August 17, 2004,NYTimes

Study Finds Climate Shift Threatens California

By DEAN E. MURPHY

SAN FRANCISCO, Aug. 16 - A scientific study released on Monday presents an alarming view of climate changes in California, finding that by the end of the century rising temperatures could lead to a sevenfold increase in heat-related deaths in Los Angeles and imperil the state's wine and dairy industries.

The study, published in the online version of the Proceedings of the National Academy of Sciences, offers the most detailed projection yet of changes in California as temperatures rise around the world because of building concentrations of heat-trapping gases.

Under one of two scenarios, in which fossil fuel use continues at its present pace, the study determined that summertime high temperatures could increase by 15 degrees in some inland cities, putting their climate on par with that of Death Valley now. That scenario also foresaw a reduction of 73 percent to 90 percent in the snow pack in the Sierra Nevada, resulting in disrupted water supplies from the San Francisco Bay Area to the Central Valley.

Even in the second scenario, which assumed significant increases in the use of renewable energy like wind and solar power, the study concluded that fossil fuel emissions could push average high temperatures up by four to six degrees - the difference, one author said, between the temperature in Yosemite National Park and downtown Sacramento.

The study warned that the higher temperatures could have devastating consequences for wine grapes, which could ripen more quickly and be of poorer quality, and for cows, which could produce less milk. In cities like Los Angeles, it found, the number of days of extreme heat could increase by four to eight times. It projected that heat-related deaths in Los Angeles, which it said averaged 165 annually during the 1990's, could double or triple under the moderate scenario and grow as much as seven times under the harsher one.

The scientists said that California was chosen for the study because of its range of climates and the predominance of industries, like agriculture, that are dependent on climatic conditions. The state's economic heft - by some measures it is the fifth largest economy in the world - and its history of environmental activism were also considerations.

"California alone can't address the emissions problem, but California is in a position of leadership," one of the study's authors, Peter C. Frumhoff of the Union of Concerned Scientists, said in a teleconference.

The study was conducted by 19 scientists from several universities and research institutions, including Stanford University, the University of California and the Scripps Institution of Oceanography. It was financed by a variety of foundations as well as the Department of Energy and the California Energy Commission.

Several of the scientists warned against dismissing the findings as overstated. "We have been studying this for 30 years, and the conclusions are getting increasingly clear, and increasingly consistent," said Dr. Stephen H. Schneider, a climate scientist at Stanford. He added, "We think this problem has too high a chance of happening and in negative incarnations for us to ignore it."

A fresh look at California's climate future suggests some profound changes may be coming as global warming takes hold, including extended heat waves in Los Angeles, disrupted ecosystems in the mountains and chaos in California's water-supply system.

Researchers adapted two of the latest computer models of global climate change to determine how California might be affected under two different scenarios -- one optimistic and one pessimistic -- for emissions of heat-trapping greenhouse gases.

Although the scientists steered clear of making any specific pronouncements on policies or politics, their study, which was published online Monday in the Proceedings of the National Academy of Sciences, sets a new benchmark for evaluating California's stake in the global-warming debate.

Nineteen scientists took part, many of them donating their time, including California climate experts Daniel Cayan of the Scripps Institution of Oceanography, Stephen Schneider of Stanford University and R. Michael Hanemann of UC Berkeley.

The Union of Concerned Scientists in Washington, D.C., contributed researchers and financing for the lead author, Katharine Hayhoe, an atmospheric scientist at ATMOS Research and Consulting in South Bend, Ind.

During a telephone briefing Monday, Hayhoe and colleagues said conservation practices today could have a big effect on climate conditions in 50 or 100 years.

Researchers deliberately chose not to evaluate the merits of any particular policy option, but they called on the U.S. government, as well as American businesses and individual citizens, to take a leadership role in putting the world on a course to reduce harmful emissions. They said it's clear something needs to be done, and soon, to cut the emissions they said are clouding both the atmosphere and California's economic future.

"Unless we take steps now, the consequences after 2050 will be significantly worse," Schneider said. California's arid nature -- and its weather-dependent industries, from skiing to wine-making -- dramatically highlight the effects of climate change.

The scientists compared data for the period 1961-1990 with projections for 2020-2049 and for 2070-2099. Under the more optimistic scenario, the results showed that average temperatures in the state would rise by roughly 4 to 6 degrees Fahrenheit by the end of the century compared with the 1961-1990 base period, if the computer models are accurate.

That might not seem cataclysmic. But Hayhoe said it would still be enough to make Yosemite Valley feel more like downtown Sacramento in the summer, and trigger profound ecological effects.

If it's worse than that, the annual temperature averages could jump by 7 to 10 degrees. It could be a whopping 15 degrees warmer in summer. That would make California's balmy coastal cities feel more like hot inland towns do now, while "inland cities would feel like Death Valley does today," Hayhoe said.

Daily life in Los Angeles already includes about a dozen "heat-wave days" a year, defined as three or more days in a row when temperatures climb above 90 degrees. Under the worst-case heating outlook, there would be as many as 95 such days by the end of the century, producing about 1,400 more heat-related deaths.

In the mountains, snowpack by April 1 would diminish to nearly nothing at the lower and middle elevations, with up to a two-thirds reduction above the 9,000-foot level. That would have a devastating impact on the state's water system, since the Sierra snowpack serves essentially as a gigantic reservoir for downstream water systems.

This would allow some species of plants and animals to extend their range to higher elevations. At the same time, it would "squeeze high-altitude ecosystems right off the tops of the California mountains," said Christopher Field, a study co-author and director of the Carnegie Institution's Department of Global Ecology, located at Stanford.

Reduced water availability would more than cancel out any advantage from longer growing seasons. The state's prestige wine growers would take a hit, because the hotter summers would cause the premium varietals to mature too quickly.

Despite the widespread consensus among climate researchers that global warming is a genuine problem, a few scientists suggest climate-change worries might be overblown.

A report last week in the journal Geophysical Research Letters, for example, claimed that satellite readings have found no evidence of a warming trend, and that surface temperature data are not reliable measures of long-term climate change. Counterbalancing natural factors also may reduce temperatures and prove all the forecasts and computer models wrong, scientists say.

But most experts agree there is little doubt that worldwide average temperatures already have increased measurably -- roughly 1 or 2 degrees Fahrenheit during the past century -- and are headed higher, almost certainly as a result of greenhouse gas emissions.

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Risk to State Dire in Climate Study

Unless checked, global warming could reduce the Sierra snowpack up to 89% by century's end, new research says.

By Miguel Bustillo
Times Staff Writer

August 17, 2004

Global warming could raise average temperatures as much as 10 degrees in California by the end of this century — sharply curtailing water supplies, causing a rise in heat-related deaths and reducing crop yields — if the world does not dramatically cut its dependence on fossil fuels, according to a study by 19 scientists published Monday.

The study, in the Proceedings of the National Academy of Sciences, contemplated the consequences of two distinct paths the industrialized world could take in response to a changing climate: maintaining its current reliance on coal, oil and gas, or massively investing in new technologies and alternative energy sources. Burning fossil fuels adds carbon dioxide to the atmosphere, which increases global temperatures by trapping more of the sun's heat.

Using two new computer models on climate change, the study focused exclusively on impacts in California, citing the state's economic importance, diverse climate and longtime reputation as a leader in environmental protection.

The scientists' findings were stark. Human activities already have caused an increase in the amount of gases that contribute to global warming, and as population grows, some further increases are inevitable, the researchers said. Because of that, the state will have to endure not only higher temperatures but significantly longer summer heat waves no matter which path is taken, they warned.

Meanwhile, the Sierra Nevada will receive substantially less snowfall. Much of the state's water comes from mountain snow, and that snowpack could be reduced by 89% if greenhouse gases are not reduced, the study predicted. Rising temperatures could also produce more heavy precipitation in the spring, forcing managers of rapidly filling reservoirs to release water they would prefer to save for dry summer months.

"The state is not set up to deal with what could be a thorny problem over how to deal

with shortages and diversion," said Michael Hanemann, director of the California Climate Change Center at UC Berkeley.

Nonetheless, the study concluded that aggressive measures to reduce greenhouse gas emissions could make a dent in the global warming problem.

"The question is, are you going to wait 25 years to solve this, or are you going to act on the vast preponderance of evidence that we are accumulating?" said one of the study's authors, Steve Schneider, co-director of Stanford University's Center for Environmental Science and Policy.

If the world continues to release high levels of heat-trapping gases, California's average statewide temperature is likely to rise 7 to 10 degrees Fahrenheit by the end of the century, the study concluded.

On the other hand, if nations undertake large-scale reductions — which the scientists conceded would require major economic and behavioral changes — temperatures are still likely to rise 4 to 6 degrees by 2100, the study found.

"The choices that we make today and in the near future will determine the outcome of this giant experiment we are undertaking with our planet," said Katharine Hayhoe, an Indiana-based climate consultant who was the lead author of the report. An increase of 7 to 10 degrees "is enough to make many coastal cities feel like inland cities do today, and enough to make inland cities feel like Death Valley," Hayhoe said.

If fossil fuel use is not reduced, the study warned, heat waves in Los Angeles would become six to eight times more frequent, and heat-related deaths would increase five to seven times.

The statewide average temperature, taking in day and night throughout the year, is about 60 degrees. It has slowly risen over the last two decades, climate records show. If it continues rising, scientists say it will exceed the range of historical variation within the next 10 years.

The report was produced by scientists who have specialized in the study of climate change. They include researchers from Stanford, UC Berkeley and the Scripps Institute of Oceanography in La Jolla, as well as government experts from the U.S. Department of Agriculture's Corvallis Forestry Sciences Laboratory in Oregon.

While the findings were largely in accord with previous predictions about global warming in California, some conclusions were more extreme, a fact that some participants attributed to new, more detailed climate modeling.

"They are very dramatic, but we have seen similar numbers before in other studies," said Peter H. Gleick, president of the Oakland-based Pacific Institute for Studies in Development, Environment and Security and a 2003 MacArthur fellow who has been

studying climate change since the 1980s.

"I guess the surprise is that even the so-called good news doesn't look so good. Those scenarios look very ugly for California. Every scenario shows California's snowpack going away."

Rising temperatures could also affect the state's multibillion-dollar farming industry, the scientists noted. A particular concern is the Napa and Sonoma wine grape harvest, which experts said could be hurt by even a slight uptick in temperature.

"Under higher temperatures, grapes fall off the vine more quickly," and the quality of the valuable fruit can be harmed, said Chris Field, director of the department of global ecology at the Carnegie Institution. Any sizable increase in temperatures "threatens California's status as the leading producer of wine grapes," he said.

Study: Major changes from warming

By Edie Lau and Stuart Leavenworth -- Bee Staff Writers - *(Published August 17, 2004)*

By the end of the century, continued buildup of carbon dioxide in the atmosphere will sour wine grape production, distress dairy cows and bring summer temperatures to many inland cities that match Death Valley's today, according to scientists who have conducted the most detailed study yet of global climate change's effects in California.

The study, released Monday, lays out two main scenarios for the state. One is "business as usual," with carbon-dioxide emissions continuing to rise steeply through the rest of the century. The other presumes greater reliance in the near future on energy sources other than fossil fuels.

"We found substantial differences in the consequence of climate change ... (that) depend on future emissions," said Katharine Hayhoe of ATMOS Research and Consulting in Indiana, lead author of the study appearing this week in the journal Proceedings of the National Academy of Sciences.

Hayhoe said that finding sets apart this study from previous ones, which considered simply how the future might look under climate change. The latest study, conducted by a team of 19 scientists, "asks a striking new question," she said: "How do these impacts depend upon the choices that we make?"

In both scenarios, average temperatures rise, snowpack diminishes and agriculture and quality of life suffer noticeably. That's because the existing emissions - about 24.5 billion metric tons of heat-trapping carbon dioxide per year worldwide from burning fossil fuels - will continue to influence climate for years to come.

The number of days when the temperature reaches 90 degrees or higher in Sacramento more than doubles under the business-as-usual scenario, from 58 days on average historically to 138 days before the end of the century.

Under the lower-carbon-emissions scenario, the number of days of 90 degrees or hotter also nearly - but not quite - doubles, to 115.

Maurice Roos, the state hydrologist, said higher temperatures may not be that difficult to cope with, at least for most people. "There are many other big cities in the world that are hotter - not that it's pleasant," he said.

A one-time skeptic of global warming who is now concerned about its effects on water supply in California, Roos said he tends to believe its manifestation will not be as terrible as some models show.

By contrast, at a telephone news briefing Monday, four of the scientists who produced the study spoke passionately of the need for action.

"The way forward is clear," said Christopher Field, an ecologist and director of the Carnegie Institution's Department of Global Ecology based at Stanford University. "We (in California) need to take a leadership position on putting the world on course to lower emissions."

California has taken a maverick step in controlling "greenhouse gas" emissions from cars, becoming the first in the country to propose mandatory reductions in such pollutants from automobiles beginning with the 2009 model year.

The state also has joined seven other states and New York City in a lawsuit seeking big cuts in greenhouse gases from the nation's five largest power suppliers.

The scientists said they selected California to study in detail because of its diverse environment - mountains, deserts, coast and valleys - its diverse human cultures, its diversity of wildlife and plants and the fact that its economy consistently ranks among the world's largest.

The study was based upon two computer global climate models, one developed by a team in Britain, the other by the National Center for Atmospheric Research in Colorado. The team "downscaled" the global model to California size, using a statistical method that other researchers in the field said is scientifically sound.

Then they ran two scenarios under each model. The first assumed no changes in the carbon-dioxide emissions rate. The amount of carbon dioxide in the atmosphere has risen from 315 parts per million in 1958 to about 370 ppm today. If unabated, it will reach nearly 1,000 ppm by the end of the century.

The lower-emissions scenario assumed that the emissions rate would slow in coming decades, bringing the atmospheric concentration to 550 ppm by the 22nd century.

Among the projections:

* The April 1 snowpack declines from between 26 percent to 89 percent across all elevations.

* The heat-wave season - the period during which temperatures reach 90 degrees or higher for three or more consecutive days - lengthens to between 132 days a year and 204 days a year. Historically, the heat-wave season has lasted 115 days.

* Heat-related deaths in Los Angeles jump from 165 to 1,182 a year.

* The average annual temperatures rises to 69 degrees from 59 degrees.

A change of even 4 to 6 degrees Fahrenheit on average is notable, Hayhoe said. "It's the difference between spending the summer in Yosemite (National) Park as opposed to spending it in downtown Sacramento," she said.

A change of 15 degrees on average would make coastal cities feel like many inland cities today, she added, "and make summers in many inland cities feel like Death Valley today."

The scientists said agriculture could be severely affected. For example, dairy cows' milk production drops off as the temperature rises.

In the state's top 10 dairy-producing counties - which account for most of California's dairy output - production could drop between 7 percent and 22 percent.

Similarly, wine grapes would ripen sooner, with a consequent drop in quality.

Michael Marsh, CEO of Western United Dairymen in Modesto, said his industry group is keenly interested in environmental issues, including climate change. One avenue the industry is pursuing is capturing methane, a greenhouse gas produced by cattle manure, and burning it for energy.

Karen Ross, president of the California Association of Winegrape Growers, said her group has not tackled global warming. She said making broad statements about how it could affect the state wine industry is difficult because California has such a variety of microclimates.

"It could potentially have an impact on some of our wine-growing regions," she said.

The ski industry, which stands to be devastated by the loss of snowpack, is very active on the issue.

The National Ski Areas Association, based in Colorado, advocates a national reduction of greenhouse-gas emissions. "We don't have our heads in the snowbank on this," association President Michael Berry said.

About the Writer

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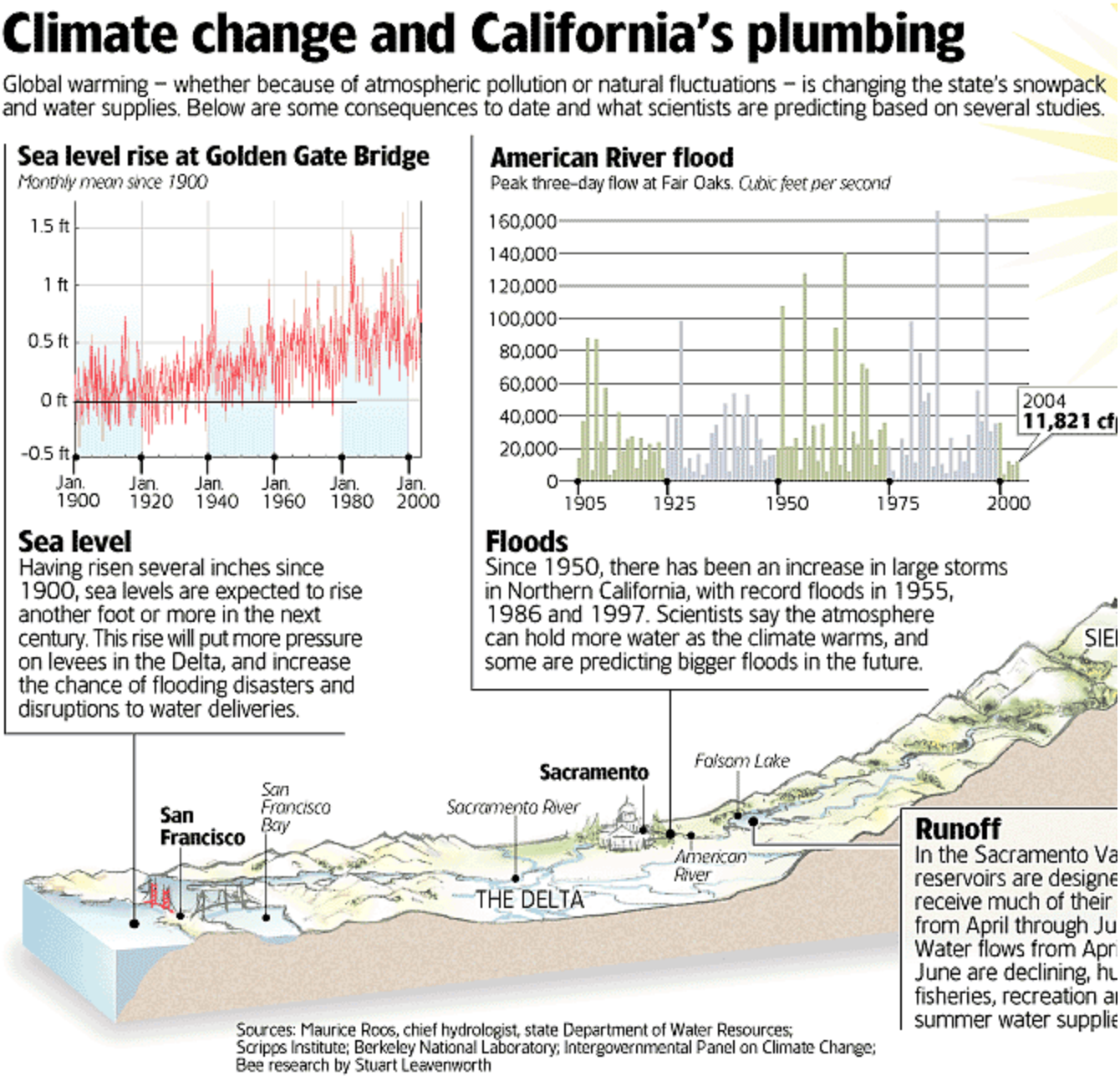

Scientists have the 'hots' for future of California

Climate experts project the state as a guinea pig

By Ian Hoffman, STAFF WRITER

If society turned dramatically "greener" and curbed its reliance on fossil fuels, California still will get noticeably hotter, its water supplies tighter and its cities, scientists say, a potentially mortal burden on the elderly.

But if the world keeps fueling its growth on coal and oil, the Golden State's future is grimmer: California could roast to a crisp as temperatures soar by as much as 15 degrees and a third of its precious snowmelt vanishes.

California's prized wineries could shrivel. Water wars that

pitted cities and environmentalists against farmers could break into free-for-all battles. And the state could be caught in a paradox of being thirstier and more needful of power when water and energy supplies are thin.

Coastal cities and Yosemite's cool meadows would feel like downtown Sacramento and Modesto, said Katharine Hayhoe, an atmospheric scientist for ATMOS Research and Consulting in South bend, Indiana.

"That's enough to make many inland cities feel like Death Valley today," she said.

Reporting Monday in the Proceedings of the National Academy of Sciences, a team of climate scientists used California as a guinea pig for two global warming scenarios -- a "business-as-usual" future of continued growth in population, wealth and emissions of carbon dioxide and an alternative future of more diverse energy sources, lower population and less wealth.

The Union of Concerned Scientists, a policy group that favors energy conservation and cuts in pollution, announced the findings and aimed them squarely at audiences in California.

"We're clearly at a fork in the road, but we need the leadership and innovation for which California is known," said Christopher Field, a biologist at Stanford and director of the Carnegie Institution's department of global ecology.

"California can't alone change national policy, but California is in a leadership position, both perceived and real," said Peter Frumhoff, director of UCS' Global Environmental Program.

What society decides in the next decade or two will determine the severity of global warming for most of the century because of lag times built into the Earth's ecosystem, scientists said.

Oceans now absorb 40 percent of carbon from the burn-

ing of fossil fuels, and it will take years for warming of the planet to expand oceans and cause a significant rise in sea level. At that point, large storms could imperil the levees of the San Francisco Bay Delta and saltwater will creep into freshwater aquifers along the coast.

But well before then, California's largest water source could begin to feel the heat. Snowcapped peaks that store almost half of the state's water are likely to get smaller and melt sooner.

"I want to emphasize that these effects due to climate change come as very unwelcome news to the California water community," said Michael Hanemann, a climate policy expert at the University of California, Berkeley.

Scientists' latest simulations show the mountain snowlines abandoning lower elevations as snow turns to rain, and the ordinary spring runoff in April shifting to March or February, he said.

"We are now going to be overtaken by impacts in the hydrology within the next century," Hanemann said.

Chief state hydrologist Maury Roos said authorities already are seeing hints of a global-warming impact on the Sierra snowpack, which can lead to more demand for water for irrigation and landscaping, as well as a longer fire season.

State water officials already are talking of new dams and enlarging Shasta Lake. But the projects are highly controversial and could take decades to build.

It's not just the time to build the infrastructure, but the time to get agreements among the parties about who will pay, Hanemann said.>

The heating of California also may have a human cost, the scientists said. Los Angeles counts 165 deaths from heat stress a year.

Contact Ian Hoffman at ihoffman@angnewspapers.com .

Los Angeles Daily News

Heat spike warned for L.A.
Scientists issue global warming report

By Harrison Sheppard
Sacramento Bureau

Monday, August 16, 2004 - If the world's population continues burning fossil fuels at the current rate, global warming could lead to more heat-related deaths in Los Angeles by the end of the century, plus severe water shortages and summers comparable to those in Death Valley, according to a study released Monday.

The study by 19 leading environmental scientists, published by the National Academy of Sciences, examined the impact of global warming on California. It found that even in a best-case scenario, with a concerted effort to reduce the use of fossil fuels, temperatures will still increase sharply by 2099, summers will be longer, and water provided by the Sierra Nevada snowpack will be in short supply.

But if there is no such effort and usage continues at its current rate, then as many as 1,182 people a year, especially the elderly and children, could die from heat-related causes in Los Angeles by the year 2099, compared to 165 a year currently.

Other effects include lengthening the heat-wave season from 115 days to 204 days and raising the average temperature by 10 degrees, or even 15 degrees, in summer.

"The 7-to-10-degree range (increase) is enough to make many coastal cities feel like inland cities do today," said Katharine Hayhoe, the study's lead author. "And at the higher end of the range, with 15-degree Fahrenheit change in summer, that's enough to make summer in many of California's inland cities feel like Death Valley does today."

The scientists say their study points to a clear need for voluntary energy conservation, as well as policies that encourage conservation and the development of more energy-efficient technologies.

While this study builds upon a large volume of previous research, some scientists remain skeptical of global warming theories.

Kenneth Green, an adjunct scholar at the Santa Monica-based Reason Public Policy Institute, said most studies of global warming oversimplify the highly complex global climate to the point where the data is nearly useless.

"The bottom line is, we have an incredibly small amount of data about the climate," said Green, who is also chief scientist at the Fraser Institute, a Canadian free-market think tank.

"It's spotty around the world. It's of varying -- not usually good -- quality and it has to be pinched, prodded, kneaded and tortured until it says something."

He said more research is needed before society uses its precious resources to fight global warming when it could use those same resources to, for example, fight disease.

But Bill Patzert, a climate expert at the Jet Propulsion Laboratory in Pasadena, who was not involved in the study, said its authors are some of the top experts in the world and he agrees with their conclusions.

In Los Angeles, for example, Patzert said, the average temperature has increased by 5 degrees over the past century. The increase is most severe at night, when temperatures have risen by 7 degrees, compared to only 3 degrees during the day.

Warming is caused not only by global trends, he noted. California's development and population explosions over the last 100 years, with its accompanying increase in asphalt and decrease in shade trees, has contributed to a greater absorption of heat by the ground throughout the state.

"What they're doing is giving us a heads-up, a view of the canary in the coal mine here," Patzert said. "Scientifically, you'd be hard-pressed to find anybody who disagrees with these guys who has any credentials at all.

"As far as L.A., what does it mean? It means go into the air-conditioning business."

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State headed for warming, study says

By Mike TaugherBy Mike Taugher

CONTRA COSTA TIMES

California is destined to be hotter and drier a century from now, but the outlook will be far worse if emissions of greenhouse gases around the world are not curtailed, a new study says.

In Monday's Proceedings of the National Academy of Sciences, a team of scientists say that continued worldwide dependence on fossil fuel will dramatically alter life in the Golden State.

Coastal areas could feel like inland valleys do today, and inland valleys could feel like deserts in the summer, significantly impacting wine grape growers and dairy farmers, the report's lead author said. High mountain ecosystems could wither away while the average Sierra Nevada

snowpack could melt dramatically, reducing the state's water supply and damaging ecosystems.

"By the end of the century, the Sierra Nevada snowpack could decline by about 90 percent if emissions are not curtailed or 30 percent if emissions are curtailed," said Michael Hanemann, a UC Berkeley professor in the Department of Agriculture and Resource Economics who helped write the study.

Earlier this month, the state Air Resources Board issued proposed regulations that would force carmakers to reduce greenhouse gas emissions by one-third over the next 12 years.

The report's authors said such regulations, though limited to California, are an important step in addressing climate change because other states and nations might follow. They said their research focused on California because of the state's enormous economy, a range of wildlife habitat from desert to alpine mountains and a dependence on weather patterns for water.

"We are making decisions today that are setting in place what our kids and grandkids will perceive," said Peter Frumhoff, a senior scientist at the Union of Concerned Scientists.

The study examined two scenarios. One assumed robust economic growth and little change in how fossil fuel is used for energy, resulting in the tripling of emissions of greenhouse gases over the next 100 years.

The second scenario assumed that alternative energy sources are pursued aggressively around the world. In this scenario, greenhouse gas emissions would continue to increase for a while but then gradually fall off so that in 100 years, emissions are roughly what they are today.

Using sophisticated computer models, the team then attempted to predict how California would be affected in each scenario.

"This study asks the question, how do these impacts depend on the choices we make," said Katherine Hayhoe, the lead author of the study and atmospheric science consultant in Indiana.

The scientists found little difference in either scenario over the next 50 years. But after that, life in California becomes increasingly dependent on where energy comes from.

Predicting how changes in the climate will affect specific regions is an uncertain task, and similar studies in the past have been criticized for being too speculative.

"The modeling is just too crude to predict regional impacts," said Bill O'Keefe, president of the Marshall Institute, a Washington D.C.-area think tank skeptical of climate change theories. "The models tend to overpredict the amount of warming."

Stephen Schneider, a Stanford professor in the Department of Biological Sciences and the Institute for International Studies, said the authors could not discount the possibility that greenhouse gas emissions will have no bad effects in California.

But he said the odds that nothing detrimental will happen are low, and it was equally probable that climate change will have unforeseen catastrophic effects.

The report's authors predicted more frequent heat waves, major problems for Napa wine growers and California dairy farmers, loss of alpine ecosystems and significant water shortages.

Even if use of fossil fuel is decreased, California's alpine and subalpine forests are expected to decline by 50 percent to 75 percent.

Although the scientists said annual precipitation in California would probably be close to what it is now, far more of that would fall as rain instead of snow.

Warmer temperatures and more rain mean less snow in the mountains in winter and spring. That will lead to water shortages as managers try to capture as much runoff as they can in reservoirs while also trying to leave space in the reservoirs to capture floods that would otherwise inundate downstream areas.

Today, state water planners are nearing completion of a statewide water plan that is issued every five years. The document calls for more research on how climate changes will affect the state's water.

"This is probably the first time that climate change has gotten such a prominent mention (in the water plan)," said John Andrew, a water planner at the Department of Water Resources. "I expect that five years from now, this will be an even bigger issue."

Mike Taugher covers the environment and energy. Reach him at 925-943-8257 or mtaugher@cctimes.com.

STUDY'S FUNDING

The research article "Emissions pathways, climate change and impacts on California" was published Monday in the journal of the National Academy of Sciences. The team of 19 scientists came from universities, government agencies and other organizations. Funding for the study included grants from the David and Lucile Packard Foundation, the William and Flora Hewlett Foundation, the Energy Foundation, the California Energy Commission, the National Oceanic and Atmospheric Administration Office of Global Programs and the U.S. Department of Energy.

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STUDY'S FUNDING

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