

State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 07-23

June 21, 2007

Agenda Item No.: 07-7-2

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2631-256, entitled "A Spatial Synoptic Classification Approach to Projected Heat Vulnerability in California under Future Climate Change Scenarios," has been submitted by Kent State University;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2631-256 entitled "A Spatial Synoptic Classification Approach to Projected Heat Vulnerability in California under Future Climate Change Scenarios," submitted by Kent State University, for a total amount not to exceed \$191,553.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2631-256 entitled "A Spatial Synoptic Classification Approach to Projected Heat Vulnerability in California under Future Climate Change Scenarios," submitted by Kent State University, for a total amount not to exceed \$191,553.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$191,553.

I hereby certify that the above is a true and correct copy of Resolution 07-23, as adopted by the Air Resources Board.


Lori Andreoni, Clerk of the Board

ATTACHMENT A

"A Spatial Synoptic Classification Approach to Projected Heat Vulnerability in California under Future Climate Change Scenarios"

Background

Executive Order S-3-05, signed by Governor Schwarzenegger on June 1, 2005, called for the California Environmental Protection Agency to prepare biennial science reports on the potential impact of global warming on certain sectors of the California economy. The Air Resources Board (ARB) was assigned to lead the analyses of public health impacts of climate change. The first report under this Executive Order was released in 2006, and included an analysis of the risk of heat-related mortality on five of the most populous areas of California that was performed by the Sheridan, Hayhoe, and Kalkstein, the same group of contractors as this project. The project will extend the previous methodologies, and add two cities to an updated analysis that will be included in the next scheduled report to the Governor on climate change impacts in California.

Objective

The objectives are: first, to estimate potential changes in oppressive air mass events over the coming century under higher and lower scenarios of climate change; second, to translate these changes into potential impacts on mortality rates in California, by urban center and age group; and finally, to assess the expected adaptation potential of the population in each city to these changing conditions.

Methods

The project involves several stages. The initial steps will involve acquisition and standardization of historical (1957-2000) and future projected (2000-2099) reanalysis data from the National Center for Environmental Protection/Department of Energy R2 and output fields from the European Center for Medium Range Weather Forecasting ERA-40 and Atmospheric Oceanographic General Circulation Model (AOGCM) [Parallel Climate Model, Geophysical Fluid Dynamics Laboratory, and Hadley Center Climate Model 3, and acquisition and standardization of mortality data for the seven urban areas to be studied. This data will be used to identify Spatial Synoptic Classification air-mass categories and relationships with surface variables in historical and AOGCM data for the baseline period, and analysis of potential trends in atmospheric circulation patterns. This analysis will identify the frequency and intensity of air mass types associated with elevated heat-related mortality for the seven cities. The second step will involve development of age-specific mortality rates for the seven cities, based on the present climate, and development of age-specific mortality rates during the hottest summers for the same seven cities, for use in the "analog summer" sensitivity analysis. This stage will involve also involve acquisition of census projections, and determination of demographic changes expected in the seven cities over the next century.

The third stage of the project will involve making projections of future oppressive air mass frequencies and related impacts on heat-related mortality, both with and without

acclimatization, for the emissions scenarios to be used in the next report to the Governor (higher and lower emissions) to estimate the potential magnitude of climate-related impact on mortality. This stage of the analysis will also make projections of the number of excessive heat warnings and heat advisories (as would be issued by an adaptive Heat Watch-Warning System [HHWS]), with and without acclimatization, to estimate the potential influence of adaptive measures in reducing climate impacts.

Expected Results

The final products of this study will include estimates of heat-related mortality across California's seven largest metropolitan areas through 2100 both with and without acclimatization, and estimates of the numbers of actual heat warnings that would be called under the same circumstances by an operational HWWS. Products will also include an assessment of the adaptation potential that might be achieved through implementing HWWS in additional cities beyond San Francisco and San Jose.

Significance to the Board

The results of the study will be included in the next report to the Governor on the impacts of climate change in California, and will inform possible future regulatory actions to protect the public from heat mortality consequences related to climate change. The results will contribute to ARB's responsibilities under AB32 of evaluating possible adaptations to climate change that could be applied on a statewide basis.

Contractor:

Kent State University

Contract Period:

24 Months

Principal Investigator (PI):

Dr. Scott Sheridan, Ph.D.

Contract Amount:

\$191,553

Basis for Indirect Cost Rate:

The rates charged are the Federally approved rates for each of the three participating universities.

Past Experience with this Principal Investigator:

These investigators performed a related analysis that was included in the 2006 report to the Governor on climate change impacts on California. The work produced was of high quality, and was completed according to the specified schedule.

Prior Research Division Funding to Kent State University:

Year	2006	2005	2004
Funding	\$ 0	\$ 0	\$ 0

BUDGET SUMMARY

Contractor: Kent State University

"A Spatial Synoptic Classification Approach to Projected Heat Vulnerability in California under Future Climate Change Scenarios"

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	46,209
2.	Subcontractors	\$	102,042 ¹
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	2,304
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	0
7.	Mail and Phone	\$	0
8.	Supplies	\$	400
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>0</u>
	Total Direct Costs		\$150,955

INDIRECT COSTS

1.	Overhead	\$	0
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	40,598
4.	Fee or Profit	\$	<u>0</u>

Total Indirect Costs \$40,598

TOTAL PROJECT COSTS

\$191,553

¹ The project is a collaboration between researchers at Kent State University, Texas Tech University and the University of Miami that will be coordinated through Dr. Sheridan at Kent State. Each investigator brings a unique expertise, which is required for successful completion of the project.

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Katharine Hayhoe, M.S.

Description of subcontractor's responsibility: Ms. Hayhoe and her research assistant will be responsible for global climate modeling and projections of climate change at the regional level. She will also be instrumental in integrating the different levels of the analysis, and participate in preparing publications based on the project's results.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	40,211
2.	Subcontractors	\$	0
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	2,928
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	200
7.	Mail and Phone	\$	100
8.	Supplies	\$	405
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>0</u>

Total Direct Costs \$43,844

INDIRECT COSTS

1.	Overhead	\$	20,387
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>

Total Indirect Costs \$20,387

TOTAL PROJECT COSTS **\$64,231**

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Laurence Kalkstein, Ph.D.

Description of subcontractor's responsibility: Dr. Kalkstein and his research assistant will be involved in the synoptic classification portion of the analyses, as well as the sensitivity and validation analyses.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	28,209
2.	Subcontractors	\$	0
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	1,800
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	0
7.	Mail and Phone	\$	0
8.	Supplies	\$	0
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>0</u>
	Total Direct Costs		\$30,009

INDIRECT COSTS

1.	Overhead	\$	0
2.	General and Administrative Expenses	\$	7,802
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>
5.	Total Indirect Costs		<u>\$7,802</u>

TOTAL PROJECT COSTS

\$37,811