes the agenda or introduction to the presentation slides. See Section 0 discussion.

Web Page Index

Often, it is as valuable to know what organizations are doing, and to be able see current information from those organizations, as it is to see the work itself. In addition, new work is continually being done, and the Document Index and the Presentation Index will become out-of-date over time. The Web Page Index is intended to provide the user with a listing of organizations doing climate-related work of interest to actuaries, as well as a set of references that he or she can use to search for additional material on an area of interest or to monitor new work as it becomes available. This includes links to the climate-related Web pages of actuarial organizations as well as organizations and networks that figure prominently in the Document Index and the Presentation Index. Finally, the Web Page Index includes links to some sources of climate and disaster data and models that may be of use.

Table 3 lists all the fields included in the Web Page Index, along with some pertinent comments.

Table 3: Web Page Index Fields

Field	**Comments**
Publishing organization	The organization that publishes and maintains the Web page
Web page title	
URL/Web link	
Description/comments	This field generally includes a description of the publishing organization as well as the contents of the specific Web page. See Section 0 discussion.

Section IV: Commentary—Observations and Use of the Climate Sources for Actuaries Resource Index

The target audiences of the Climate Sources for Actuaries Resource Index include:

- The CESRC, other research bodies and actuarial researchers seeking to identify future avenues of actuarial research related to climate change
- Practicing actuaries seeking to learn more about climate change as it relates to insurance in general or their specific area of practice
- Actuaries seeking to practice in climate-related areas
- Actuaries and nonactuaries seeking to keep up-to-date with current developments
- Researchers outside the actuarial field

We expect that researchers will find the Document Index useful as a reference source and will find the Web Page Index useful to identify reference materials that post-date the Resource Index. We expect that the Presentation Index may provide the more general reader with useful introductions to some topics and may provide ideas for those planning educational sessions such as SOA meetings and conferences.

The remainder of this section provides information and commentary that may be of benefit to users of the Resource Index.

One important observation is simply that the content is quite rich. The volume and diversity of content included in the Resource Index has far exceeded our expectations, and there is certainly additional literature we did not identify. This large body of existing literature will be invaluable to the actuarial community in developing its research agendas. We also observed a broad range of authorship, ranging from actuarial organizations to international organizations at the forefront of international climate policy to governmental bodies to individual academics in various disciplines. This broad range of sources provides a valuable diversity of perspectives, and the identifying information in the Resource Index is intended to highlight this diversity to the user. Here is one other observation regarding the content: a large portion of the actuarial literature focuses on educating actuaries and identifying opportunities for actuaries to contribute, but to date it does not appear that this work has created a clear path for the development of such opportunities. We hope that the extensive amount of work done by others outside the profession might help guide the actuarial profession in developing such opportunities in the future.

Topic, Sub-Topic and Description/Comments Fields

The Resource Index is intended to be easily searchable to allow the user to find resources related to a specific area of interest. The Document Index and the Presentation Index include topic and sub-topic fields, providing a view of the topical areas covered by a specific entry. In addition, all three indices include a description/comments field, which provides additional summary information related to the specific entry. A couple of observations regarding these fields will be of benefit to the user:

- Topics and sub-topics have been provided for both the Document Index and the Presentation Index. In many cases, a research report or article may cover multiple topics or sub-topics, so in the Document Index, up to three sub-topics were identified for each entry, to reflect the breadth of the entry. We found that presentation topical areas were more narrowly focused, so only one sub-topic was chosen for each entry in the Presentation Index.
- The description/comments field in each index was intended to provide a reasonable summary of the entry. In most cases, we pulled much of this information from the document itself—e.g., from the abstract, executive summary, presentation agenda, “About Us” Web page and so on.
- Not surprisingly, topics were developed to be quite broad, and sub-topics were developed to be more specific. In many cases, sub-topics clearly relate to just one topic, but in other cases, a sub-topic could reasonably be mapped to multiple topics. Appendix A provides a listing that maps each sub-topic to the single topic that we considered most relevant. In using Appendix A, the user should remember that other valid mappings may not be shown.
- The choice of topics and sub-topics, and the decision of how to map them to index entries, was a judgmental process. In many cases, multiple topics and sub-topics were relevant to an entry. We attempted to select the most relevant topics and sub-topics, but different individuals would certainly have assigned topics differently. Therefore, in searching the Resource Index for

content, the user should consider the topics and sub-topics to be guidance, not gospel. One should not focus too narrowly in determining which topics relate to his or her area of inquiry.

- Similarly, the descriptions should be treated as indicative. Even when the descriptions quote the author(s), they may not provide a full flavor of the content of the document. The user should always refer to the document itself to determine if it is useful for his or her purposes.

The Resource Index has been provided in Microsoft Excel format. This format was chosen for practical reasons: Excel is very familiar to most actuaries. It is very flexible and allows the user multiple ways to sort, filter and search the index. This format did not require any specific programming. There are also limitations to the Excel format, including the ability to dynamically update the Resource Index, but, in our judgment, the benefits of this format outweighed the limitations.

At the time of this report, the SOA had not developed specific plans to maintain or update the Resource Index over time. We believe that the materials in the Resource Index will be relevant for a number of years, but as new work is completed, the Resource Index will gradually become out-of-date. Similarly, the Web links provided in the Resource Index may change over time. The Resource Index includes the date an entry was last updated, and the user should be aware of this date. With respect to invalid Web links, the identifying information for each document should be sufficient to allow the user to find another source for the document.

Many documents are available from multiple online sources. The possible sources often include the original publisher as well as various online research repositories. We found two online sources to be particularly valuable in constructing the Resource Index—the Social Science Resource Network (SSRN) and ResearchGate (both included in the Web Page Index). Where possible, the Web links provided in the Resource Index are to SSRN or ResearchGate entries. The SSRN and ResearchGate allow for quick viewing of abstracts and simple download processes for full reports of open-access content. Almost all SSRN content is open access, although a free registration makes downloading easier. ResearchGate includes both open- and restricted-access documents but distinguishes the two pretty clearly and allows the user to request access for restricted-access documents directly from the authors. A free registration is necessary to make the most use of ResearchGate.

Inclusion in the Climate Sources for Actuaries Resource Index should not be considered an endorsement of the conclusions, methods or assumptions of any research report or other document. The SOA, the CESRC and this author make no representations regarding the quality or validity of any entry in the Resource Index. The objective of this project was to develop a repository, not to perform a review, critique or evaluation of the usefulness of any of the documents. The user is responsible for his or her own evaluation of any content included in the Resource Index.

Finally, to restate, the Resource Index is extensive but not exhaustive. An individual searching for climate change literature of interest to actuaries should consider the Resource Index as a starting point, not an ending point. The Resource Index does not include all literature on a given topic and may not include the best literature. Review the reference and bibliography listings in these documents, and search for other documents by the same authors. Become familiar with the organizations publishing research, and monitor the work of these organizations.

Section V: Conclusion and Suggested Next Steps

With some exceptions, the dominant themes of the existing actuarial literature related to climate change have been inward-looking: Why should actuaries care about climate change? What roles can we play to best utilize our actuarial skills to address climate change? How do we engage each other and our employers in conversations about climate change? How might an actuary practice in a climate-related area?

Meanwhile, there is a rich and growing body of climate-related literature and climate-related work that relates directly to traditional areas of actuarial practice—right in our own backyard, so to speak—with which the actuarial profession as a whole is not connected and of which we may not be broadly aware. This includes the work of:

- (Re)insurers, such as Swiss Re and Munich Re, and insurance industry organizations, such as The Geneva Association, the International Insurance Society, and the International Cooperative and Mutual Insurance Federation. Their work considers both the risks and opportunities presented by climate change to the insurance industry, and they have played important and high-level roles in the international community addressing climate change.
- International bodies, such as the Intergovernmental Panel on Climate Change, the World Bank, and the United Nations Environmental Programme, which understand the importance of a strong and stable insurance industry for a resilient world economy, the risk management expertise that the industry has to offer, and the power of insurance to drive behavioral change by individuals as well as organizations. Their work has set forth for the industry important roles in mitigating and adapting to climate change and protecting the most vulnerable from the ravages of climate change.
- Vast numbers of researchers, academic and otherwise, who have thought deeply about the intersection of climate and the insurance industry, in all of its facets; who have worked tirelessly to identify not only where those intersections exist but also how to make the most of them; and who may not be deeply connected to the insurance industry but have seen a forest that we actuaries may have missed for the trees.

Beyond this, there is much literature that may not relate directly to traditional areas of actuarial practice but that may suggest new and rewarding paths for actuaries to contribute.

To be sure, as actuaries, we must continue to look inward. Many actuaries do not perceive the relevance of climate change to our stakeholders and our work. A significant portion of the actuarial research agenda with respect to climate change must focus on understanding and appropriately reflecting climate in our work. In addition, we are just beginning to understand the professional opportunities offered by the myriad climate change risks that must somehow be managed. Our professional organizations have an ongoing responsibility to educate actuaries and to develop new and meaningful career paths. Our research agenda should also focus on identifying and developing new opportunities for actuaries related to climate and sustainability.

However, we must also be outward-looking. As a profession, we cannot grasp the risks of climate change to our stakeholders or seize the resulting professional opportunities by talking to and amongst ourselves. Many organizations and individuals are doing work to understand the impact of climate change on our stakeholders and to develop responses and solutions. Only by engaging with this

community can the actuarial profession catch up and hope to make a difference. We believe that this is the most important next step suggested by this research, and we hope that the Climate Sources for Actuaries Resource Index will be helpful in building the necessary bridges between the actuarial profession and the climate research community.

As a second next step, we believe that the content in the Climate Sources for Actuaries Resource Index will be immediately useful in developing a research agenda for the CESRC and other actuarial organizations. Valuable projects may include:

- Literature reviews in specific topic areas to synthesize existing research in ways that are of use to actuaries and our stakeholders.
- Research in climate change adaptation and mitigation—there is a significant body of research regarding ways the insurance industry might be used to support climate change mitigation and adaptation. The actuarial perspective may be particularly valuable in identifying ideas with the greatest likelihood for success and in developing methods to operationalize these ideas.
- Modeling work, including linkages between insurance loss models and climate models and development and use of integrated assessment models to benefit the actuarial profession's stakeholders.

Finally, the CESRC should consider next steps for the Climate Sources for Actuaries Resource Index itself. How should it be maintained and with what frequency? Is Excel the best long-term tool for maintaining the Resource Index? Should it be modified to be more or less inclusive? Does the Resource Index provide the most useful information for the user? As new content is added, should out-of-date content be removed? The CESRC should consider and plan for these questions as the Resource Index is published. We suggest that it would be reasonable and appropriate for CESRC volunteers to maintain the Resource Index in the future. The work of maintaining the Resource Index would help ensure that the CESRC and its volunteer members remain current with the latest research and literature. In addition, we believe that maintenance of the Resource Index should be a manageable effort for a reasonably small pool of volunteers.

Appendix A: Topic/Sub-Topic Mappings

Topic	Sub-Topic
Actuaries and climate change	Actuarial pricing/modeling
	Actuaries Climate Index
	Role of actuaries
Agricultural insurance	Crop insurance
	Microinsurance
	U.S. Federal Crop Insurance Program
	Weather index insurance
Capital market solutions	Carbon pricing / emissions trading
	Insurance-linked securities
Catastrophe risk	Catastrophe databases
	Catastrophe risk financing
	Catastrophe risk modeling
	Disaster insurance
	Disaster relief
	Disaster risk management
	Disaster risk reduction
	Donor-assisted disaster insurance
	Economic impact of natural disasters
	Flood insurance
	International risk pooling
	Public disaster insurance
	U.S. National Flood Insurance Program
Impact modeling	Climate modeling
	Cost/benefit analysis
	Economic impact of climate change
	Economic modeling
	Fat-tailed uncertainty
	Integrated assessment models
	Social cost of carbon
Impact of climate change	Climate change impact on financial sector
	Climate change impact on insurers
	Climate change impact on pension system
	Climate change liability
	General climate change
	Investment risk/asset management
	Liability insurance
	Mortality and morbidity
	Protection gaps
Responses to climate change	Climate change adaptation
	Climate change mitigation
	Climate insurance
	Financial regulation
	Green finance and investing
	Insurance as a mitigation mechanism
	Insurance as an adaptation mechanism
	Insurance design
	Insurance law and regulation
	Public/private partnerships
	Renewable energy and new technology
	Risk management
	Role of insurance industry
	Social insurance
Sustainability	Economic sustainability
	Food security
	Resource constraints and sustainability

Appendix B: Document Index and Presentation Index Topic Counts

Topic	Document Index Count	Presentation Index Count
Actuaries and climate change	13	12
Agricultural insurance	20	0
Capital market solutions	7	0
Catastrophe risk	93	5
Impact modeling	41	2
Impact of climate change	68	14
Responses to climate change	96	13
Sustainability	11	0
N/A	0	16
Total	**349**	**62**

Appendix C: Document Index and Presentation Index Sub-Topic Counts

	Document Index Count				Presentation Index Count
Sub-topic	**Sub-Topic 1**	**Sub-Topic 2**	**Sub-Topic 3**	**Total**	**Sub-Topic**
Actuarial pricing/modeling	2	5	4	11	0
Actuaries Climate Index	3	1	0	4	2
Carbon pricing / emissions trading	4	2	0	6	0
Catastrophe databases	2	2	1	5	0
Catastrophe risk financing	6	2	2	10	1
Catastrophe risk modeling	11	1	2	14	3
Climate change adaptation	3	13	9	25	1
Climate change impact on financial sector	6	2	0	8	0
Climate change impact on insurers	34	33	18	85	9
Climate change impact on pension system	0	2	2	4	0
Climate change liability	5	2	2	9	0
Climate change mitigation	4	4	2	10	2
Climate insurance	11	4	1	16	0
Climate modeling	4	2	9	15	0
Cost/benefit analysis	0	8	6	14	0
Crop insurance	1	4	6	11	0
Disaster insurance	29	36	5	70	1
Disaster relief	3	5	4	12	0
Disaster risk management	3	1	0	4	0
Disaster risk reduction	3	5	4	12	0
Donor-assisted disaster insurance	1	1	5	7	0
Economic impact of climate change	29	14	7	50	2
Economic impact of natural disasters	14	6	1	21	0
Economic modeling	0	3	2	5	0
Economic sustainability	0	5	0	5	0
Fat-tailed uncertainty	4	1	1	6	0
Financial regulation	2	2	1	5	0
Flood insurance	14	12	3	29	0
Food security	0	1	0	1	0
General climate change	4	1	2	7	5
Green finance and investing	1	3	1	5	3
Insurance as a mitigation mechanism	12	8	2	22	1
Insurance as an adaptation mechanism	22	25	18	65	2
Insurance design	0	4	5	9	0
Insurance law and regulation	5	8	3	16	1
Insurance-linked securities	3	4	1	8	0
Integrated assessment models	0	5	6	11	0
International risk pooling	2	6	0	8	0
Investment risk/asset management	2	3	0	5	1
Liability insurance	1	5	4	10	0
Microinsurance	5	5	2	12	0
Mortality and morbidity	17	0	1	18	0
Protection gaps	0	0	2	2	0
Public disaster insurance	4	10	5	19	0
Public/private partnerships	4	4	15	23	0
Renewable energy and new technology	0	2	5	7	0
Resource constraints and sustainability	11	1	0	12	0
Risk management	13	9	10	32	4
Role of actuaries	7	7	2	16	7
Role of insurance industry	9	7	4	20	1
Social cost of carbon	2	2	0	4	0
Social insurance	1	0	0	1	0
U.S. Federal Crop Insurance Program	3	0	0	3	0
U.S. National Flood Insurance Program	12	1	0	13	0
Weather index insurance	11	5	1	17	0
N/A	0	0	0	0	16
Total	**349**	**304**	**186**	**839**	**62**

Appendix D: Document Index Document Type Counts

Document Type	Count
Article	26
Assessment report	1
Book	11
Book chapter	7
Comment submission	2
Declaratory judgment	1
Discussion paper	1
Editorial	3
Goals document	1
Lecture	1
Literature review	3
Literature survey	1
Policy briefing	2
Policy paper	1
Public policy statement	2
Research commentary	3
Research report	264
Summary report	1
Survey report	9
Testimony	3
White paper	6
Total	**349**

Appendix E: Presentation Index Document Type Counts

Document Type	Count
Event program	7
Event review	5
Event Web page	8
No documents	1
Presentation slides	41
Total	**62**

About the Society of Actuaries

The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world, dedicated to serving more than 27,000 actuarial members and the public in the United States, Canada and worldwide. In line with the SOA Vision Statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby for specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and nonactuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues and thereby provides value to stakeholders and decision makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

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