

2023 Student Research Case Study Challenge: Relocation Social Insurance Case Study

OVERVIEW

The fictitious country of Storslysia is acutely threatened by the impact of climate-related catastrophes that are increasing over time due to climate change. Storslysia has diverse geography; different geographic regions are subject to different current and future threats from catastrophic climate-related events. Residents who live in the areas at high threat run the risk of permanent displacement when catastrophic events occur. The residents of Storslysia are keenly aware of these threats, both to the individuals who live in areas at risk as well as to the overall economy of Storslysia. The leaders of Storslysia are highly motivated to manage the risks associated with catastrophe-related displacement and wish to consider implementing a social insurance program to help manage its exposure to the financial impacts of mass displacement due to these events.

PROJECT OBJECTIVES

Your consulting firm has been hired for an agreed-upon fee to design a social insurance program for relocation to help Storslysia manage its exposure to displacement risk arising from catastrophic climate-related events. Coverage should address voluntary, proactive relocation as well as involuntary displacement following a catastrophic event. Proactive relocation can typically be achieved at a considerably lower cost than reactive relocation. In contrast, displacement—meaning involuntary relocation following a catastrophic climate-related event—usually involves higher costs to find or build accommodation, replace lost household items, and manage associated challenges such as psychological impacts.

Your client is an interdisciplinary task force co-led by Storslysia's Minister of Finance, Natalia Bowditch, and Minister of Environment, Huey Caine. Their task force includes individuals with financial expertise, including the Chief Actuary of Storslysia's insurance regulator. The task force also includes environmental experts and other experts in non-financial matters. This task force is solely focusing on a countrywide social insurance relocation program that will cover the entire population of Storslysia, with benefits that may vary by geographic risk and socio-economic status. Other Storslysia task forces are working on the sources of funding for the program, emergency response, and other infrastructure needs arising from the increasing climate-related threats.

Your firm has been asked to produce a report that includes the following details of your proposed insurance program:

- Objectives
- Program design (triggers and features)
- Pricing/Costs
- Assumptions
- Risk and Risk Mitigation Strategies
- Data and Data Limitations

PARAMETERS

Your program design, along with competing designs from other consulting firms, will be evaluated by the task force as it seeks a program that will best help Storslyisia manage its exposure to displacement risk resulting from climate-related catastrophes. The task force has provided the following constraints:

- The program should reduce Storslyisia's costs arising from climate catastrophe-related displacement with a high degree of certainty.
- The program should prevent costs arising from relocation (voluntary or climate catastrophe-related displacement) from exceeding 10% of Storslyisia's gross domestic product (GDP) each year with a high degree of certainty.
- The program must cover all Storslyisia's population.
- Funding models and sources of funding will be separately considered by another task force from Storslyisia's government and is out of scope for your assignment.

DATA

The task force has provided your consulting firm with access to a data set which can be found [here](#) that includes:

- Housing and demographic information including housing costs and socio-economic status of the population by geographic risk location;
- Historical weather-related hazards data;¹
- Economic data for Storslyisia as a whole;
- Projections of emissions scenarios along with associated "Shared Socioeconomic Pathways" (SSPs) published by the United Nations' Intergovernmental Panel on [Climate Change](#) that include CO₂, population, and GDP projections; and
- A projection model of probabilities of weather hazards based on various future emissions scenarios.

¹ The SOA Research Institute developed fictitious data for this case study based on selected data elements from the Spatial Hazard Events and Losses Database for the United States (SHELDUSTM). The SOA Research Institute is grateful to the faculty at the Arizona State University Center for Emergency Management and Homeland Security who permitted access to the selected data for the sole purpose of the SOA Research Institute 2023 Student Research Case Study Challenge.

In addition, Storslysia's task force has provided the following information:

- Because of a surge in demand after weather events, material and labor costs associated with housing and relocation increase between 0% and 50% after weather events. Storslysia's laws limit the price increases to 50% in these situations.
- The cost of replacing household goods typically ranges from 40% to 75% of housing costs.
- The exchange rate between US\$ to ₱ is 1.321 (1 US\$ = 1.321₱).

DELIVERABLES

The task force requests your consulting firm to deliver a high-level report that is informed by your research and analysis and that addresses each of the following items:

1. Objectives

- The main objectives of your proposed program design
- Key metrics to be reported and used to monitor the proposed program's success over the selected timeframe; include a schedule (frequency) for reporting these metrics

2. Program Design

- Describe the requirements that must be satisfied for a citizen of Storslysia to file a claim under your proposed program
- Describe what would be covered in the event of a claim, including any limitations of coverage
- Describe incentives, if any, your proposed program provides that would encourage voluntary relocation
- Describe any other key program features or requirements
- Provide quantitative and qualitative justification for the features of your proposed program
- Describe with justification short and long-term timeframes in which the program will be evaluated

3. Pricing/Costs

- Project the economic costs of the program over appropriate short and long-term timeframes
- Project the economic costs without the program over appropriate short and long-term timeframes
- Determine the economic capital needed for the program to remain solvent with a high degree of certainty
- Contrast the costs under the program associated with voluntary relocation with those associated with emergency displacement

4. Assumptions

- List all the assumptions used in the analysis. The body of your report should include a summary of the assumptions your firm used. You may use an appendix to your report to describe these assumptions in more detail, if necessary.
- In the body of your report identify the key assumptions that have the most significant impact on program costs and economic capital, including rationale and analysis for each key assumption.

5. Risk and Risk Mitigation Considerations

Provide a risk analysis that discusses potential risks and unforeseen events that may have a material impact on the program. Your analysis should include, but is not limited to the following elements:

- Identifying both quantifiable and qualitative key risks.
- Ranking these key risks using appropriate metrics such as likelihood and severity estimates for the quantifiable risks.
- Suggesting possible risk mitigation techniques for the key risks you identify.
- Performing sensitivity analyses that examine the financial impact of actual experience differing from key assumptions. For each quantitative assumption, provide recommended ranges to achieve desired results. Sensitivity analyses should demonstrate both favorable and unfavorable sensitivities.
- Indicating the degree of certainty within the short and long-term timeframes selected that the economic costs associated with the program will be less than the economic costs would be without the program and providing justification for the degree of certainty indicated.
- Indicating the degree of certainty that the costs to Storslysia under the proposed program will not exceed 10% of Storslysia's GDP in any given year within the short and long-term timeframes selected.

6. Data and Data Limitations

- Identify any data limitations and the impact of any such limitations on your analyses
- Identify any data sources used

PROJECT EVALUATION CRITERIA

Natalia Bowditch and Huey Caine's task force will evaluate your firm's report, using the following criteria:

- Organization, form, clarity, and cohesiveness of your report, as appropriate for the task force audience, which includes very busy, high-level officials who represent a wide variety of disciplines, many of which are not quantitative in nature.
- Clear, concise, and complete responses to all items that are listed in the "DELIVERABLES" section of this Relocation Social Insurance Case Study.
- Detailed mathematical analysis applying the concepts of probability, probability distributions, and time value of money (with explanations of any formulas, models, and other aspects to the analysis that you use) that are understood by technically minded individuals in the task force.
- Creative and strategic recommendations.
- Secondary research including a bibliography showing a list of all sources cited throughout your report.
- Consideration of the provided data, including documentation of data limitations.
- Documentation of assumptions.
- Adherence to all items discussed in the "SUBMISSION REQUIREMENTS" section of this Relocation Social Insurance Case Study.

SUBMISSION REQUIREMENTS

Your team’s submission must contain a written report that meets all the **Written Report Criteria** outlined below as well as those under **Supporting Analysis** and **When and Where to Submit**. Please refer to the 2023 Student Research Case Study Challenge [official rules](#) for further information.

Written Report Criteria

Your written report should be addressed to Natalia Bowditch and Huey Caine’s task force. Their task force includes individuals with financial expertise, including the Chief Actuary of Storslysia’s insurance regulator. The task force also includes environmental experts and other experts in non-financial matters.

The report format must meet all the following criteria. If your team fails to meet the items numbered 1 through 3 below, the task force will not accept your report and will not pay your consulting fees.

1. The report must be in Microsoft Word (docx or doc) or Adobe (pdf) format and must not be password protected.
2. Your report must be written in English.
3. On the top page of your report (cover page, if you are using a cover page, or the first page of your report if you are not using a cover page), state your team name, university affiliation and each member’s name. Do *not* include any email information or phone numbers for any team member.²

The task force is also expecting that your report will meet the following criteria numbered 4 through 9 below. If your team fails to meet the items numbered 4 through 9 below, the task force will be disappointed, may disregard your report, and may not pay your consulting fees in full.

4. Your report should be clearly readable and formatted to professional standards.
5. The filename of your report must be your team name and a *brief* description of content for quick identification (for example: “WassamattaU Consulting Report 2023.docx”).
6. You must reference in a bibliography all elements of your report that are not original with full citations. This requirement applies to all written material, tables, graphs, charts, images, and data other than data provided by the task force for this Relocation Social Insurance Case Study.
7. For an item under the section header “**DELIVERABLES**” in this document to be considered during judging, it must appear in the main body of your report.
8. Your report and its supporting calculations must be the original work of your team specifically for this Relocation Social Insurance Case Study. Previously prepared or published work should not be repurposed or submitted.
9. Your report’s length cannot exceed 10 pages with 1-inch (2.5-cm) margins and size 12-point font. If your report exceeds 10 pages, the task force will consider only the first 10 pages. Reports with narrower margins or smaller font sizes will be downgraded during judging. The following items *will not count* toward the 10-page limit:
 - a. Cover page, if using (cover page is optional)
 - b. Bibliography containing cited sources

² Since winning reports will be posted on the Society of Actuaries Research Institute website, the Society of Actuaries Research Institute, for reasons of privacy, does not recommend providing email addresses.

- c. Appendix (optional) or appendices. Information in appendices should be supplemental with the intent of providing additional detail to support the deliverables discussed in the main body of your report for the more technically focused task force members. Material in the appendices will not be considered in evaluation of whether deliverables were met. Consequently, it is good practice to provide summarizing sentences in the main body for any appendix referred to. Appendices may contain:
 - i. Supporting formulas, calculations, or data,
 - ii. Further elaboration or amplification on any item in the main body of the report,
 - iii. Program code, or
 - iv. Direct citations of external research.

Supporting Analysis

As noted, your report must be submitted in Microsoft Word (docx or doc) or Adobe (pdf) format. You may optionally support your project with calculations done in any programming language. However, any supporting documents or files—for example as an appendix to the main report—may be submitted only in Microsoft Word (docx or doc), Microsoft Excel (xlsx or xls), or Adobe (pdf) formats. Other formats will not be considered.

When and Where to Submit

Send your final submission to research@soa.org by forwarding the email confirmation of your [Intent to Submit form](#) and attaching your report and any supporting documents and copying all of your teammates at the email address provided on your Intent to Submit form. If you do not have an email confirmation of your Intent to Submit form, send an email with your submission attached to research@soa.org, copy all team members and your faculty adviser, and include in the body of your submission email your university affiliation and the names and email addresses of each team member *and* your faculty adviser. Submissions must be received by 5:00 p.m. U.S. Central Standard Time March 24, 2023.

THANKS TO OUR SPONSOR

The SOA Research Institute is proud to have [Valani Global](#) as a platinum sponsor to help fund the 2023 Student Research Case Study Challenge.

About The Society of Actuaries Research Institute

Serving as the research arm of the Society of Actuaries (SOA), the SOA Research Institute provides objective, data-driven research bringing together tried and true practices and future-focused approaches to address societal challenges and your business needs. The Institute provides trusted knowledge, extensive experience and new technologies to help effectively identify, predict and manage risks.

Representing the thousands of actuaries who help conduct critical research, the SOA Research Institute provides clarity and solutions on risks and societal challenges. The Institute connects actuaries, academics, employers, the insurance industry, regulators, research partners, foundations and research institutions, sponsors and non-governmental organizations, building an effective network which provides support, knowledge and expertise regarding the management of risk to benefit the industry and the public.

Managed by experienced actuaries and research experts from a broad range of industries, the SOA Research Institute creates, funds, develops and distributes research to elevate actuaries as leaders in measuring and managing risk. These efforts include studies, essay collections, webcasts, research papers, survey reports, and original research on topics impacting society.

Harnessing its peer-reviewed research, leading-edge technologies, new data tools and innovative practices, the Institute seeks to understand the underlying causes of risk and the possible outcomes. The Institute develops objective research spanning a variety of topics with its [strategic research programs](#): aging and retirement; actuarial innovation and technology; mortality and longevity; diversity, equity and inclusion; health care cost trends; and catastrophe and climate risk. The Institute has a large volume of [topical research available](#), including an expanding collection of international and market-specific research, experience studies, models and timely research.

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