

Study: Man-made heat put in oceans has doubled since 1997

By **SETH BORENSTEIN**
AP Science Writer

WASHINGTON — The amount of man-made heat energy absorbed by the seas has doubled since 1997, a study released Monday showed.

Scientists have long known that more than 90 percent of the heat energy from man-made global warming goes into the world's oceans instead of the ground. And they've seen ocean heat content rise in recent years. But the new study, using ocean-observing data that goes back to the British research ship Challenger in the 1870s and including high-tech modern underwater monitors and computer models, tracked how much man-made heat has been buried in the oceans in the past 150 years.

The world's oceans absorbed approximately 150 zettajoules of energy from 1865 to 1997, and then absorbed about another 150 in the next 18 years, according to a study published Monday in the journal Nature Climate Change.

To put that in perspective, if you exploded one atomic bomb the size of the one that dropped on Hiroshima every second for a year, the total energy released would be 2 zettajoules. So since 1997, Earth's oceans have absorbed man-made heat energy equivalent to a Hiroshima-style bomb being exploded every second for 75 straight years.

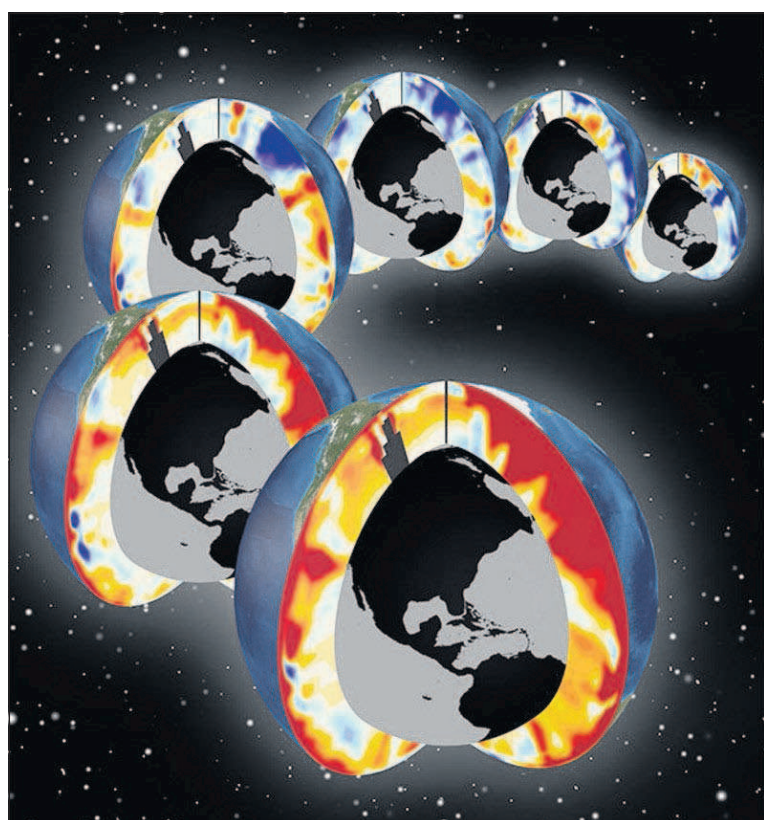
"The changes we're talking about, they are really, really big numbers," said study co-author Paul Durack, an oceanographer at the Lawrence Livermore National Lab in California. "They are nonhuman numbers."

Because there are decades when good data wasn't available and computer simulations are involved, the overall figures are rough but still are reliable, the study's authors said. Most of the added heat has been trapped in the upper 2,300 feet, but with every year the deeper oceans also are absorbing more energy, they said.

But the study's authors and outside experts say it's not the raw numbers that bother them. It's how fast those numbers are increasing.

"After 2000 in particular the rate of change is really starting to ramp up," Durack said.

This means the amount of



This image provided by Lawrence Livermore National Laboratory shows Pacific and Atlantic meridional sections showing upper-ocean warming for the past six decades (1955-2011). Red colors indicate a warming (positive) anomaly and blue colors indicate a cooling (negative) anomaly.

"These findings have potentially serious consequences for life in the oceans as well as for patterns of ocean circulation, storm tracks and storm intensity."

— Jane Lubchenco,
Oregon State University marine sciences professor

energy being trapped in Earth's climate system as a whole is accelerating, the study's lead author Peter Gleckler, a climate scientist at Lawrence Livermore, said.

Because the oceans are so vast and cold, the absorbed heat raises temperatures by only a few tenths of a degree, but the importance is the energy balance, Gleckler and his colleagues said. When oceans absorb all that heat it keeps the surface from getting even warmer from the heat-trapping gases spewed by the burning of coal, oil and gas, the scientists said.

The warmer the oceans get, the less heat they can absorb and the more heat stays in the air and on land surface, the study's co-author, Chris Forest at Pennsylvania State University, said.

"These findings have poten-

tially serious consequences for life in the oceans as well as for patterns of ocean circulation, storm tracks and storm intensity," said Oregon State University marine sciences professor Jane Lubchenco, the former chief of the National Oceanic and Atmospheric Administration.

One outside scientist, Kevin Trenberth, climate analysis chief at the National Center for Atmospheric Research, also has been looking at ocean heat content and he said his ongoing work shows the Gleckler team "significantly underestimates" how much heat the ocean has absorbed.

Jeff Severinghaus at the Scripps Institute of Oceanography praised the study, saying it "provides real, hard evidence that humans are dramatically heating the planet."

Audit finds serious backlogs at teacher licensing agency

By **PARIS ACHEN**
Capital Bureau

for efficiency. Staff shortages Cuts to management and staff during the recession contributed to long delays in issuing licenses and responding to complaints. In 2012, the agency cut six positions.

SALEM — Mismanagement, outdated technology and staffing shortages at the state's teacher licensing agency have resulted in four-month-long waits for teacher licenses, years-long investigations into teacher misconduct and poor morale, according to an audit by the Secretary of State's Office.

"The licensing and customer service delays can damage the agency's reputation, complicate school district hiring and make it harder on educators looking for jobs," stated an audit report released Thursday.

The Legislature ordered the emergency audit in 2015 to address perennial problems at the Teachers Standards and Practices Commission.

Auditors, who released their report Thursday, gave the commission credit for making "recent improvements in service to educators."

"But it still faces substantial backlogs in issuing licenses, investigating complaints against educators, and responding promptly to educator questions," the report stated.

Mismanagement Commission Executive Director Vickie Chamberlain, who, auditors said, received inadequate oversight from the 17-member commission, announced her retirement in early October in the midst of the audit. She agreed to stay on at the agency until a successor could be found.

She told The Oregonian at the time that the demands of the job had been taking a toll on her.

Chamberlain said the job will be posted soon but gave no specific timeline. The Department of Administrative Services plans to handle the recruitment, which will be national in scope, she said.

"They would like a short transition with me and the new director," she said.

Auditors have recommended that the agency set clearer goals to track performance of employees, including the executive director; make performance evaluations routine, and review and update policies, procedures and work processes

Licensing staff lacked a direct manager for nearly two years, while investigators faced high turnover and high caseloads, according to the audit.

Technology The agency's outdated and "complicated" paper-based licensing system also contributed to delays. The commission's website lacked basic information that could have provided answers to teacher's licensing questions, the report stated.

The commission, in a response sent to the Secretary of State's Office, largely agreed with the Secretary of State's critique of the agency.

The commission indicated it plans to prioritize resolving backlogs in licensing and investigations and make changes to increase oversight of employees, enhance transparency and boost effectiveness.

An increase in license fees in 2015 — the first in 10 years — could help in addressing backlogs by allowing the agency to add four new staff positions and replace the archaic licensing system. The agency's budget operates solely on licensing fees. Starting Jan. 1, applicants were scheduled to be able to file applications and pay fees online.

Consumers are already seeing some improvements, the report indicated. The average call hold time fell from 30 minutes in 2014 to five minutes in the summer. Investigators are testing a new triage system to help reduce investigation lengths.

The agency, consisting of 26 employees, licenses 19,000 K-12 teachers a year and investigates hundreds of complaints against educators. The commission also is responsible for disciplining educators and evaluating education programs for teachers at Oregon colleges.

The Capital Bureau is a collaboration between EO Media Group and Pamplin Media Group.

Corrections

In a photo of the Pendleton High School class of 1948 that was published in the Saturday, Jan. 16 Your EO News, Pat Keown Norton's name (front row) was incomplete and Mike Boylen's name (back row, fourth from left) was omitted.

The East Oregonian works hard to be accurate and sincerely regrets any errors. If you notice a mistake in the paper, please call 541-966-0818.

EAST OREGONIAN

— Founded Oct. 16, 1875 —

211 S.E. Byers Ave., Pendleton 541-276-2211
333 E. Main St., Hermiston 541-567-6211
Office hours: Monday through Friday, 8 a.m. to 5 p.m.
Closed major holidays

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East Oregonian (USPS 164-980) is published daily except Sunday, Monday and Dec. 25, by the EO Media Group, 211 S.E. Byers Ave., Pendleton, OR 97801. Periodicals postage paid at Pendleton, OR. Postmaster: send address changes to East Oregonian, 211 S.E. Byers Ave., Pendleton, OR 97801. Copyright © 2016, EO Media Group

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AccuWeather.com Forecast

TODAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Occasional rain and drizzle	A shower in spots early	Mostly cloudy	Cloudy with a couple of showers	Cloudy with rain tapering off

PENDLETON TEMPERATURE FORECAST

45°	39°	49°	36°	48°	44°	53°	41°	48°	36°
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HERMISTON TEMPERATURE FORECAST

44°	39°	53°	36°	48°	41°	54°	40°	51°	37°
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ALMANAC

PENDLETON
through 3 p.m. yesterday

TEMPERATURE	HIGH	LOW
Yesterday	53°	33°
Normals	42°	28°
Records	63° (2005)	-20° (1922)

PRECIPITATION
24 hours ending 3 p.m. 0.30"
Month to date 0.95"
Normal month to date 0.93"
Year to date 0.95"
Last year to date 0.70"
Normal year to date 0.93"

HERMISTON
through 3 p.m. yesterday

TEMPERATURE	HIGH	LOW
Yesterday	49°	32°
Normals	42°	29°
Records	65° (1961)	-11° (1930)

PRECIPITATION
24 hours ending 3 p.m. 0.07"
Month to date 0.50"
Normal month to date 0.75"
Year to date 0.50"
Last year to date 0.43"
Normal year to date 0.75"

REGIONAL FORECAST

Coastal Oregon: Cloudy today with rain; steady and heaviest during the morning. Showers early tonight.

Eastern and Central Oregon: Mostly cloudy today with some snow and rain; snow level mostly near 4,000 feet.

Western Washington: Periods of rain today; arriving in the afternoon in central and northern parts.

Eastern Washington: Snow across the north today and tonight; any snow mixing with rain across the south.

Cascades: Periods of snow and rain today with snow level: 4,000 feet north, 5,000 feet south.

Northern California: Rain, heavy at times today, but 3-6 inches of snow in the interior mountains.

REGIONAL CITIES

	Today			Wed.		
	Hi	Lo	W	Hi	Lo	W
Astoria	49	44	r	52	46	sh
Baker City	39	29	sn	36	25	sn
Bend	41	29	r	41	34	c
Brookings	53	43	r	54	50	r
Burns	37	24	sn	34	22	c
Enterprise	39	30	sn	36	23	sn
Eugene	49	42	r	49	46	sh
Heppner	44	35	r	45	32	c
Hermiston	44	39	r	53	36	c
John Day	44	34	sh	41	33	c
Klamath Falls	41	27	sn	40	31	c
La Grande	42	36	sn	41	31	sn
Meacham	40	34	sn	40	30	sn
Medford	51	37	r	51	42	r
Newport	50	43	r	52	47	sh
North Bend	54	44	r	55	50	r
Ontario	41	31	sn	41	27	sn
Pasco	42	37	r	51	36	c
Pendleton	45	39	r	49	36	c
Portland	47	41	r	51	45	sh
Redmond	44	31	r	45	35	c
Salem	49	43	r	52	46	sh
Spokane	39	33	sn	39	32	sn
Ukiah	41	32	sn	39	26	c
Vancouver	46	42	r	49	44	sh
Walla Walla	47	39	r	48	36	c
Yakima	39	28	r	44	32	c

WORLD CITIES

	Today			Wed.		
	Hi	Lo	W	Hi	Lo	W
Beijing	29	7	c	28	11	c
Hong Kong	65	60	pc	66	63	r
Jerusalem	48	41	sh	49	38	c
London	38	27	s	39	31	s
Mexico City	69	44	pc	68	39	s
Moscow	16	11	s	15	9	sn
Paris	35	25	c	39	25	s
Rome	47	29	r	48	38	c
Seoul	18	8	pc	25	11	pc
Sydney	87	69	s	91	72	pc
Tokyo	46	36	s	49	37	s

WINDS

(in mph)	Today	Wednesday
Boardman	NE 4-8	WSW 6-12
Pendleton	SE 6-12	WSW 8-16

UV INDEX TODAY

0	0	1	0	0	0
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8 a.m. 10 a.m. Noon 2 p.m. 4 p.m. 6 p.m.

0-2, Low 3-5, Moderate 6-7, High; 8-10, Very High; 11+, Extreme

The higher the AccuWeather.com UV Index™ number, the greater the need for eye and skin protection.

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NATIONAL WEATHER TODAY

Shown are noon positions of weather systems and precipitation. Temperature bands are highs for the day.

National Summary: Locally heavy snow will fall around the Great Lakes today as accumulating snow spreads over much of the Plains with rain to the south. Rain and mountain snow will return to the Northwest.

Yesterday's National Extremes: (for the 48 contiguous states)
High 74° in Harlingen, Texas Low -34° in Embarrass, Minn.

NATIONAL CITIES

	Today			Wed.				Today			Wed.		
	Hi	Lo	W	Hi	Lo	W		Hi	Lo	W	Hi	Lo	W
Albuquerque	49	31	pc	52	30	s	Louisville	24	18	pc	35	22	sn
Atlanta	39	25	s	45	38	r	Memphis	38	33	c	46	36	r
Atlanta City	30	23	s	37	26	pc	Miami	65	52	pc	71	59	pc
Baltimore	28	17	s	36	22	pc	Millwaukee	14	9	s	22	10	c
Billings	38	26	r	39	23	sn	Minneapolis	9	6	c	21	15	c
Birmingham	41	30	s	47	45	r	Nashville	30	24	pc	39	33	sn
Boise	45	33	sh	43	28	sn	New Orleans	59	51	s	69	57	c
Boston	26	19	s	32	21	s	New York City	29	24	s	37	26	pc
Charleston, SC	43	25	s	49	37	pc	Philadelphia	53	25	c	47	30	c
Charleston, WV	20	8	pc	31	21	sn	Portland, ME	21	7	sn	29	21	c
Chicago	16	11	pc	23	15	sn	Portland, OR	29	22	s	38	26	pc
Cleveland	19	11	sf	22	14	sn	Providence	70	48	pc	70	48	s
Dallas	65	35	c	56	45	pc	Raleigh	27	18	s	34	20	pc
Denver	37	23	sn	44	22	c	Rapid City	33	13	c	36	18	c
Detroit	23	12	pc	23	13	sn	Reno	49	34	c	50	32	pc
El Paso	66	38	s	67	41	s	Sacramento	57	47	r	61	46	c
Fairbanks	1	-9	pc	-4	-13	pc	St. Louis	26	21	sn	32	24	c
Fargo	11	7	c	23	7	c	St. Louis City	42	35	sn	38	22	sn
Honolulu	82	65	s	80	66	r	San Diego	65	57	c	67	53	pc
Houston	68</												